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DEPARTMENT OF PEDIATRICS

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# **The Physical Examination of infants and children**

THE EDUCATIONAL SUPPLY

**for the students  
for institutions of medical education**

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## **INTERVIEWING AND THE HEALTH HISTORY**

The way you talk with a patient while taking a history lays the foundation for good care. By listening and responding skillfully and empathically, you learn what is bothering the patient and what symptoms he or she has experienced. You also may learn what the patient thinks the trouble may be, how or why it happened, and what outcome is hoped for or feared. As you listen to the story of an illness, moreover, you begin to formulate a range of possible diagnoses. By asking additional questions, you can fill in the gaps in the patient's initial account and test some of your diagnostic hypotheses.

This process, when successful, helps to establish a trusting relationship between you and the patient. It develops your understanding of the patient as a person and, in turn, helps the patient to feel understood. What you learn while taking a history, moreover, helps to shape the history itself, and it suggests the most relevant bodily parts or systems on which you may focus your physical examination. At a later stage of care, it will affect your explanations to the patient and your shared plan for the future.

Even if you discover that nothing can be done about the patient's disease, your discussion with the person about the experience of being ill can be therapeutic. In the example that follows, research protocol made the patient ineligible for treatment of her longstanding and severe arthritis. She had never talked about what the symptoms meant to her. She had never said: "This means that I can't go to the bathroom by myself, put my clothes on, even get out of bed without calling for help."

When we finished the physical assessment. I said something like: "Rheumatoid arthritis really has not been nice to you." She burst into tears, and her daughter did also, and I sat there, very close to losing it myself. She said: "You know, no one has ever talked about it as a personal thing before, no one's ever talked to me as if this were a thing that mattered, a personal event."

That was the significant thing about the encounter. I didn't really have much else to offer. . . . Something really significant had happened between us, something that she valued and would carry away with her.

This chapter outlines the structure, purposes, and content of a health history and describes some basic techniques of interviewing. It also suggests ways to talk with patients of different ages and to approach a variety of difficult issues and problems.

### **The Structure and Purposes of a Health History**

The traditional health history has several parts, each with a specific purpose. Together they give structure to your data collection and to your final record, but they do not dictate the sequence of the interview.

Certain introductory materials in the health history typically precede the account of the patient's story. The *date* is always important, and in rapidly changing circumstances the time should be added. *Identifying data*, such as age, sex, race or ethnic origin, birthplace, and occupation, serve not only to establish who the patient is but also to give you some tentative suggestions as to what kind of person you are talking to and what the likely problems might be. When patients do not initiate their own visits, the *source of referral* becomes important. It indicates that a written report may be necessary, and it helps you to understand the patient's possible motivations. Persons seen at the request of school authorities or an insurance company may have different goals than those who come on their own initiative. The *source of the history*, whether it be the patient, family, friends, police, a letter of referral, or the past medical record, also deserves comment. It helps you to assess the value and possible biases of the information. Under some circumstances it is also helpful to comment on the probable *reliability* of the source of your data. Reliability varies with knowledge, memory, trust, and motivation, among other factors, and is a judgment made at the end of the interaction, not at the beginning.

The main part of the history starts with the patient's *chief complaints*. These are the one or more symptoms or other concerns for which the patient is seeking care or advice. The *present illness* amplifies the chief complaints and, in its written form, gives a full, clear, chronological account of how each of the symptoms developed and what events were related to them. It also includes how the patient thinks and feels about the illness, what concerns have led to seeking attention, and how the illness has affected the patient's life and functions. The *past history* explores prior illnesses, injuries, and medical interventions, while the *current health status* focuses on the present state of health and on environmental conditions, personal habits, and health-related measures that may impinge on it.

The *family history* helps you to assess the patient's risks of developing certain diseases and may also suggest what the patient might be worrying about. Further, a pattern of familial illness may emerge that will prove useful in the care of related persons. The *psychosocial history* sometimes suggests some contributory factors in the patient's illness and helps you to evaluate the patient's sources of support, likely reactions to illness, coping mechanisms, strengths, and concerns. It helps you in getting to know your patient as a person. In the *review of systems* you ask about common symptoms in each major body system, and thus try to identify problems that the patient has not mentioned.

### **The Content of a Comprehensive History**

The items in a history vary with the patient's age, sex, and illness, with the clinician's specialty and available time, and with the goals of the visit.

Under many circumstances the clinician's efforts are targeted on a specific complaint, such as a sore throat or burning on urination. A limited approach, tailored to the problem, is then indicated. In other circumstances, however, a comprehensive history is needed. By learning and understanding all the items in such a history you can select the ones you need. Two patterns of a comprehensive history are detailed in the next few pages: one for adults, the other for children. Technical terms for symptoms appear in these histories.

## COMPREHENSIVE HISTORY: ADULT PATIENT

### *Date of History*

Identifying Data, including age, sex, race, place of birth, marital status, occupation, and religion

Source of Referral, if any, and the purpose of it

Source of History, such as the patient, a relative, a friend, the patient's medical record, or a referral letter

Reliability, if relevant. For example, "The patient is consistently clear about her symptoms but vague on when they began."

Chief Complaints, when possible in the patient's own words. "My stomach hurts and I feel awful." Sometimes patients have no overt complaints; ascertain their goals instead. "I have come for my regular checkup" or "I've been admitted for a thorough evaluation of my heart."

Present Illness. This section is a clear, chronological account of the problems for which the patient is seeking care. The data come from the patient but the organization is yours. The narrative should include the onset of the problem, the setting in which it developed, its manifestations, and any treatments. The principal symptoms should be described in terms of (1) location, (2) quality, (3) quantity or severity, (4) timing (i.e., onset, duration, and frequency), (5) the setting in which they occur, (6) factors that have aggravated or relieved them, and (7) associated manifestations. Also note significant negatives (the absence of certain symptoms that will aid in differential diagnosis).

A present illness should also include patients' responses to their own symptoms and incapacities. What does the patient think has caused the problem? What are the underlying worries that have led to seeking professional attention? ("I think I may have appendicitis.") And why is that a worry? ("My Uncle Charlie died of a ruptured appendix.") Further, what effects has the illness had on the patient's life? This

question is especially important in understanding a patient with chronic illness. "What can't you do now that you could do before? How has the backache, shortness of breath, or whatever, affected your ability to work? . . . your life at home? . . . your social activities? . . . your role as a parent? . . . your role as a husband, or wife? . . . the way you feel about yourself as a man, or a woman?"

## Past History

**General State of Health** as the patient perceives it

**Childhood Illnesses**, such as measles, rubella, mumps, whooping cough, chickenpox, rheumatic fever, scarlet fever, polio

**Adult Illnesses**

**Psychiatric Illnesses**

**Accidents and Injuries**

**Operations**

**Hospitalizations** not already described

**Current Health Status.** Although some of the variables grouped under this heading have past as well as current components, they all may affect current health.

**Current Medications**, including home remedies, nonprescription drugs, vitamin/mineral supplements, and medicines borrowed from family or friends. Ask about doses and frequency of use. You may need to ask patients to bring you all their medicines and show you what they take.

**Allergies**

**Tobacco**, including the type (smoked, e.g., cigarettes, or smokeless, e.g., chewing tobacco or snuff), amount, and duration of use, e.g., cigarettes, a pack a day for 12 years

**Diet**, including usual daily intake and any dietary restrictions or supplements. Ask about coffee, tea, cola drinks, and other caffeine-containing beverages.

**Screening Tests** appropriate to the patient, such as tuberculin tests, Pap smears, mammograms, stools for occult blood, and cholesterol tests, together with the results and the dates they were last performed

**Immunizations**, such as tetanus, pertussis, diphtheria, polio, measles, rubella, mumps, influenza, hepatitis B, *Hemophilus influenzae*, type b, and pneumococcal vaccine

**Sleep Patterns**, including times that the person goes to bed and awakens, daytime naps, and any difficulties in falling asleep or staying asleep

### ***Exercise and Leisure Activities***

**Environmental Hazards**, including those in the home, school, and workplace

**Use of Safety Measures**, such as seat belts, smoke detectors, and other devices related to specific hazards

## **Family History**

The age and health, or age and cause of death, of each immediate family member (i.e., parents, siblings, spouse, and children). Data on grandparents or grandchildren may also be useful.

The occurrence within the family of any of the following conditions: diabetes, heart disease, hypercholesterolemia, high blood pressure, stroke, kidney disease, tuberculosis, cancer, arthritis, anemia, allergies, asthma, headaches, epilepsy, mental illness, alcoholism, drug addiction, and symptoms like those of the patient.

**Psychosocial History.** This is an outline or narrative description that captures the important and relevant information about the patient as a person:

**Home Situation and Significant Others.** "Who lives at home with you? Tell me a little about them . . . and about your friends." "Who helps you when you are sick, or need assistance?"

**Daily Life,** from the time of arising to bedtime. "What is a typical day like? What do you do first? . . . Next?"

**Important Experiences**, including upbringing, schooling, military service, job history, financial situation, marriage, recreation, retirement

**Religious Beliefs** relevant to perceptions of health, illness, and treatment

**The Patient's Outlook** on the present and on the future

## Review of Systems

**General.** Usual weight, recent weight change, any clothes that fit tighter or looser than before. Weakness, fatigue, fever

**Skin.** Rashes, lumps, sores, itching, dryness, color change, changes in hair or nails

**Head.** Headache, head injury

**Eyes.** Vision, glasses or contact lenses, last eye examination, pain, redness, excessive tearing, double vision, blurred vision, spots, specks, flashing lights, glaucoma, cataracts

**Ears.** Hearing, tinnitus, vertigo, earaches, infection, discharge. If hearing is decreased, use of hearing aids

**Nose and Sinuses.** Frequent colds; nasal stuffiness, discharge, or itching; hay fever, nosebleeds, sinus trouble

**Mouth and Throat.** Condition of teeth and gums, bleeding gums, dentures, if any, and how they fit, last dental examination, sore tongue, dry mouth, frequent sore throats, hoarseness

**Neck.** Lumps, "swollen glands," goiter, pain or stiffness in the neck

**Breasts.** Lumps, pain or discomfort, nipple discharge, self-examination

**Respiratory.** Cough, sputum (color, quantity), hemoptysis, wheezing, asthma, bronchitis, emphysema, pneumonia, tuberculosis, pleurisy; last chest x-ray film

**Cardiac.** Heart trouble, high blood pressure, rheumatic fever, heart murmurs; chest pain or discomfort, palpitations; dyspnea, orthopnea, paroxysmal nocturnal dyspnea, edema; past electrocardiogram or other heart test results



***Gastrointestinal.*** Trouble swallowing, heartburn, appetite, nausea, vomiting, regurgitation, vomiting of blood, indigestion. Frequency of bowel movements, color and size of stools, change in bowel habits, rectal bleeding or black tarry stools, hemorrhoids, constipation, diarrhea. Abdominal pain, food intolerance, excessive belching or passing of gas. Jaundice, liver or gallbladder trouble, hepatitis

***Urinary.*** Frequency of urination, polyuria, nocturia, burning or pain on urination, hematuria, urgency, reduced caliber or force of the urinary stream, hesitancy, dribbling, incontinence; urinary infections, stones

### ***Genital***

***Male.*** Hernias, discharge from or sores on the penis, testicular pain or masses, history of sexually transmitted diseases and their treatments. Sexual preference, interest, function, satisfaction, and problems

***Female.*** Age at menarche; regularity, frequency, and duration of periods; amount of bleeding, bleeding between periods or after intercourse, last menstrual period; dysmenorrhea, premenstrual tension; age at menopause, menopausal symptoms, postmenopausal bleeding. If the patient was born before 1971, exposure to DES (diethylstilbestrol) from maternal use during pregnancy. Discharge, itching, sores, lumps, sexually transmitted diseases and their treatments. Number of pregnancies, number of deliveries, number of abortions (spontaneous and induced); complications of pregnancy; birth control methods. Sexual preference, interest, function, satisfaction; any problems, including dyspareunia

***Peripheral Vascular.*** Intermittent claudication, leg cramps, varicose veins, past clots in the veins

***Musculoskeletal.*** Muscle or joint pains, stiffness, arthritis, gout, backache. If present, describe location and symptoms (e.g., swelling, redness, pain, tenderness, stiffness, weakness, limitation of motion or activity).

***Neurologic.*** Fainting, blackouts, seizures, weakness, paralysis, numbness or loss of sensation, tingling or "pins and needles," tremors or other involuntary movements

***Hematologic.*** Anemia, easy bruising or bleeding, past transfusions and any reactions to them

**Endocrine.** Thyroid trouble, heat or cold intolerance, excessive sweating; diabetes, excessive thirst or hunger, polyuria

**Psychiatric.** Nervousness, tension, mood including depression; memory

## COMPREHENSIVE HISTORY: CHILD PATIENT

In addition to the obvious age-related differences between histories of children and those of adults, there are present and past historical data specifically pertinent to the assessment of infants, children, and adolescents. These relate particularly to the patient's chronological age and stage of development. The child's history, then, follows the same outline as the adult's history, with certain additions that are presented here.

**Identifying Data.** Date and place of birth. Nickname, particularly for those between 2 and 10 years of age. First names of parents (and last name of each, if different), their occupations, and where they may be reached during work hours

**Chief Complaints.** Make clear whether these are concerns of the patient, the parent(s), or both. In some instances a third party, such as a schoolteacher, may have expressed concerns about the child.

**Present Illness.** Should include how all members of the family respond to the patient's symptoms, what they think about them, and whether the patient achieves any secondary gains from the illness

### Past History

**Birth History.** Particularly important during the first 2 years of life and for neurologic and developmental problems. Hospital records should be reviewed if preliminary information from the parent(s) indicates significant difficulties before, during, or after delivery.

**Prenatal** Maternal health before and during pregnancy, including nutrition and specific illnesses related to or complicated by pregnancy; doses and duration of all legal and illegal drugs taken during pregnancy (includes alcohol ingestion and cigarette smoking); weight gain; vaginal bleeding; duration of pregnancy; parental attitudes concerning the pregnancy and parenthood in general and this child in particular

*Natal.* Nature of labor and delivery, including degree of difficulty, analgesia used, and complications encountered; birth order if a multiple birth; birth weight

*Neonatal.* Onset of respirations; resuscitation efforts; Apgar scores and estimation of gestational age. Specific problems with feeding, respiratory distress, cyanosis, jaundice, anemia, convulsions, congenital anomalies, infection, Mother's health postpartum; separation of mother and infant and reasons for it; mother's initial reaction to her baby and the nature of bonding. Patterns of crying and sleeping, and of urination and defecation

**Feeding History.** Particularly important during the first 2 years of life and in dealing with problems of under- and overnutrition

*Infancy. Breast feeding*—frequency and duration of feeds, use of complementary or supplementary artificial feedings, difficulties encountered, timing and method of weaning. *Artificial (formula) feeding*—type, concentration, amount, and frequency of feeds, difficulties (regurgitation, colic, diarrhea) encountered, timing and method of weaning. *Vitamin and iron supplements*—type, amount given, frequency, and duration. *Solid foods*—types and amounts of baby foods given, when introduced, infant's response, introduction of table foods, self-feeding, parental and infant responses to feeding process

*Childhood. Eating habits*—likes and dislikes, specific types and amounts of food eaten, parental attitudes toward eating in general and toward this child's under- or overeating, parental response to feeding problems (if present). A *diet diary* kept over a 7- to 14-day period may be required for an accurate assessment of food intake in childhood feeding problems.

**Growth and Developmental History.** Particularly important during infancy and childhood and in dealing with problems of delayed physical growth, psychomotor and intellectual retardation, and behavioral disturbances

*Physical Growth.* Actual (or approximate) weight and height at birth and at 1, 2, 5, and 10 years; history of any slow or rapid gains or losses; tooth eruption and loss pattern

*Developmental Milestones.* Ages at which patient held up head while in a prone position, rolled over from front to back and back to front, sat with support and alone, stood with support and alone, walked with support and

alone, said first word, combinations of words, and sentences, tied own shoes, dressed without help.

*Social Development.* *Sleep*—amount and patterns during day and at night, bedtime routines, type of bed and its location; nightmares, terrors, and somnambulation. *Toileting*—methods of training used, when bladder and bowel control attained, occurrence of accidents or of enuresis or encopresis, parental attitudes, terms used within the family for urination and defecation (important to know when a young child is admitted to the hospital). *Speech*—hesitation, stuttering, baby talk, lisping, estimate of number of words in vocabulary. *Habits*—feed rocking, head banging, tics, thumb sucking, nail biting, pica, ritualistic behavior. *Discipline*—parental assessment of child's temperament and response to discipline; methods used, success or failure, negativism, temper tantrums, withdrawal, aggressive behavior. *Schooling*—experience with day care, nursery school, and kindergarten; age and adjustment upon entry; current parental and child satisfaction; academic achievement; school's concerns. *Sexuality*—relations with members of opposite sex; inquisitiveness regarding conception, pregnancy, and girl-boy differences; parental responses to child's questions and the sex education they have offered regarding masturbation, menstruation, nocturnal emissions, development of secondary sexual characteristics, sexual urges, and AIDS and other sexually-transmitted diseases; dating patterns. *Personality*—degree of independence; relationship with parents, siblings, and peers; group and independent activities and interests, congeniality, special friends (real or imaginary); major assets and skills; self-image

**Childhood Illnesses.** In addition to specific illnesses experienced, mention of any recent exposures to childhood illnesses should be made here.

**Accidents and Injuries  
Operations  
Hospitalizations**

The reactions of the child and parents to these events should be ascertained. Age-appropriate questions about safety and injury prevention should be asked of the child.

## Current Health Status

**Allergies.** Particular attention should be given to the allergies that are more prevalent during infancy and childhood—eczema, urticaria, perennial allergic rhinitis, asthma, food intolerance, and insect hypersensitivity.

**Immunizations.** Specific dates of administration of each vaccine should be recorded so that an ongoing booster program can be maintained throughout childhood and adolescence. Parents should have their own written record of their child's immunizations. Any untoward reactions to specific vaccines should also be recorded.

**Screening Procedures.** The dates and results of any screening tests performed should be recorded. These include blood pressure, vision, hearing, and tuberculin tests, urinalysis, hematocrits, tests for phenylketonuria, galactosemia, and other genetic-metabolic disorders, and, for certain high-risk populations, sickle cell, blood lead, cholesterol, alpha<sub>1</sub>-antitrypsin deficiency, and other tests that may be indicated.

**Family History.** The education attained, job history, emotional health, and family background of each parent or parent substitute. The family socioeconomic circumstances, including income, type of dwelling, and neighborhood in which the family lives. Parental work schedules; family cohesiveness and interdependence; support available from relatives, friends, and neighbors; the ethnic and cultural milieu in which the family lives. Parental expectations, and attitudes toward the patient in relation to siblings. (All or portions of this information may be recorded in the present illness section, if pertinent to it, or under psychosocial history.) Consanguinity of the parents should be ascertained (by inquiring if they are "related by blood").

Once you know what kind of information to gather, you should lay that knowledge aside temporarily lest it come between you and the patient. At least at the start of the interview, and often at other times, you should be guided primarily by what the patient says and does rather than by a printed form or a rigid format.

#### **Setting the Stage for the Interview**

**Reviewing the Chart.** Before seeing the patient, quickly review the chart. Note the identifying data. Age, sex, race, marital status, address, occupation, and religion give you important glimpses into the patient's likely life experiences and may even guide your diagnostic hypotheses. Has the patient been referred from elsewhere? By whom? For what? Reviewing the medical chart may give you valuable information about past diagnoses and treatments, but it should not prevent you from developing new approaches or ideas.

**The Environment.** Although you may have to talk with the patient under difficult circumstances, such as a four-bed room or the corridor of a busy emergency department, a proper environment will improve communication. Try to make it as private and comfortable as possible. There

should be places where both you and the patient can sit down in clear view of each other, preferably at eye level. Leaning against the far wall, inching toward the door, or shifting around uncomfortably from foot to foot discourages the patient's attempts at communication. So do arrangements that indicate inequality of power or even disrespect, such as greeting and interviewing a woman while she is lying supine, positioned for a pelvic examination.

Your distance from the patient should probably be several feet, not so close as to be intimate nor too distant for easy conversation. Patients may be able to talk more easily when sitting next to your desk than when peering over it as if over a barrier. When they prefer greater social distance they are telling you something about themselves, psychologically or perhaps culturally. Lighting also makes a difference. Avoid sitting between a patient and a bright light or window. Although your view may be fine, the patient must squint uncomfortably toward your silhouette. You unwittingly conduct an interrogation, not a helping interview.

*Your Demeanor and Appearance.* Just as you observe the patient throughout the interview, the patient will be watching you. Consciously or not, you send messages through both your words and your behavior. You should be sensitive to those messages and control them as well as you can. Posture, gestures, eye contact, and words can all express interest, attention, acceptance, and understanding. The skilled interviewer seems calm and unhurried, even when time is limited. Reactions that betray disgust, disapproval, embarrassment, impatience, or boredom block communication, as do behaviors that condescend, stereotype, or make sport of the patient. Although negative reactions such as these are normal and understandable, they should not be expressed. Guard against them not only when talking with the patient but also when discussing the patient with your colleagues or instructors, either at the bedside or in the hall.

Your personal appearance may also affect the ease with which you establish a relationship. Cleanliness, neatness, conservative dress, and a name tag are usually desirable, but casual dress may be preferable in circumstances such as dealing with children or young people.

*Note Taking.* Because no one can remember all the details of a comprehensive history, you need to take notes. Most patients are accustomed to note taking, but some may seem uncomfortable with it. If so, explore their concerns and explain your desire to make an accurate record. With practice you may be able to record most of the past history, current health status, family history, and review of systems in final form as you talk with the patient, especially if you have the help of a written questionnaire. Note taking should not divert your attention from the patient, however, nor should a written form prevent you from following a patient's leads. While eliciting the present illness, the psychosocial history, or other complex portions of the

patient's account, do not attempt to write your final report. Instead, jot down short phrases, words, and dates. When the patient is talking about sensitive or disturbing material it is best not to take notes at all.

### **Learning About the Present Illness**

*Greeting the Patient.* You are now ready to make your approach, greet the patient by name, and give your undivided attention. Shake hands if you feel comfortable doing so. Unless you are talking with a child or adolescent or unless you already know the patient well, use the appropriate title—for example, Mr. O'Neill or Ms. Washington. Use of first names or terms of endearment with unfamiliar adults and use of "Granny" for an aged woman or "Mother" for a child's parent tend to depersonalize and demean. Introduce yourself by name. If there is any ambiguity in your role, such as your status as a student, explain your relation to the patient's care.

*The Patient's Comfort.* Be alert to the patient's comfort. In the office or clinic, there should be a suitable place for coats and belongings other than the patient's own lap. In the hospital, inquire how the patient is feeling and whether your visit now is convenient. Watch for indications of discomfort such as poor positioning, evidence of pain or anxiety, or signs of the need to urinate. An improved position in bed or a short delay so that the patient can say goodbye to visitors or make a trip to the bathroom may be the shortest route to a good history.

*Opening Questions.* You need to find out why the patient is here—the chief complaints, if any, and the present illness. (Occasionally a patient may come for a checkup or may wish to discuss a health-related matter without having either complaint or illness.) Begin your interview with a general question that allows full freedom of response—for example, "What brings you here?" or "What seems to be the trouble?" After the patient answers, inquire again, or even several times, "Anything else?" When the patient has finished, encourage further description by saying "Tell me about it," or, if there seems to be more than one problem, ask about one of them. "Tell me about the headaches" or ". . . about what bothers you most." As the patient answers, pick up the thread of the history and follow wherever it leads.

*Following the Patient's Leads.* Many patients want help with relatively straightforward medical problems. Others, however, have illnesses with complex psychosocial and pathophysiological causes, and may have complicated feelings about themselves, their illnesses, potential treatments, and those who are trying to help them. At the start you cannot tell one kind of patient from another. In order to do so, your interviewing technique must allow patients to recount their own stories spontaneously. If you intervene verbally too soon, if you ask specific questions prematurely, you risk trampling on the very information you are seeking. Your role, however, is not passive. You should listen actively and watch for clues to important

symptoms, emotions, events, and relationships. You can then guide the patient into telling you more about these areas. Methods of helping and guiding patients without diverting them from their own accounts include facilitation, reflection, clarification, empathic responses, confrontation, interpretation, and questions that elicit feelings.

**Facilitation.** You use facilitation when by posture, actions, or words you encourage the patient to say more but do not specify the topic. Silence itself, when attentive yet relaxed, is facilitative. Leaning forward, making eye contact, saying "Mm-hmm" or "Go on" or "I'm listening," all help the patient to continue.

**Reflection.** Closely akin to facilitation is reflection, a repetition of the patient's words that encourages the patient to give you more details. Reflection may be useful in eliciting both facts and feelings, as in the following example:

*Patient:* The pain got worse and began to spread. (Pause)  
*Response:* It spread?  
*Patient:* Yes, it went to my shoulder and down my left arm to the fingers. It was so bad that I thought I was going to die. (Pause)  
*Response:* You thought you were going to die?  
*Patient:* Yes. It was just like the pain my father had when he had his heart attack, and I was afraid the same thing was happening to me.

This reflective technique has helped to reveal not only the location and severity of the pain, but also its meaning to the patient. It did not bias the story or interrupt the patient's train of thought.

**Clarification.** Sometimes the patient's words are ambiguous or the associations are unclear. If you are to understand their meaning you must request clarification, as in "Tell me what you meant by 'a cold'," or "You said you were behaving just like your mother. What did you mean?"

**Empathic Responses.** As patients talk with you, they may express—with or without words—feelings about which they are embarrassed, ashamed, or otherwise reticent. These feelings may well be crucial to how you understand their illnesses or plan treatment. If you can recognize and respond to them in a way that shows understanding and acceptance, you show empathy for the patients, make them feel more secure, and encourage them to continue. Empathic responses may be as simple as "I understand." Other examples include, "You must have been very upset," or "That must have been very difficult for you." Empathic responses may also be nonverbal—for example, offering a tissue to a crying patient or gently placing your hand on an arm to convey understanding. In using an empathic response, be sure that you are responding correctly to what the patient has already expressed. If you have acknowledged how upset a patient must have been at the death of a



parent, when in fact the death relieved the patient from a longstanding financial and emotional burden, you have misunderstood the situation.

**Confrontation.** While an empathic response acknowledges expressed feelings, confrontation points out to patients something about their own words or behaviors. If you observe clues of anger, anxiety, or depression, for example, confrontation may help to bring these feelings out in the open. "Your hands are trembling whenever you talk about that," or "You say you don't care but there are tears in your eyes." Confrontation may also be useful when the patient's story has been inconsistent. "You say you don't know what brings on your stomach pains, yet whenever you've had them you were feeling picked on."

**Interpretation.** Interpretation goes a step beyond confrontation. Here you make an inference, rather than a simple observation. "Nothing has been right for you today. You seem fed up with the hospital." "You are asking a lot of questions about the x-rays. Are you worried about them?" In interpreting a patient's words or behavior, you take some risk of making the wrong inference and impeding further communication. When used wisely, however, an interpretation can both demonstrate empathy and increase understanding.

**Asking About Feelings.** Rather than making an inference or reflecting a feeling, you may simply ask patients how they feel, or felt, about something such as symptoms or events. When you sense important but unexpressed feelings from the patient's face, voice, words, or behavior, inquire about them. Unless you let patients know that you are interested in feelings as well as in facts, you may miss important insights.

**Getting More Data.** Using the nondirective techniques described thus far, you will usually be able to obtain a general idea of the patient's principal problems. You can encourage a chronological account by such questions as "What then?" or "What happened next?" Most of the time, however, you will need further specific information. Fill in the details with more direct questions that ask for specific information not already offered by the patient. If the present illness involves pain, for example, you should determine the following elements:

### *Attributes of a Symptom*

1. Its location. Where is it? Does it radiate?
2. Its quality. What is it like?
3. Its quantity or severity. How bad is it?
4. Its timing. When did (does) it start? How long does it last? How often does it come?
5. The setting in which it occurs, including environmental factors, personal activities, emotional reactions, or other circumstances that may have contributed to the illness
6. Factors that make it better or worse
7. Associated manifestations

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Other symptoms should be described in similar terms. These attributes are fundamental in recognizing patterns of disease and differentiating one disease from another.

*Clinical Reasoning.* As you learn about a patient's symptoms and their attributes, you should start to think analytically about what bodily systems might be involved by a pathologic process. Leg pain, for example, suggests a problem in the peripheral vascular, musculoskeletal, or nervous system. An associated swollen ankle favors a venous problem. Aching joints suggest a musculoskeletal disorder, while a severe pain that shoots down the back of one leg to below the knee indicates pressure on a nerve root. For additional data that will contribute to your analysis, use items from relevant sections of the review of systems. You can thus develop arguments for and against the various diagnostic possibilities.

*Direct Questions.* To gather specific items of information, direct questions are suitable. Several principles apply to their use. They should *proceed from the general to the specific*. A possible sequence, for example, might be "What was your chest pain like? Where did you feel it? Show me. Did it stay right there or did it travel anywhere? ... to which fingers?"

Direct questions *should not be leading questions*. If a patient says yes to "Did your stools look like tar?" you must wonder if the description is the patient's or yours. A better wording is "What color were your stools?" When possible, ask questions that *require a graded response* rather than a yes or no answer. "How many stairs can you climb before stopping for breath?" is better than "Do you get short of breath climbing stairs?"

Sometimes patients seem quite unable to describe their symptoms without help. To minimize bias here, *offer multiple-choice answers*. "Is your pain aching, sharp, pressing, burning, shooting, or what?" Almost any direct question can provide at least two possible answers. "Do you bring up any phlegm with your cough, or not?"

*Ask one question at a time.* "Any tuberculosis, pleurisy, asthma, bronchitis, pneumonia?" may lead to a negative answer out of sheer confusion.

Finally, *use language that is understandable and appropriate* to the patient. Although you might ask a trained health professional about dyspnea, the more customary term is shortness of breath. When talking with an Appalachian coal miner, on the other hand, it may help to use the colloquial phrase "smothering spells." Whenever possible use the patient's words, making sure you understand their meaning.

### **The Rest of the Story**

While the present illness is usually the single most important part of a history, important data are also discovered in subsequent parts of the interview. In most of these later sections, direct questions constitute your

major technique. Stay alert, however, for important medical or emotional material, and be prepared to revert to a nondirective style whenever indicated. While taking a family history, for example, you may learn of a parent's death or a child's illness. Here is a good opportunity to find out what it meant to the patient. "How was it for you then?" or "What were your feelings at the time?" The review of systems may also uncover material that requires as full an exploration as the present illness. Keep your technique flexible.

*Taking a History on Sensitive Topics.* Beginning students always have difficulties in talking with patients about topics that are emotionally laden or culturally sensitive. At first the list of such subjects may be long, including sexual activities, death and dying, the financial concerns of patients, their racial and ethnic experiences, family interactions, domestic violence, psychiatric illnesses, physical deformities, and the functions of the urinary tract and bowel. Most of us will always feel a little uncomfortable in a few of these areas. Many adult patients, however, respond fairly easily to such questions, and you may thereby learn of important factors that have contributed to their illnesses.

There are several ways of becoming more comfortable in difficult areas: special courses, professional and general reading, and your own life experiences. Use them all. Further, familiarize yourself with some opening questions on sensitive topics, and learn the additional kinds of data you need in order to make the desired assessments. Whenever possible, listen to experienced clinicians as they discuss such subjects with patients, and then try some of the difficult areas yourself. The range of topics that you can explore with comfort will widen progressively, sometimes to your surprise.

*Alcohol and Drugs.* One difficult area for many clinicians is asking patients about their use of alcohol and illicit drugs. Yet alcohol and drugs are often directly related to a patient's symptoms, and dependence upon a substance may importantly affect future management. It is not your role to pass judgment on the use of these substances, but it is your job (if the patient is willing) to gather the data with which to make a correct assessment and plan treatment. A nonjudgmental demeanor will help patients discuss their practices with you.

Questions about alcohol and other drugs follow naturally after questions about coffee and cigarettes. "How much alcohol do you drink?" is a good opening question that avoids the easy yes or no response. It is not, however, very helpful in detecting an alcohol problem. For this purpose, try two additional questions: "Have you ever had a drinking problem?" and "When was your last drink?" An affirmative answer to the first question, along with a drink within 24 hours, has been shown in at least one study to suggest a drinking problem.

Four other questions known as the CAGE questions are also helpful in

detecting alcoholism. Their name comes from their themes of Cutting down, Annoyance by criticism, Guilty feelings, and Eye-openers. You can alter the wording of the questions to suit your style, but retain their meaning and themes.

### ***The CAGE Questionnaire\****

- Have you ever felt the need to Cut down on drinking?
- Have you ever felt Annoyed by criticism of drinking?
- Have you ever had Guilty feelings about drinking?
- Have you ever taken a drink first thing in the morning (Eye-opener) to steady your nerves or get rid of a hangover?

\*Adapted from Mayfield D, McLeod G, Hall P: The CAGE questionnaire: Validation of a new alcoholism screening instrument.

Two or more affirmative answers suggest alcoholism. They also suggest further lines of inquiry.

If indicated, ask about blackouts (loss of memory for events during drinking), about accidents or injuries while drinking, and about alcohol-related job losses, marital problems, or arrests.

Questions about drugs take a somewhat similar pattern. "How much marijuana do you use? cocaine? heroin? other drugs like these? How about sleeping pills? diet pills? pain-killers?" And further:

How do you feel when you take it?

Have you had any bad reactions? What happened?

Any drug-related accidents, injuries, or arrests? Job or family problems?

Have you ever tried to quit?

Less directly, it may be helpful to ask first about the use of such substances by friends or family members. "A lot of college students are using drugs these days. How about your school? your friends?" After patients have found your response nonjudgmental and concerned, they may feel more comfortable telling you about their own patterns of use.

***Physical Violence.*** Physical abuse—often not mentioned by the victim—should be considered (1) when injuries are unexplained, seem inconsistent with the patient's story, are concealed by the patient, or cause embarrassment; (2) when the patient has delayed getting treatment for trauma; (3) when there is a past history of repeated injuries or "accidents"; and (4) when the patient or a person close to the patient has a history of alcoholism or drug abuse. At times, the behavior of the abuser raises suspicion: he (she) tries to dominate the interview, will not leave the room, or seems unusually anxious or concerned.

Suitable questions relate to what the patient has told you and what you

have observed:

When he comes home drunk like that, does he ever hit (beat, abuse) you, or the children? What does he do? What do you do?

You mentioned that you and your husband were having lots of arguments.

Do they ever lead to physical fighting?

I notice you have some bruises on your breasts and abdomen. Can you tell me what happened? Did somebody hit you?

By suggesting that the problem is common, you may enable patients to talk about their experiences. "Many women tell me that someone at home is abusing or hurting them. How is it for you?" In cases of suspected child abuse, you might proceed as follows: "Most parents get very upset when their baby cries or their child has been naughty. How do *you* feel when *your* baby cries? What do you do when your baby won't stop crying? What sort of discipline do you use when your child has done something wrong? Are you ever afraid you might hurt your child?"

**The Sexual History.** Asking questions about sexual functions and practices serves at least four purposes. (1) Many patients have sex-related questions or problems that they would like to discuss with a professional if given the opportunity. Even if they choose not to discuss these questions on the first visit, they may feel free to do so at a later time if you have introduced the topic. (2) Sexual practices may be directly related to specific symptoms, and they need to be understood for diagnostic, therapeutic, and preventive reasons. (3) Sexual dysfunctions are sometimes the consequence of medications and, if recognized, may be reversible. (4) Sexual practices are obviously related to the risks of unwanted pregnancy and sexually transmitted diseases, including AIDS. Discussion may lead to preventing disease.

Questions about sexual functions or practices may be relevant at more than one point in a person's history. If a patient's chief complaint involves genitourinary symptoms, a sexual history is included in the present illness. Whenever a person has a chronic illness or serious symptoms such as pain or shortness of breath, sexual function may be affected. Asking about it in the context of other effects on the patient's life is a natural sequence of inquiry. Most commonly, a sexual history is taken during the genitourinary portion of the review of systems. This fairly late point in the history has the advantage of having given you time to establish rapport with the patient.

An introductory sentence or two is often helpful in preparing patients for what to them is sometimes an embarrassing topic. "Now, to figure out why you have this discharge and what we should do about it, I need to ask you some questions about your sexual activity." If there have been no apparent sex-related complaints, a different introduction is indicated. "I'd like to ask you some questions about your sexual health and practices. This information helps me (us) to provide better care for you. If you prefer, I won't write down

your answers in the chart. May I go ahead?" If the patient does not wish to go on, accept the choice and make clear (if it is true) that you are available to discuss any such matters in the future.

If the patient assents, proceed with the following questions:

1. "Are you sexually active? That is, have you had sex with anyone in the past few months?" If the answer is yes, skip to question 3.
2. "Have you ever been sexually active?" If no, skip to question 8. If yes, proceed to questions 3, 4, 6, and 7. (Adjust to the past by changing "Do" to "Did" in questions 3, 4, and 7.) Then continue to question 8.
3. "Do you have sex with men, women, or both?"
4. "Do you have more than one partner?" or "How many partners have you had in the last two months?"
5. If the patient is a woman or girl of childbearing age and is sexually active with males, "Are you interested in getting pregnant? Are you using any contraception, or doing anything to try to prevent pregnancy?"
6. "Are you worried about the AIDS virus? Do you think your partner(s) might have had sex with other people who were using IV drugs? Or who could have been exposed to the AIDS virus or other sexual infections?"
7. "Do you take any precautions to avoid infection?"
8. "Do you have any problems or concerns about your sexual function?"

Note that these questions make no assumptions about marital status, sexual preference, or attitudes toward pregnancy or contraception. Listen to each of the patient's responses, and ask additional questions as indicated.

*Transitions.* As you move from one part of the history to another, it helps to orient the patient with brief transitional phrases. "Now I'd like to ask some questions about your past health," or "about other parts of your body."

*The Review of Systems.* The main purpose of the review of systems is to make sure that you have not missed any important symptoms, particularly in areas that you have not already thoroughly explored while discussing the present illness. A fairly general question that introduces each system, or subset of a system, is helpful. It focuses the patient's attention, allows you to move from the general to the more specific in each system, and on occasion may be all you need to ask. For example:

How are your ears and hearing?

How about your lungs and breathing?

Any trouble with your heart?

How is your digestion? How about your bowels?

The detail in which you ask additional questions within each area depends on the patient's age, complaints, and general state of health and the purpose of the visit, among other variables. An older patient, who is at

greater risk of heart disease, cancer, and hearing loss, for example, needs more detailed questioning in certain areas than does an apparently healthy 20-year-old.

Some clinicians like to combine the review of systems with the physical examination, asking about the ears, for example, while looking at them. When a patient has few symptoms, this combination can be efficient. When a patient has multiple symptoms, however, the flow of both the history and the examination is disrupted and necessary note taking becomes awkward. If you want to try the combination, it is probably wise to wait until you master the flow of the examination.

*Closing.* After you have completed the history, return the initiative briefly to the patient: "Is there anything else we should talk about?" or "Have we left anything out?" You may want to recapitulate part of the present illness to be sure of a common understanding. Finally, make clear to the patient what to do or what to expect next. "Now I would like to examine you. I will step out for a few minutes. Please get completely undressed and put on this gown." By specifying whether the gown should open in the front or back, you may earn the patient's gratitude and save yourself some time.

### **Patients at Different Ages**

As people develop, have families, and age, they provide you with special opportunities and require certain adaptations in your interviewing style.

*Talking With Parents.* To obtain histories on infants and children under 5 years of age, you gather all or at least most of your information from a third party, the parent(s) or legal guardian. Pediatric practitioners usually conduct interviews with both the parent and the child present. This is convenient, and it offers an opportunity to observe both parent-child interactions and the child's capacity for self-amusement. These observations may provide a clearer picture of the relationship between parent and child (and between parents if both are present) than can the answers to any number of questions. For the younger child, moreover, this interlude may help to dispel fears of the practitioner or of the visit, and it may allow for a smooth transition from the interview to the examination.

Interviewing a parent with the child present, however, has its disadvantages. The history may be incomplete and less accurate than when you interview the parent(s) alone. When sensitive areas are not fully explored because the child is present, you will need to interview the parent at a later time (often at the end of the visit when the child has left the room) to clarify certain points or to fill in missing data.

The techniques for talking with parents are much the same as those for talking with adult patients, with some special modifications. When parents describe a child's symptoms, they often do so accurately but they also have

their own assumptions, perceptions, biases, and needs. For example, parents may assume that their child's chronic cough is due to a series of colds, not to bronchial asthma; they may perceive their child's poor performance in school as the fault of an overbearing teacher rather than as the result of a learning disability; or their bias toward their child as being exceptional may cause them to play down inappropriate social behaviors. Parents need to feel that they are doing a good job. When you ask a mother questions about her child's health you are, in a sense, testing her capabilities as a mother, and you should evaluate her responses in that context. There is a lot at stake for most parents as they try to cope with the problems of their children, so they need health practitioners who are supportive rather than judgmental or critical. Comments like, "Why didn't you bring him in sooner?" or "Why, in heaven's name, did you do that?" will not improve your rapport with a worried parent whose infant or child is acutely ill.

Refer to the infant or child by name rather than by "him," "her," or "the baby." When the mother's marital status is not immediately clear, you may avoid embarrassment in asking about the father by saying "Is Jane's father in good health?" rather than "Is your husband in good health?" Address the parents as "Mr. Smith" and "Ms. Smith" rather than by their first names or, heaven forbid, "Mom" or "Dad." First names may be used with permission when you have established a reasonably long-standing relationship. On the other hand, be prepared for the parent who calls you by your first name.

In interviewing parents, open-ended questions are usually more productive than direct questions. In the realm of psychosocial issues and problems, however, you must more often than not use explicit direct questions, since parents rarely introduce these subjects spontaneously even when given the opportunity with open-ended approaches.

Finally, you need to recognize that the chief complaint may not relate at all to the real reason the parent has brought the child to see you. The complaint may serve as a "ticket of admission" to care, through which if the circumstances are right the parent may bring up another concern that by itself is not viewed as a "legitimate" reason for seeking care. Try to create an atmosphere that will allow parents to express all their concerns. If necessary, ask questions that will facilitate the process.

Are there any other problems with Johnny that you would like to tell me about?

What did you hope I would be able to do for you when you came today?

Is there anything special you would like me to explain to you about Jody?

Is there anything else bothering you about the other children, your husband (wife), or yourself that you'd like to talk about?

*Talking With Children.* Children of 5 years or older are able to add significantly to the history and can describe more accurately than can parents



the severity of the symptoms and their own level of concern regarding them. You can sometimes improve the accuracy of your information by interviewing the child without the parent present. Usually, it is best to begin such interviews by discussing an interesting, nonthreatening subject, such as the child's T-shirt or school activities. An enthusiastic, informal, gentle style is most effective.

Following this, simple open-ended questions help to place children at ease and get them to talk about their problems:

Your mother tells me that you get a lot of stomachaches. What can you tell me about them?

What do they make you worry about?

How does it bother you when you miss going to school a lot?

What helps to make them go away?

What do you think causes them?

Questions may also be used to obtain a subjective assessment of the child's symptoms:

Show me where you get the pain. Is it like a pin prick, or does it ache?

Does it stay in the same spot, or does it move around?

Does it make you feel like you are going to throw up?

*Talking With Adolescents.* Many adults find talking with an adolescent difficult and frustrating because the adolescent often does not answer questions in an "adult" manner and may appear laconic and disdainful. This need not be the case. Adolescents, like most other people, will usually respond positively to anyone who demonstrates a genuine interest in them, not as "cases" but as people. That interest must be established early and then sustained if communication is to be effective. Adolescents tend to open up when the focus of the interview is on themselves and not on their problems. Thus, a good way to begin the interview with adolescents is to chat informally about their friends, school, hobbies, and family.

Adolescents seek health care on their own initiative or at the suggestion or insistence of their parents. They may come alone or with at least one parent. In the latter case, it is best to explain to both parent and adolescent that health care at this stage of one's individual development requires some degree of confidentiality. This requires speaking to the adolescent alone after obtaining past medical and social information from the parent). A confidential relationship is not based on "keeping secrets"; it is based on mutual respect. If it becomes necessary for the adolescent's own sake or for the sake of others to share confidential information, it is important to include the adolescent in that process.

Certain techniques of promoting good communication with an adult patient may be threatening to an adolescent. Reflection is a technique that should be avoided with the younger, cognitively immature adolescent, since

it requires thinking skills not yet acquired. The use of silence in an attempt to get the patient to talk is rarely successful with adolescents, who usually do not have sufficient self-assurance to respond appropriately to this form of facilitation. Confrontation may cause an anxious adolescent to retreat into silence. Closely related to this is the technique of asking about feelings. Adolescents often find discussing their feelings with adults very difficult.

These caveats need not deter you from talking with adolescents. Most adolescents will talk with someone they respect and accept when given the opportunity in a friendly, informal atmosphere. You are more likely to succeed as a professional if you "play it straight," act your age, and do not stretch too far in trying to bridge the generation gap.

*Aging Patients.* At the other end of the life cycle, aging patients also pose special problems and special opportunities. Their hearing and vision may be impaired, their responses may be slow, and they often have chronic illnesses with their associated discomforts and difficulties in getting about. For several reasons, elderly people may not report their symptoms. Some may be afraid or embarrassed to do so or are trying to avoid medical expenses or the discomforts of diagnosis and treatment. Others may think that their symptoms are merely a part of the aging process, or may simply have forgotten about them. Aging patients also may tell their histories more slowly than do younger ones.

Give an elderly person extra time to respond to your questions if needed. Speak slowly and in a lower voice. A comfortable room, free of distractions and noise, is helpful. Do not try to accomplish everything in one visit. Multiple visits may be less fatiguing and more productive.

From middle age on, people become increasingly aware of their personal aging and begin to measure their lives in terms of the years left rather than the years lived. It is normal for older people to reminisce about the past and to reflect upon previous experience, including joys, regrets, and conflicts. Listening to this process of life review can give you important insights into your patients and may help them work through some of their painful feelings.

While generalizations about elderly people are useful, they may also lead to stereotypes that block your understanding and enjoyment of their individuality. Try to determine the priorities and goals of such patients. Learn how they have handled crises in the past. Because they may pursue similar adaptive patterns in the present situation, this knowledge will help you plan with them. Find out how they perceive themselves and their situation. "Can you tell me how you feel about getting older? What kinds of things do you find most satisfying? What kinds of things worry you? What would you like to change if you could?"

Learning how elderly people (and others with chronic illness) function in their daily lives is essential to your understanding of and care for them.

Establishing their level of function also provides a baseline against which to make future comparisons. Can they perform the ordinary activities of daily living independently, do they need some help, or are they entirely dependent? Inquire about walking, eating, dressing, grooming, bathing, and toileting. Are there any problems such as incontinence or falls? Inquire too about using a telephone, shopping, preparation of food, housekeeping, house repairs, laundry, driving a car or using other transportation, taking medications, and handling financial affairs such as paying the bills. Are there problems with stairs, distance from shops or the bank, and fears for personal safety? Who is available for help?

### **Special Challenges**

Regardless of patient age, certain behaviors and special situations may particularly vex or perplex the practitioner. Your skills in handling these problems will evolve over a lifetime.

*Silence.* Neophyte interviewers may grow uncomfortable during periods of silence, feeling somehow obligated to keep the conversation going. They need not feel so. Silences have many meanings and many uses. When recounting their present illnesses, patients frequently fall silent for short periods in order to collect their thoughts, remember details, or decide whether or not they trust you enough to report something. An attentive silence on the interviewer's part is usually the best response here, sometimes followed by brief encouragement to continue. During periods of silence, be particularly alert to nonverbal signs of distress—evidence that the patient is having difficulty in controlling emotions. If so, these are almost invariably significant feelings that are best expressed. A gentle confrontation may help: "You seem to be having trouble talking about this." Depressed patients or those with dementia may have lost their usual spontaneity of expression, give short answers to questions, and fall silent quickly after each one. If you sense one of these problems, shift your inquiry to an exploratory mental status examination.

At times, a patient's silence results from interviewer error or insensitivity. Are you asking too many direct questions in rapid sequence? The patient may simply have yielded the initiative to you and taken the passive role you seem to expect. Have you offended the patient in any way—for example, by signs of disapproval or criticism? Have you failed to recognize an overwhelming symptom such as pain, nausea, dyspnea, or the need to urinate or defecate? If so, you may need to interrupt or abbreviate the interview or return when the patient feels more comfortable.

*Overtalkative Patients.* The garrulous, rambling patient may be just as difficult as the silent one, possibly more so. Faced with limited time and a perceived need to "get the whole story," the interviewer may grow impatient, even exasperated. Although there are no perfect solutions for this problem, several techniques are helpful. First, you may need to lower your goals and

accept less than a comprehensive history. It may be unobtainable. Second, give the patient free rein for the first 5 or 10 minutes of the interview. You will then have the chance to observe the patient's pattern of speech. Does the patient seem obsessively detailed or unduly anxious? Is there a flight of ideas or a disorganization of thought processes that suggests a psychotic disorder? Perhaps the patient has simply lacked a good listener for a long time and is expressing pent-up concerns that need to be aired. Third, try to focus the account on what seems to be most important. Show interest and ask questions in those areas. Interrupt if you must, but courteously. A brief summary may help you change the topic while letting the patient know that you have both heard and understood. "As I understand it, your chest pains come frequently, last a long time, and do not necessarily stay in any one place. Now tell me about your breathing." Finally, do not let your impatience show. If you have used up the allotted time or, more likely, gone over it, explain that to the patient and arrange for a second meeting. Setting a time limit for the next appointment may be helpful. "I know we have much more to talk about. Can you come again next week? We will have a full half hour then."

*Patients With Multiple Symptoms.* Some patients seem to have every symptom that you mention. They have an "essentially positive review of systems." Although it is conceivable that such a patient has multiple organic illnesses, serious emotional problems are much more likely. In such cases it will profit little to explore each symptom in detail. Guide the interview into a psychosocial assessment instead.

*Anxious Patients.* Anxiety is a frequent and natural reaction to sickness, to therapy, and to the health-care system itself. For some patients, anxiety has importantly colored their reactions to life stress and may have contributed to their illnesses. Be sensitive to nonverbal and verbal clues. For example, anxious patients may sit tensely, fidgeting with their fingers or clothes. They may sigh frequently, lick their dry lips, sweat more than average, or actually tremble. Carotid pulsations may betray a rapid heart rate. Some anxious patients fall silent, unable to speak freely or confide. Others try to cover their feelings with words, busily avoiding their own basic problems. When you sense an underlying anxiety, encourage such patients to talk about their feelings.

*Reassurance.* When you are talking with anxious patients, it is tempting to reassure them: "Don't worry. Everything is going to be all right." This approach is usually counterproductive. Unless you and the patient have had a chance to explore the nature of the anxiety, you may well be giving reassurance about the wrong thing. Moreover, premature reassurance blocks further communication. Because admitting anxiety exposes a weakness, it requires encouragement, not a coverup. The first step to effective reassurance involves identifying and accepting the patient's feelings. This promotes a feeling of security. The final steps come much later in the health-care

process, after you have completed the interview, the physical examination, and perhaps some laboratory studies. Then you can interpret for the patient what is happening and deal openly with the real concerns.

*Anger and Hostility.* Patients have reasons to be angry: they are ill, they have suffered loss, they lack their accustomed control over their own lives, they feel relatively powerless in the health-care system. They may direct this anger toward you. It is possible that you have justly earned their hostility. Were you late for your appointment, inconsiderate, insensitive, or angry yourself? If so, recognize the fact and try to make amends. More often, however, patients are displacing their anger onto the clinician as a symbol of all that is wrong. Allow them to get it off their chests. Accept their feelings without getting angry in return. Beware of joining such patients in their hostility toward another part of the clinic or hospital, even when you privately harbor similar feelings. After a patient has calmed down, you may be able to identify specific steps that will help in the future. Rational solutions to emotional problems are not always possible, however, and people need time to resolve their angry feelings.

*The Obstreperous Inebriate.* Few patients can disrupt the clinic or emergency room more quickly than acutely intoxicated persons who are angry, belligerent, and uncontrolled. Before interviewing such patients, it is wise to alert the security force of the hospital. As you make your approach greet the patient by name and title, introduce yourself, and offer a handshake. In this situation it is especially important to appear accepting, not challenging. To do this, avoid all but the briefest eye contact and keep your posture relaxed and nonthreatening, your hands loosely open rather than clenched into fists. Do not try to make inebriated patients lower their voices or stop cursing at you or the staff, but listen carefully and try to understand what they are saying. Since some such persons feel trapped in small rooms it is usually best to talk with them in an open area, and you too are likely to feel more comfortable there. In addition, an offer of food or coffee may help to quiet the agitated person and bring some calm to the stormy scene.

*Crying.* Like anger, crying is an important clue to emotions. Rarely should it be suppressed. If the patient seems on the verge of tears, gentle confrontation or an empathic response may simply allow crying. Quiet acceptance is then appropriate. Offer a tissue; wait for recovery; perhaps make a facilitating or supportive remark: "It's good to get it out." In that kind of accepting context, most patients will soon compose themselves and will feel better and capable of continuing the discussion.

*Depression.* Masquerading as fatigue, weight loss, insomnia, or mysterious aches and pains, depression is one of the most common problems in clinical medicine, and is commonly missed or ignored. Be alert for it, identify it, and explore its manifestations. Be sure you know how bad it is.

Just as you would evaluate the severity of chest pain, you must evaluate the severity of depression. Both are potentially lethal. You need not fear that asking about suicide will suggest it to the patient.

*Sexually Attractive or Seductive Patients.* Clinicians of both sexes may occasionally find themselves attracted to their patients. If you become aware of such feelings, accept them as normal human responses but prevent them from affecting your behavior. Keep your relationship with the patient within professional bounds.

Occasionally patients may be frankly seductive or may make sexual advances. Calmly, but firmly, you should make clear that your relationship is professional, not personal. You may also wish to review your own image. Have you been overly warm with the patient? expressed your affection physically? sought his or her emotional support? Has your dress or demeanor been unconsciously seductive? Avoid these problems when you can.

*Confusing Behaviors or Histories.* At times you may find yourself baffled, frustrated, and confused in your interaction with the patient. The history is vague and difficult to understand, ideas are poorly related to one another, and language is hard to follow. Even though you word your questions carefully, you seem unable to get clear answers. The patient's manner of relating to you may also seem peculiar: distant, aloof, inappropriate, or bizarre. Symptoms may be described in bizarre terms: "My fingernails feel too heavy," or "My stomach knots up like a snake." These characteristics should alert you to possible mental illnesses, such as schizophrenia. With the usual nondirective techniques you may be able to get more information about the unusual qualities of the symptoms. You should also include in your interview an assessment of the patient's mental status, with special attention to mood, thought, and perceptions.

Many psychotic patients are functioning, with varying degrees of success, in the community. Such patients are frequently capable of telling you freely about their diagnoses, their symptoms, their hospitalizations, and their current medications. You should feel comfortable inquiring about these without embarrassment or circumlocution.

Schizophrenia is not the only cause of confusing histories. Some patients have disorders of cognitive function such as delirium or dementia. Be particularly alert for delirium when dealing with an acutely ill or intoxicated patient, and for dementia when dealing with an elderly patient. Patients with these problems may be unable to give clear histories. They are vague and inconsistent about symptoms or events and unable to report when and how things happened. They may be inattentive to your questions and hesitant in their answers. Occasionally such patients may confabulate, that is, make up part of their histories in order to fill in the gaps in their memories. When you suspect a cognitive disorder, such as dementia, do not spend too much time trying to get a detailed history. You will only tire and frustrate the

patient as well as yourself. Shift your inquiry instead to an evaluation of mental status, checking particularly on level of consciousness, orientation, and memory. You can work the initial questions smoothly into the interview. "When was your last appointment in the clinic? Let's see, then, that was about how long ago?" "Your address now is? ... and your phone number?" Responses can all be checked against the chart (presuming, of course, that the chart is accurate).

*Patients With Limited Intelligence.* Patients of moderately limited intelligence can usually give adequate histories. You may, in fact, overlook their limitations and thereby make mistakes, such as omitting their dysfunction from a disability evaluation or giving instructions they cannot understand. If you suspect such problems, pay special attention to the patients' schooling. How far did they go in school? Why did they drop out? How were they doing at the time? What kinds of courses are (were) they taking? High school seniors of normal intelligence are not usually taking simple arithmetic. If your patient is, you can make a smooth transition into a mental status examination, including simple calculations, vocabulary, information, and tests of abstract thinking.

When patients suffer from severe mental retardation, you will have to obtain their history from family or friends. By showing interest in the patients themselves, however, and by engaging them in simple conversation, try to establish a personal relationship. As with children, avoid "talking down" to mentally retarded patients and using affectations of speech or condescending behaviors. If the patient does not perceive these postures, family members or friends will.

*Ability to Read.* Before giving written instructions, it may be advisable to assess a patient's reading ability. Some people who cannot read because of a language barrier, learning disorder, or poor vision admit it when questioned. Others do not. You can check, as if testing their vision, by asking them to read some words or sentences for you. Illiterate people may try to hide their inability to read. Respond sensitively, and remember that literacy and intelligence are not synonymous.

*Language Barriers.* Nothing will more surely convince you that a history is essential than having to do without one. When you cannot communicate with your patient because you speak different languages, take every possible step to find a translator. A few broken words and gestures are no substitute. The ideal translator is a neutral, objective person who is familiar with both languages. When family members or friends try to help, they are more likely to distort meanings and may also present problems in confidentiality to both the patient and the interviewer. Many translators try to speed the process by telescoping a long communication into a few words. Try to make clear at the beginning that you need the translator to translate everything, not to interpret or summarize. Make your questions clear and

short. You can also help the translator by outlining the goals for each segment of your history.

When available, written bilingual questionnaires are invaluable, especially for the review of systems. Before using one, however, be sure patients can read in their own language or can get help with the questionnaire.

*Hearing Problems.* Communicating with people whose hearing is severely impaired presents many of the problems of communicating with a patient who speaks a different language. Written questionnaires are a great help. Although very time-consuming, handwritten questions and answers may be the only solution. If the patient knows sign language, make every effort to find a translator who speaks, hears, and can use it. When patients have partial hearing impairment or can read lips, face them directly, in good light. Speak slowly and in a relatively low-pitched voice. Do not let your voice trail off at the ends of sentences, avoid covering your mouth, and use gestures to reinforce your words. If the patient has a "good" ear, arrange the seating to take advantage of it. A person who has a hearing aid should, of course, wear it, and you should check to be sure that it is working. Patients who wear glasses should use them too; visual cues may help them to understand you better. Supplement any oral instructions with written ones.

*Blind Patients.* When talking with a blind patient, be especially careful to announce yourself and explain who you are and why you are there. Taking the patient's hand may help to establish contact and indicate where you are. If the room is unfamiliar, orient the patient to it and explain what is there and whether anyone else is present. Remember to respond vocally to such patients when they speak, since facilitative postures and gestures will not work. At the same time guard against raising your voice unnecessarily.

*Fatally ill Patients.* In communicating with fatally ill or dying patients, most interviewers face problems within themselves—their own discomforts, anxieties, and desires to avoid the subject or even the patients. With the help of reading and discussion, you will need to work through your own feelings. As in any clinical situation, it is helpful to know what reactions the patient is likely to have. Kübler-Ross has described five stages in a patient's response to impending death: denial and isolation, anger, bargaining, depression or preparatory grief, and acceptance. At each stage, your approach is basically the same. Be alert to the feelings of such patients and to cues that they want to talk about them. Help them to bring out their concerns with nondirective techniques. Make openings for them to ask questions: "I wonder if you have any concerns about the operation? . . . your illness? . . . how it will be when you go home?" Explore these concerns and provide whatever information the patients request. Be wary of inappropriate reassurance. If you can explore and accept the patients' feelings, if you can answer the patients' questions, if you can assure and demonstrate your ability to stay with the



patients throughout the illness, reassurance will grow where it really matters—within the patients themselves.

Fatally ill or dying patients rarely want to talk about their illnesses all the time, nor do they wish to confide in everyone they meet. Give such patients opportunities to talk, and listen receptively, but if the patient prefers to keep the conversation on a lighter plane you need not feel like a failure. Remember that illness—even a terminal one—is only one small part of personhood. A smile, a touch, an inquiry after a family member, a comment on the day's ballgame, or even some gentle kidding all recognize and reinforce other parts of the patient's individuality and help to sustain the living person. To communicate appropriately you have to get to know the patient; that is part of the helping process.

*Talking With Families or Friends.* Some patients are totally unable to give their own histories. Others may be unable to describe parts of them, such as their behavior during a convulsion. Under these circumstances you must try to find a third person from whom to get the story. At times, although you may think you have a reasonably comprehensive knowledge of the patient, other sources may offer surprising and important information. A spouse, for example, may report significant family strains, depressive symptoms, or drinking habits that the patient has denied. When you suspect such discrepancies, look for opportunities to get additional information from persons other than the patient.

When seeking data from a third person, it is usually wise to get the patient's approval. Assure such patients that you will keep confidential what they have already told you, or get their permission to share certain information. Data from other persons must also be held in confidence.

The basic principles of interviewing apply to your conversations with relatives or friends. Find a private place to talk. Leaning against opposite walls of a hospital corridor is not conducive to good communication. Introduce yourself, state your purpose, inquire how they are feeling under the circumstances, and recognize and acknowledge their concerns. As you listen to their versions of the history, be alert for clues to the quality of their relationships with the patient. These may color their credibility or give you helpful ideas in planning the patient's care.

Occasionally a relative or friend insists on accompanying the patient during the history or even the physical examination. If you can, ascertain his or her reasons as well as the patient's wishes. When patients are completely unable to give their own histories, help from an informed person is essential. When patients can communicate at all, however, even just by facial expressions or gestures, it is important that they be given the chance to do so with complete confidentiality. It is usually possible to divide the interview into two parts—one with the patient alone and the other with both the patient and the second person. Each part has its own value.

*Responding to Patients' Questions.* Patients' questions may seek simple factual information. More often, however, they express feelings or concerns. Try to elicit these feelings or delve further, lest you offer a misguided answer.

*Patient:* What are the effects of this blood pressure medicine?

*Response:* There are several effects. Why do you ask?

*Patient:* (Pause) Well, I was reading up on it in a friend's book..  
I read it could make me impotent.

Similar caution is indicated when patients seek advice for personal problems. Should the patient quit a stressful job, for example, or move to Arizona, or have an abortion? Before responding, find out what approaches he or she has considered, what pros and cons there might be to the possible solutions. A chance to talk through the problem with you is usually much more valuable than any answer you could give.

Finally, when the patient is asking for specific information about the diagnosis, progress, or treatment plan, answer when you can but be careful that your responses do not conflict with those provided by others. When you are unsure of the answer, offer to find out if you can. Alternatively, you can suggest that the patient ask Dr. X because Dr. X knows more about the case or is making that decision. Beware, however, of using this approach simply to avoid a difficult issue. If you carry the primary patient responsibility yourself, share your opinions and plans and the patient's prognosis with other members of the health team so that each in turn can communicate with the patient effectively.

## **THE PHYSICAL EXAMINATION OF INFANTS AND CHILDREN**

The anatomy and physiology, the techniques of examination, and the normal and abnormal findings presented in the foregoing sections of this book focus primarily on the adult patient. Most of this material is also applicable to infants and children. Developmentally, however, children are anatomically and physiologically unique. Consequently, many of the techniques, the physical findings, and the significance of the findings differ in younger patients.

The purpose of this section is to describe how to conduct the parts of the physical examination of infants and children that require different approaches and techniques than those used for examining adults. Emphasis is placed on the normal, variations of normal, and findings that accompany common pathologic conditions of infancy and childhood. A few uncommon pathologic conditions that require specific examination techniques are also presented. The texts listed in the bibliography should be consulted for complete differential diagnoses of abnormal physical findings.

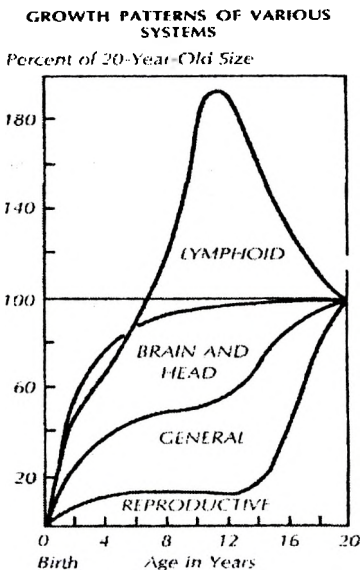
When assessing an infant or a child, always consider where the patient is

on the continuum of growth and development, as well as the age range in which that point is normally reached. Also take into account the different rates of growth of the various systems of the body. For example, growth and development of the central nervous system, the lymphatic system, and the reproductive system parallel neither general somatic growth nor each other.

You must be well acquainted, therefore, with the normal and abnormal patterns of growth and development. You should be aware, for example, that a physical finding such as a Babinski response is abnormal beyond the age of 2 years, but may be found in as many as 10% of normal subjects before that age.

Measurement of length, weight, and head circumference at various ages is very useful in comparing a patient's physical growth with norms for infants, children, and adolescents. Measurements should be recorded more often when a patient is not keeping pace with or begins to exceed expected patterns of growth, and at any initial examination, whatever the child's age.

Each section discusses three somewhat different approaches tailored to different *developmental levels*: infancy (the first year), early childhood (years 1 through 4), and late childhood (years 5 through 12). The physical examination of adolescents (years 13 through 20) is conducted essentially like that of the adult.



Because discussion of individual systems here is brief, sections on *techniques of examination* are set off in boldface rather than presented

separately, as in the earlier chapters.

Palpating the head and neck, determining the range of motion of the extremities, and auscultating the heart and lungs are best done early, whereas looking into the ears and mouth or palpating the abdomen are done near the end of the examination. Areas of the body in which the patient, by history, is having pain are usually examined last.

### *Techniques of Examination*

In general, neophyte (and some veteran) examiners are intimidated by the thought of approaching a tiny baby or a screaming child, especially if the physical examination is performed under the critical eyes of anxious parents. Although it takes a bit of courage to overcome this feeling, one soon comes to accept this challenge easily and to enjoy almost all such encounters.

### **Approach to the Patient**

*Infancy.* The first year of life, infancy, is divided into the neonatal period (the first 28 days) and the postneonatal period (29 days to 1 year). This distinction is important for reporting mortality rates for those age groups.

### *Examination of the Newborn Infant*

The next few pages deal with (1) the immediate adaptation of newborn infants to extrauterine life, using basic clinical signs to predict immediate survival and long-term morbidity, (2) their classification according to eral weight and gestational age, and (3) special techniques used in general assessment. Methods used in examining the organ systems of newborns are for the most part identical to those used during the rest of infancy.

The newborn should be examined briefly immediately after birth to determine the general condition of cardiorespiratory, neurologic, and gastrointestinal systems and to detect any gross congenital abnormalities.

*Immediate Adaptation to Extrauterine Life. The Apgar Scoring System.* Assess the infant's immediate adaptation to extrauterine life by making the five observations shown in Table 1. Score each infant at 1 minute and 5 minutes after birth. Each observation is scored on a three-point scale (0, 1, or 2). The total Apgar score may range from 0 to 10.

**If at 5 minutes the Apgar score is 8 or more, proceed to a more complete examination.**

### *Classification of Newborn Infants*

Newborn infants may be classified according to their birth weight, their gestational age (maturity), or a combination of these two dimensions.

Table 1

## The Apgar Scoring System

Assigned Score			
Clinical Sign	0	1	2
Heart Rate	Absent	<100	>100
Respiratory Effort	Absent	Slow and irregular	Good; crying
Muscle tone	Flaccid	Some flexion of the arms and legs	Active movement
Reflex irritability*	No responses	Crying	Crying vigorously, sneeze, or cough
Color	Blue, pale	Pink body, blue extremities	Pink all over

\* Reaction to suction of nares with bulb syringe

- Classification by Birth Weight

Extremely low birth weight = <1000 grams

Very low birth weight = 1000-1499 grams

Low birth weight = 1500-2499 grams

Normal birth weight =  $\geq$ 2500 grams

- Classification by Gestational Age

The clinical assessment of gestational age is used to determine whether an infant should be categorized as pre-term, term, or post-term. Gestational age is based on specific neuromuscular signs and physical characteristics that change with gestational maturity. Several scores have been developed to estimate an infant's gestational age using these neuromuscular and physical characteristics. The Ballard scoring system\* enables estimates of gestational age to within 1 week.

Pre-term = gestation <37 weeks

Term = gestation 37 to 42 weeks

Post-term = gestation  $\geq$ 42 weeks

- Classification by Birth Weight and Gestational Age

*Weight Small for Gestational Age (SGA)* = birth weight <10th percentile on the intrauterine growth curve

*Weight Appropriate for Gestational Age (AGA)* = birth weight within the 10th and 90th percentiles on the intrauterine growth curve

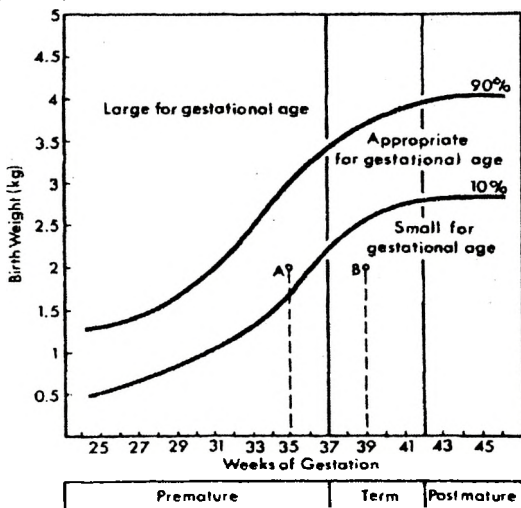
*Weight Large for Gestational Age (LGA)* = birth weight >90th percentile on the intrauterine growth curve

The three babies shown below are all at 32 weeks' gestational age. They weighed 600 g (SGA), 1400 g (AGA), and 2750 g (LGA), respectively.



Reprinted with permission from Korones SB: High-Risk Newborn Infants: The Basis for Intensive Nursing Care.

The figure shows the intrauterine growth curves for the 10th and 90th percentiles, and depicts nine possible categories of maturity for newborn infants based on birth parameters and gestational age: pre-term (<37 weeks) SGA, AGA, and LGA; term SGA, AGA, and LGA; and post-term ( $\geq 42$  weeks) SGA, AGA, and LGA.



Level of intrauterine growth based on birth weight and gestational age of liveborn, single, white infants. Point A represents a premature infant, while point B indicates an infant of similar birth weight who is mature but small for gestational age; the growth curves are representative of the 10th and 90th percentiles for all of the newborns in the sampling.

### *Special Techniques Used in the General Assessment*

**Following the above assessment, listen to the anterior thorax with your stethoscope, palpate the abdomen, and inspect the head, face, oral cavity, extremities, genitalia, and perineum. Pass a small tube through the nose, nasopharynx, and esophagus into the stomach to establish their patency. To be sure that the tube is in the stomach, palpate the epigastrium for the tip itself; if the tip cannot be felt, feel or listen there for the emergence of an air bubble injected with a 5cc-IOcc syringe through the tube into the stomach. Aspirate the gastric contents in premature babies, in babies born with meconium-stained amniotic fluid, and in babies born by cesarean section, in order to prevent regurgitation and aspiration.**

A more extensive examination of the newborn should be conducted within 12 hours of birth, and again at approximately 72 hours of age when the effects of anesthesia and shock of birth have subsided.

**Observe the baby, first as it is lying undisturbed in the bassinet and then completely undressed on an examining table.**

Best results, in terms of responsiveness, are obtained 2 or 3 hours after a feeding when the baby is neither too satiated (and therefore less responsive) nor too hungry (and therefore more agitated).

**Observe the baby's color, size, body proportions, nutritional status, and posture, as well as respirations and movements of the head and extremities.**

Normal full-term newborns lie in a symmetrical position with the limbs semiflexed and the legs partially abducted at the hip. The head is slightly flexed and positioned in the midline or turned to one side. Normal newborns have spontaneous motor activity of flexion and extension, alternating between the arms and the legs. The forearms supinate with flexion at the elbow and pronate with extension. The fingers are usually flexed in a tight fist, but may extend in slow athetoid posturing movements. Low-amplitude and high-frequency tremors of the arms, legs, and body are seen with vigorous crying and even at rest during the first 48 hours of life.

Most newborn infants are cooperative during the examination unless it is close to feeding time.

**Make sure that the baby is quiet when you auscultate the heart and lungs and palpate the abdomen, since these maneuvers are more difficult to perform if the baby is crying. Place a pacifier, a bottle of formula, or the tip of one of your fingers in a crying baby's mouth to silence the baby long enough to complete these portions of the examination.**

Hereafter, the order of examination is relatively unimportant, except that painful components, such as hip abduction, should be performed at the end because they usually cause the baby to cry.

### *Examination of Older Infants*

After the newborn period and throughout the rest of infancy, little difficulty should be encountered in performing the complete physical examination. The key to success is distraction. Since infants usually attend to only one thing at a time, it is relatively easy to bring the baby's attention to something other than the examination being performed.

**Use a moving object, a flashing light, a game of peek-a-boo, tickling, or any sort of noise to distract the baby.**

Infants usually do not object to removal of their clothing. Indeed, most seem to prefer being nude, perhaps because it allows for greater tactile stimulation. It is wise, however, in the interest of keeping yourself and your surroundings dry, to leave the diaper in place throughout the examination, removing it only to examine the genitalia, rectum, lower spine, and hips.

You can perform much of the examination with the infant lying or sitting in the parent's lap or held in an upright position against the parent's chest, although this usually is not necessary except with tired, hungry, or acutely ill babies. Occasionally, most of the physical examination can be completed without waking a sleeping infant.

**Observe the parent-infant interactions.** The parent's affect in talking about the infant, manner of holding, moving, and dressing the baby, and response to situations that may produce discomfort for the infant should be noted. A breast or a bottle feeding should be observed.

**Before performing the general physical examination of older infants, test for attainment of developmental milestones, such as the ability to reach for a toy, transfer a cube from one hand to the other, and use the thumb and forefinger pincer grasp in picking up a small object.**

The standard for measuring the attainment of developmental milestones throughout infancy and childhood is the Denver Developmental Screening Test (DDST). The DDST is designed to reveal developmental delays in personal-social, fine motor-adaptive, language, and gross motor dimensions from birth through 6 years of age. It can be administered easily and rapidly.

It must be emphasized that the DDST is only a measure of developmental attainment in the dimensions indicated, and not a measure of intelligence. It is a highly specific test (i.e., most normal children score as normal), but it is not very sensitive (i.e., many children with mild developmental delay also score as normal). While the DDST is a useful screening test, other more sophisticated tests are available to assess motor, language, and social development when, despite normal DDST results, it is suspected that these are delayed.

### *Early Childhood*

One of the most difficult challenges facing the professional who cares for children in this age group is completing the examination without



producing a physical struggle, a crying child, or a distraught parent. When this is accomplished successfully, it provides a great measure of satisfaction to all involved and comes close to "art" in the practice of pediatrics.

Gaining the confidence and dispersing the fears of the child begin at the moment of encounter and continue throughout the visit. The approach may vary with the place and circumstances of the visit; however, a health-supervision visit for a well child will probably allow greater development of rapport than will a visit at the office, in the home, or in the hospital emergency room when the child is acutely ill.

During the interview, children should usually remain dressed. This may prolong the visit, but avoids apprehension on their part and affords the opportunity later to observe their response to being undressed or their ability to undress and dress themselves. Children are also more apt to play quietly and interact with the parent and examiner more appropriately if fully clothed.

**Engage children in conversation appropriate to their ages and ask simple questions about their health or illness. Compliment them about their appearance, dress, or performance, tell a story, or play a simple trick to help "break the ice."**

If children respond to conversation and questions directed to them by silence, shielding of the eyes, or apprehension, it is wise to ignore them temporarily.

**Include in your observations during the interview a general assessment of the degree of sickness or wellness, mood, state of nutrition, speech, cry, respiratory pattern, facial expression, apparent chronologic and emotional age, posture (particularly as it may reflect discomfort), and developmental skills. In addition, closely observe the parent-child interaction, including the amount of separation tolerated, displays of affection, and response to discipline.**

Specific developmental testing (such as building towers with blocks, playing:

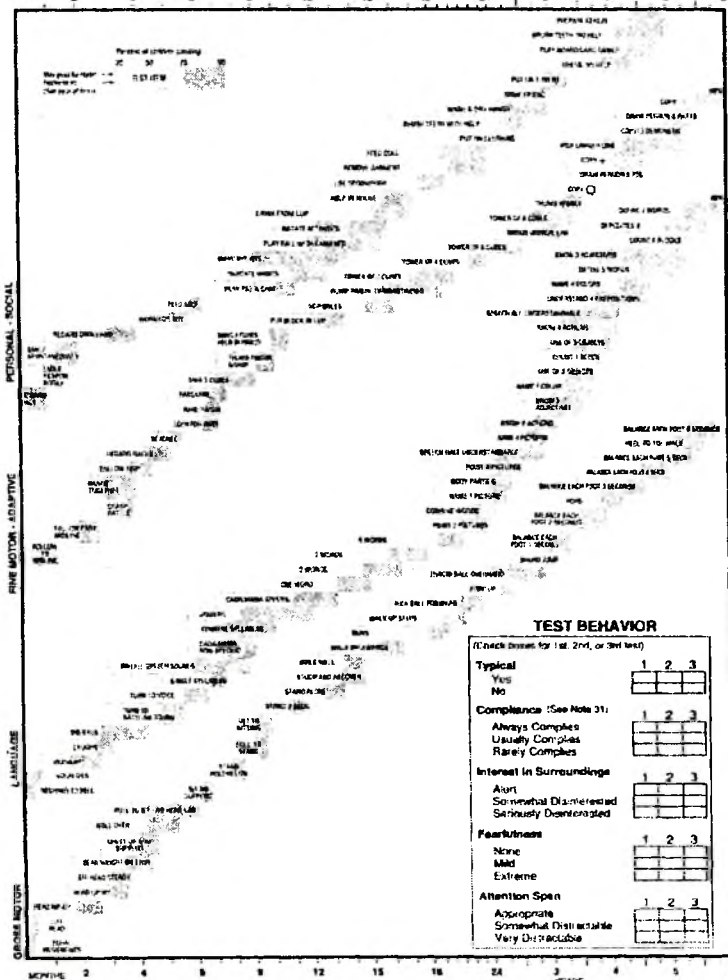
- ball with the examiner, and performing hop, skip, and jump maneuvers) is best accomplished at the end of the interview, just before the;
- formal physical examination. This "fun and games" interlude is likely to;
- improve the child's view of the examiner and enhance cooperation during the examination.

# Denver II

Examiner:  
Date:

Name:  
Birthdate  
ID No.:

MONTHS 2 4 6 8 10 12 15 18 24 YEARS 3 4 5 6

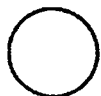


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Testing kits, test forms, and reference manuals (which must be used to ensure accuracy in administration of the test) for the DDST may be ordered from Denver Developmental Materials Incorporated, P.O. Box 6919, Denver, CO 80206-0919. (Reprinted with permission from William K. Frankenburg, M.D.)

## DIRECTIONS FOR ADMINISTRATION

1. Try to get child to smile by smiling, talking or waving. Do not touch him/her.
2. Child must stare at hand several seconds.
3. Parent may help guide toothbrush and put toothpaste on brush.
4. Child does not have to be able to tie shoes or button/zip in the back.
5. Move yarn slowly in an arc from one side to the other, about 8" above child's face.
6. Pass if child grasps rattle when it is touched to the backs or tips of fingers.
7. Pass if child tries to see where yarn went. Yarn should be dropped quickly from sight from tester's hand without arm movement.
8. Child must transfer cube from hand to hand without help of body, mouth, or table.
9. Pass if child picks up raisin with any part of thumb and finger.
10. Line can vary only 30 degrees or less from tester's line.
11. Make a fist with thumb pointing upward and wiggle only the thumb. Pass if child imitates and does not move any fingers other than the thumb.




- |   |   |   |   |
|---|---|---|---|
| <p>12. Pass any enclosed form. Fail continuous round motions.</p> | <p>13. Which line is longer? (Not bigger.) Turn paper upside down and repeat, (pass 3 of 3 or 5 of 6)</p> | <p>14. Pass any lines crossing near midpoint.</p> | <p>15. Have child copy first. If failed, demonstrate.</p> |
|---|---|---|---|

When giving items 12, 14, and 15, do not name the forms. Do not demonstrate 12 and 14.

16. When scoring, each pair (2 arms, 2 legs, etc.) counts as one part.
17. Place one cube in cup and shake gently near child's ear, but out of sight. Repeat for other ear.
18. Point to picture and have child name it. (No credit is given for sounds only.) If less than 4 pictures are named correctly, have child point to picture as each is named by tester.



19. Using doll, tell child: Show me the nose, eyes, ears, mouth, hands, feet, tummy, hair. Pass 6 of 8.
20. Using pictures, ask child: Which one flies?... says meow?... talks?... barks?... gallops? Pass 2 of 5, 4 of 5.
21. Ask child: What do you do when you are cold?... tired?... hungry? Pass 2 of 3, 3 of 3.
22. Ask child: What do you do with a cup? What is a chair used for? What is a pencil used for? Action words must be included in answers.
23. Pass if child correctly places **and** says how many blocks are on paper. (1, 5).
24. Tell child: Put block **on** table; **under** table; **in front of** me, **behind** me. Pass 4 of 4. (Do not help child by pointing, moving head or eyes.)
25. Ask child: What is a ball?... lake?... desk?... house?... banana?... curtain?... fence?... ceiling? Pass if defined in terms of use, shape, what it is made of, or general category (such as banana is fruit, not just yellow). Pass 5 of 8, 7 of 8.
26. Ask child: If a horse is big, a mouse is \_\_\_? If fire is hot, ice is \_\_\_? If the sun shines during the day, the moon shines during the \_\_\_? Pass 2 of 3.
27. Child may use wall or rail only, not person. May not crawl.
28. Child must throw ball overhand 3 feet to within arm's reach of tester.
29. Child must perform standing broad jump over width of test sheet (8 1/2 inches).
30. Tell child to walk forward,  heel within 1 inch of toe. Tester may demonstrate. Child must walk 4 consecutive steps.
31. In the second year, half of normal children are non-compliant.

### **OBSERVATIONS:**

*Instructions printed on the back of the DDST form for administering some of the items contained in the Denver Developmental Screening Test.*

This dialogue will indicate the child's level of receptive and expressive function and will direct the approach by the examiner.

Careful observation of the parent's response to the child's verbal and nonverbal signals may reveal problems such as overly anxious parents, disengaged parents who provide insufficient stimulation, stressed families, enmeshed families, and even possibly abusive parents.

Abusing parents often pay little or no attention to their abused child, treating him or her more like a piece of property than a person. By the same token, an abused child usually demonstrates no separation anxiety when physically and environmentally removed from the parents. On the other hand, both child and parents may appear overaffectionate to one another in an attempt to hide the abuse.

The actual performance of the physical examination, with certain exceptions, need not take place on the examining table. In fact, some parts of

the examination can best be accomplished with the child standing, sitting on the parent's lap, or even sitting on the examiner's lap. It is not essential that the child be completely undressed throughout the examination; often, exposing only the part of the body being examined will suffice and may avert objection by the child. Occasionally, a child is reluctant to undress because the examining room is cool and the examining table and instruments (including the examiner's hands) are cold, rather than because of apprehension or modesty. When two or more siblings are to be examined, it is wise to begin with the oldest, who is most likely to cooperate and set a good example for the younger children.

Actually, only a few children resist undressing. Most will allow themselves to be stripped to their underpants and placed, sitting, on the examining table without objection.

**During the examination, ask the parent to stand at the head of the examining table, to the right of the child and to your left as you face the examining table. As with infants, distraction is the key to gaining the patient's cooperation. The child in this age group, however, is not as easily distracted as the infant; therefore, approach the patient pleasantly and, whenever possible, explain each step of the examination before performing it. Demonstrate the procedure on yourself or on a doll or toy animal. This also helps the child understand what is to be done. For example, you can place the otoscope in your ear, flash the light into your open mouth, or place the stethoscope on your chest. Allow the child to play with the examining instruments to create an atmosphere of trust. Play at blowing out the examining light or use the stethoscope bell as a telephone to create attractive diversions.**

The initial "laying on of the hands" is the most crucial point of the examination; if resistance is encountered, it will most likely be at this point. Therefore, the first contact should be in nonvulnerable areas.

**Hold the patient's hand, count the fingers, and palpate the wrist and elbow while talking gently to place the patient at ease.**

Having both of the examiner's hands in contact with the patient's body whenever possible has a comforting effect on the patient and is less apt to produce involuntary withdrawal than is the use of one hand or a few probing fingers.

**For example, when examining the heart, place your left hand on the patient's right shoulder while your right hand, holding the stethoscope, makes contact with the chest wall.**

In a sense, the left hand acts as both a distracting and a comforting force. The examiner who moves unhesitatingly, firmly, and gracefully, and who talks pleasantly and reassuringly throughout the examination is not apt to provoke apprehension. Most children increase their resistance when spoken to sharply.

**Use a firm voice and unequivocal instructions when asking a child to perform an act pertaining to the examination. Tell the child what to do rather than asking the child to do it. For example, say "Roll over on your belly" rather than "Will you roll over on your belly for me?"**

Often children will sit or lie passively on the examining table covering both eyes with their hands, because they think the examiner cannot see them if they cannot see the examiner. This posture can be tolerated, because it does not interfere with the examination. The eyes can easily be examined after the child has dressed.

**Base the order of your examination on performing the least distressing procedures first and the most distressing last. Thus, perform those parts of the examination that can be accomplished while the child is sitting - for example, palpation, percussion, and auscultation of the heart and lungs—before the child lies down. Since lying down may make the child feel more vulnerable and resist further examination, accomplish this with great care. Often you can avert apprehension by supporting the head and back with your arm while the child lies down. Once the child is supine, examine the abdomen first, the throat and ears next to last, and the genitalia and rectum last. Examination of the genitalia and perineum, when a rectal examination is not performed, is usually less disturbing to the child than is the examination of the throat. However, in light of the fastidious and perhaps modest nature of some parents, leave these portions of the examination to last.**

The child's comfort should be paramount in conducting the examination. Immediately before an examination maneuver the child should be told kindly, but matter-of-factly, of the likelihood of pain or other unpleasant sensations that might result. In instances when the child is extremely apprehensive about one portion of the examination (e.g., the examination of the throat), it is helpful to do this first. Indeed, to ensure a reasonable interview, it may be necessary to complete the entire physical examination before obtaining the entire history. Distasteful portions of the examination should be accomplished quickly to minimize the child's discomfort. The examiner should remember, however, that the physical examination is designed to gather essential information and that the child's comfort may need to be sacrificed somewhat to achieve this end. A completed examination is a comfort and reassurance to the parent and examiner; an incomplete examination is a frustration and a source of dissatisfaction to both.

Obviously there will be resistance to the examination at times. Some children will scream throughout the examination but offer no physical resistance. Most toddlers will fight the examination and strive to gain an upright position and the comfort and security of a parent's arms. Parents can be helpful here in orally reassuring children and in actually restraining their movements for certain parts of the examination, such as the ears and throat.

Using another person, in addition to the parent, to restrain the child is often helpful under ordinary circumstances; however, using other kinds of restraints or mummifying methods has no place in the physical examination procedure.

The examiner should not convey feelings of frustration or anger, but should reassure the parent that the child's resistance is developmentally normal. Embarrassment may cause the parent to compound the problem by scolding the child. Some parents feel that the examiner is at fault when their child is uncooperative while being examined. Others feel that such resistance is a reflection of the child's level of independence.

Neophyte examiners are apt to be less successful in examining very young children than in examining older ones. However, with practice, perseverance, and patience they should succeed. While it is difficult to teach "how to approach a reluctant child," flexibility, enthusiasm, and a nonformal caring but firm approach are key factors. Examiners must learn which techniques work best for them as individuals and which approach they find most comfortable.

### *Late Childhood*

There is usually little difficulty in examining most children after they reach school age. Some, however, may have unpleasant memories of previous encounters with examiners and offer resistance.

**Question children to determine their orientation to time and place, their knowledge, and their language and number skills. Use intelligence screening tests, such as the Goodenough draw-a-man, the Durrell, and the Bender, when there is some element of doubt concerning the child's intellectual capacity. Keep these tests to a minimum, however, to avoid errors due to familiarity with their content, should formal psychological testing be necessary. Observe motor skills involved in writing, tying shoelaces, buttoning shirt fronts, and using scissors, and determine right-left discrimination for self (attained at age 6 or 7 years) and for others (attained at age 8 or 9 years).**

A child's modesty may be the greatest deterrent to a successful examination. Therefore girls, as early as age 6 or 7, should be gowned. For both boys and girls, leave underpants on until their removal is required, even if the lower half of the body is draped. It is usually wise for examiners who are of the opposite sex from their preadolescent and adolescent patients to leave the room while the patient disrobes. Younger children often request that siblings of the opposite sex depart; older boys often prefer that their mothers leave during the examination, and older girls that their fathers leave.

The order of examination in late childhood can follow that used with adults. At any age, it is important to examine painful areas last.

## *Adolescence*

The key to a successful physical examination of adolescents is a comfortable environment in which they feel safe. It is important to establish a trusting relationship. This will allow for a more relaxed and informative physical examination. The clinician must consider the cognitive development of adolescents when examining them. Most are developing a sense of identity and autonomy, and the examiner must consider these points when deciding on issues of privacy, parental involvement, and confidentiality during the examination.

As for the older child, modesty is often an issue for the adolescent. The patient should remain dressed until the time of the physical examination, and the examiner should leave the room while the patient undresses and gowns. Most older adolescents prefer to be examined alone without a parent or guardian in the examination room, but younger adolescents may prefer to have a familiar person with them, particularly if that person is of the same sex and the examiner is of the opposite sex.

The physical examination of the adolescent is very similar to that of the adult, and should progress in much the same manner; however, particular attention should be given to issues unique to the adolescent population. It is important to understand normal pubertal maturation, and to assess it in all adolescents to ensure that normal growth and development is occurring. For the same reason, height and weight should be plotted at all visits. The spine should be examined, particularly in younger adolescents in whom scoliosis tends to be progressive.

Regardless of age, any sexually active female adolescent should have periodic pelvic examinations and Pap smears.

New clinicians often find the examination of adolescents anxiety provoking because of the possible perceived invasion of privacy on the part of the patient; however, with practice, straightforwardness, and understanding, these interactions can be very rewarding for both the adolescent and the clinician.

### **The General Survey**

Observing infants and children carefully over time is extremely rewarding, as is noting general physical and behavioral signs. This section covers the measurement of vital signs and body size, which is particularly important in infants and children because deviations from the normal may be the first and only indicators of disease.

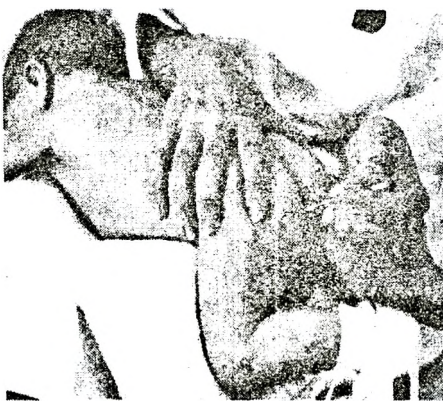
### *Temperature*

For infants and children younger than 7 years, rectal temperatures should be used because accurate oral temperature readings are difficult to obtain. Many physicians now use tympanic thermometers, which are accurate



and measure temperature in seconds with minimal discomfort. For premature infants, axillary or tympanic temperatures are satisfactory for close monitoring of temperature regulation, although electronic dermal thermometers for continuous temperature recordings are used in neonatal intensive care units. Otherwise, electronic thermometers are rarely used with infants and children because of the expense and fragility of the instruments. Temperature recordings should be obtained in any situation in which an infectious, collagen vascular, or malignant disease is suspected. For patients in whom no disease is suspected (e.g., for well-child visits), they are not necessary.

The technique of obtaining the rectal temperature is relatively simple. **Place the infant or child prone on the examining table, on the parent's lap, or on your own lap. While you separate the buttocks with the thumb and forefinger of one hand, with the other hand gently insert a well lubricated rectal thermometer (inclined approximately 20° from the table or lap) through the anal sphincter to a depth of approximately 1 inch. One method for holding a child while obtaining the rectal temperature is illustrated on the right.**



(Reprinted with permission from Gundy JH: The pediatric physical examination. In Hoekeiman RA, Friedman SB, Nelson NM et al.

Body temperature in infants and children is less constant than that in adults. The average rectal temperature is higher in infancy and early childhood, usually not falling below 99.0° F (37.2° C) until after the third year. At 18 months, 50% of children have mean rectal temperatures of 100° F (37.8° C) or higher. Ranges in body temperature of children may be as much as 3 or more degrees Fahrenheit during the course of a single day. Rectal temperature recordings may approach 101° F (38.3° C) in normal children, particularly in late afternoon after a full day of activity.

### *Pulse*

The heart rate in infants and children is quite labile, and more sensitive to the effects of illness, exercise, and emotion than that in adults. Average heart rates according to age are shown in Table 2.

Obtain the heart rate in infants by observing the pulsations of the anterior fontanelle, by palpating the femoral arteries in the inguinal area and the brachial arteries in the mid-upper arm, or by directly auscultating the heart if the rate is very rapid. Palpate the radial artery at the wrist in older children and in young children who are cooperative.

Table 2

Average Heart Rate Of Infants and Children At Rest

Age	Average Rate	Range (two standard deviations)
Birth	140	90-190
1st 6 month	130	80-180
6-12 month	115	75-155
1-2 years	110	70-150
2-6 years	103	68-138
6-10 years	95	65-125
10-14 years	85	55-115

### *Respiratory Rate*

As with the heart rate, the respiratory rate in infants and children has a greater range and is more responsive to illness, exercise, and emotion than that in adults. The rate of respirations per minute ranges between 30 and 60 in the newborn, 20 and 40 during early childhood, and 15 and 25 during late childhood, reaching adult levels at age 15 years.

The respiratory rate may vary appreciably from moment to moment in premature and full-term newborn infants, with alternating periods of rapid and slow breathing. The respiratory pattern should be observed for more than the usual 30 to 60 seconds to determine the true rate; the sleeping respiratory rate is most reliable. In infancy and early childhood, diaphragmatic breathing is predominant and thoracic excursion is minimal.

Ascertain the respiratory rate by observing abdominal rather than chest excursions. Auscultation of the chest and placement of the stethoscope in front of the mouth and external nares are also useful for counting respirations in this age group. In older children, observe the thoracic movement directly or place your hand on the thorax to determine the respiratory rate.

### *Blood Pressure*

Measuring the blood pressure in infants and children is often omitted because it has erroneously been judged to be too difficult to do with an active child. When the procedure is explained and demonstrated before-hand,

however, most children 3 years of age and older are fascinated by the sphygmomanometer and are very cooperative. Obtaining the blood pressure measurement should be part of the physical examination of every child over 2 years of age, and of any younger child whose history or physical examination suggests that the blood pressure may be high or low (rare).

Elevations of blood pressure levels in normal individuals occur due to exercise, crying, and emotional upset. Because children may be anxious about the entire physical examination as well as the blood pressure procedure per se, some clinicians prefer to obtain the blood pressure near the end of the examination. Others repeat the determination at the end of the formal examination if the initial pressure was high.

**Use the sphygmomanometer to determine blood pressures in children as you would in adults. The inflatable rubber bag cuff should be long enough to encircle the upper arm or the thigh completely, with or without overlap. It should be wide enough to cover approximately 75% of the upper arm or the thigh. A narrower cuff elevates the pressure reading, while a wider cuff lowers it and interferes with proper placement of the stethoscope's bell over the artery as it traverses the antecubital space or the popliteal space.**

With children, unlike adults, the point at which the sounds first become muffled (not the disappearance point) is recorded as the diastolic pressure. At times, especially in early childhood, the Korotkoff sounds are not audible due to a narrow or deeply placed brachial artery.

**In such instances, determine the systolic blood pressure by palpation.** This is approximately 10 mm Hg lower than the systolic pressure determined by auscultation.

In infants and very young children, small extremities and lack of cooperation preclude the use of these techniques to determine the blood pressure. However, a value lying somewhere between the systolic and the diastolic pressures can be obtained by using the *flush technique*.

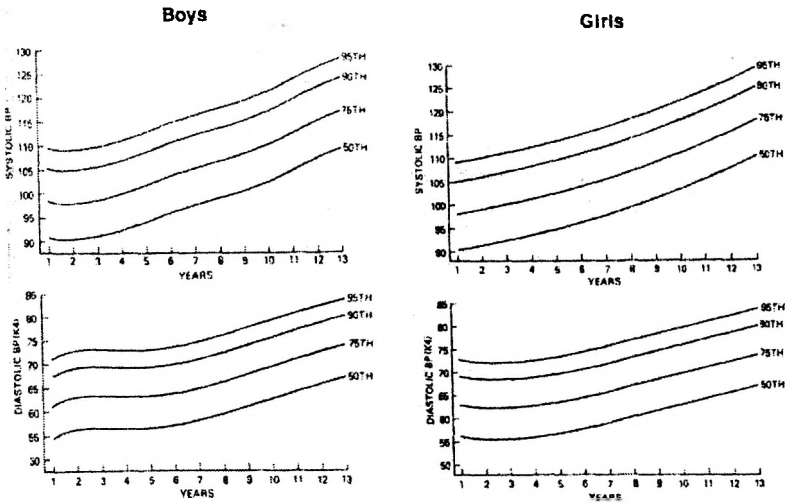
**With the cuff in place, wrap an elastic bandage snugly around the elevated arm, proceeding from the fingers to the antecubital space. This essentially empties the capillary and venous network. Inflate the cuff to a pressure above the expected systolic reading, remove the bandage, and place the pallid arm at the patient's side. Allow the cuff pressure to fall slowly until the sudden flush of color returns to the forearm, hand, and fingers. The endpoint is strikingly clear. This method may also be used in the leg.**

A more accurate measure of the systolic blood pressure of infants and very young children is obtained with an electronic sphygmomanometer (Doppler), which senses arterial blood flow vibrations, converts them to systolic blood pressure levels, and transmits them to a digital read-out device. Purchase and maintenance costs essentially limit their use to hospitals and

cardiac diagnostic centers.

The level of systolic blood pressure increases gradually throughout infancy and childhood. Measured in mm Hg, normal systolic pressure in males is in the vicinity of 70 mm Hg at birth, 85 at 1 month, 90 at 6 months, 95 at 5 years, 100 at 8 years, 110 at 13 years, and 120 at 18 years. The diastolic pressure reaches about 55 mm Hg at 1 year of age and gradually increases throughout childhood and adolescence to approximately 70 mm Hg at age 18. Normal systolic and diastolic pressures in females are approximately 5 mm mm Hg lower than those in males at all these age levels, except during the first year of life.

The 1987 Task Force on Blood Pressure Control in Children defined *Normal Blood Pressure* as systolic and diastolic BPs <90th percentile for age and sex; *High Normal Blood Pressure* as average systolic and/or average diastolic BPs between the 90th and 95th percentiles for age and sex; and *High Blood Pressure* (hypertension) as average systolic and/or diastolic BPs >95th percentile for age and sex with measurements obtained on at least three occasions. The figure below provides the age-specific percentiles needed to make these assessments.



Age-specific percentiles of BP measurements in boys and girls 1 to 13 years of age.

Children who have hypertension should be evaluated extensively to determine its cause. For infants and young children, a specific cause can usually be found. In older children and adolescents, however, the etiology may be obscure, and in many instances observed elevated blood pressure may

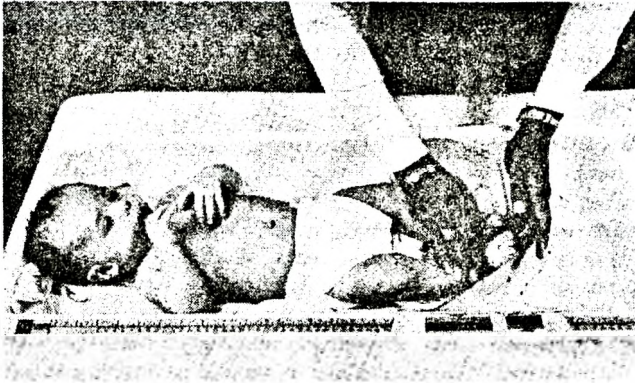
be a developmental phenomenon that disappears over time.

### *Somatic Growth*

Growth, reflected in increases in body weight and length and head circumference along expected pathways and within certain limits, is probably the best indicator of health. The significance of any measure is determined by relating it to prior measurements of the same dimension, to mean values and standard deviations for that dimension as they occur in other individuals, and to measures of other dimensions in the same patient. Measures of somatic growth in infants and children, therefore, should be plotted on standard growth charts so that those comparisons can be made.

### *Height.*

Measure the body length of infants by placing them supine on a measuring board or in a measuring tray, as illustrated below. If these are not available, measure the distance between marks made on the examining table paper indicating the crown and the heel of the infant. Direct measurement of the infant in this way with a tape is inaccurate, unless an assistant holds the baby still with its legs extended. Measure the height in older children by standing the child with heels, back, and head against a wall marked with a centimeter or inch rule. Hold a small board flat against the top of the child's head and at right angles to the rule to complete the measure.



Weighing scales equipped with a height measure are not as satisfactory because children are less likely to stand erect when not against a wall; many younger children also fear standing on a scale's slightly raised, unsteady base.

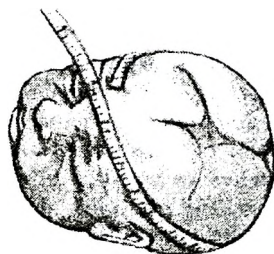
### *Weight.*

Weigh infants directly with an infant scale, rather than indirectly by holding them while you stand on the scale and subtracting your weight from the total weight registered. Remove all clothing, except for underpants in children beyond infancy and dressing gowns provided for girls in late childhood. Use balance rather than spring scales, and whenever possible weigh the child on the same scale at each visit.

*Head Circumference.* The head circumference should be measured at every physical examination during the first 2 years of life, and at any *initial* examination at whatever age, to determine the rate of growth and the size of the head.

A cloth or soft plastic centimeter tape is preferred for this procedure, but disposable paper tapes are satisfactory.

Place the tape over the occipital, parietal, and frontal prominences to obtain the greatest circumference. During infancy and early childhood this is done best with the patient supine.



The head circumference reflects the rate of growth of the cranium and its contents.

Measurements of chest circumference and the abdominal circumference are in general, inaccurate and have no clinical use.

## **The Skin**

### *Infancy*

The newborn infant's skin has many unique characteristics. The texture is soft and smooth because it is thinner than the skin of older children. In white infants an erythematous flush, giving the entire surface of the skin the appearance of a "boiled lobster," is present during the first 8 to 24 hours, after which the normal pale pink coloring predominates. Vasomotor changes in the dermis and subcutaneous tissue—a response to cooling or chronic exposure to radiant heat—produce a mottled appearance (*cutis marmorata*), particularly on the trunk, arms, and legs. In normal newborns a striking color change is often seen: one side of the body is red, the other pale, and an abrupt border separates the two sides at the midline. This phenomenon (*harlequin dyschromia*) is transient and its etiology unknown. The hands and feet may be "blue" (*acrocyanosis*) at birth and may remain so for several days. This may recur throughout early infancy when the baby is cold. After 4 or 5 hours, the cyanosis becomes less marked in the hands than in the feet.

Melanotic pigmentation of the skin is not as great as it will become in most black newborns, except in the nail beds and the skin of the scrotum or labia majora. Ill-defined blackish blue areas located over the buttocks and lower lumbar regions are often seen, especially in black, Native American, and Asian babies. These areas, called *Mongolian spots*, are due to the presence of pigmented cells in the deeper layers of the skin. The spots become less noticeable as the pigment in the overlying cells becomes more prominent, and they eventually disappear in early childhood.

There is a fine, downy growth of hair called *lanugo* over the entire body, but mostly on the shoulders and back. The amount and length vary from baby to baby, and are unusually prominent in premature infants. Most of this hair is shed within 2 weeks. The amount of hair on the head of a newborn varies considerably, being absent entirely in some and abundant in others. All the original hair is shed within a few months and replaced with a new crop, sometimes of a different color.

Superficial desquamation of the skin is often noticeable 24 to 36 hours after birth. Also, a cheesy white material, composed of sebum and desquamated epithelial cells and called *vernix caseosa*, covers the body in varying degrees at birth. It is almost always present in the vaginal labial folds and under the fingernails. A certain amount of puffiness and edema, even to the point of pitting over the hands, feet, lower legs, pubis, and sacrum, may be present but usually disappears by the second or third day.

Normal "physiologic" jaundice, which occurs in approximately 50% of all babies, appears on the second or third day, peaks during the fourth and fifth days, and usually disappears within a week but may persist for as long as a month.

**Use natural daylight rather than artificial light when evaluating for the presence of jaundice at any age. In borderline cases, press a glass slide against the infant's cheek to help you detect the presence of jaundice by producing a blanched background for contrast.**

Older infants who are fed yellow vegetables (carrots, sweet potatoes, and squash) may develop a pale, yellow to orange color that is sometimes mistaken for jaundice. However, the pigmentation in this condition, called *carotenemia*, is most prominent on the palms, soles, nose, and nasolabial folds. The scleras are not involved.

Three dermatologic conditions are seen in newborns often enough to deserve description. None is of clinical significance. *Milia*, pinhead-sized, smooth, white, raised areas without surrounding erythema, on the nose, chin, and forehead, are caused by retention of sebum in the openings of the sebaceous glands. *Milia* may be present at birth but more often appear within the first few weeks of life and disappear spontaneously over several weeks. *Miliaria rubra* consists of scattered vesicles on an erythematous base, usually on the face and the trunk, caused by sweat gland duct obstruction. This rash



also disappears spontaneously within 1 to 2 weeks. *Erythema toxicum*, which usually appears on the second or third day of life, consists of erythematous macules with central urticarial wheals or vesicles scattered diffusely over the entire body, appearing much like flea bites. The cause is unknown and the lesions disappear spontaneously within a week.

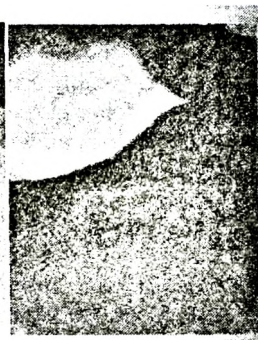
Irregular pink areas frequently are found over the nape of the neck ("stork's beak" mark) and on the upper eyelids, the forehead, and the upper lip ("angel kisses"). This redness is due to proliferation of the skin's capillary bed, and is variously called *capillary hemangioma*, *nevus flammeus*, *nevus vasculosus*, and *telangiectatic nevus*. The lesions invariably disappear at about a year of age, although they may occasionally reappear, even in adulthood, when the skin is flushed from anger or embarrassment. Such lesions appearing on other areas of the skin are larger, darker (purplish), more sharply demarcated, and may involve the mucosa of the mouth or the vagina. These "port wine stains" are not likely to fade.

The examination of the skin should go beyond observation and include palpation.

**Roll a fold of loosely adherent skin on the abdominal wall between your thumb and forefinger to determine its consistency, the amount of subcutaneous tissue, and the degree of hydration (turgor).**



The skin in well-hydrated infants and children returns to its normal position immediately upon release.



Delay in return, a phenomenon called *tenting*, as shown above, usually occurs in dehydrated patients.

### *Early and Late Childhood*

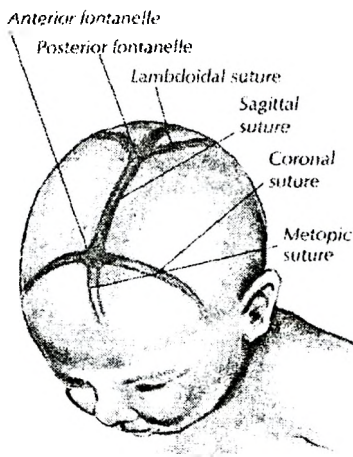
The normal child's skin beyond the first year does not vary significantly. The techniques of examination and the general classification of pathologic lesions for this age are as with the adult.



## The Head and Neck

### Infancy

The *head* accounts for one fourth of the body length and one third of the body weight at birth, whereas at full maturity it only accounts for one eighth of the body length and, for most, one tenth of the body weight. The bones of the skull are separated from one another by membranous tissue spaces called *sutures*. The areas where the major sutures intersect in the anterior and posterior portions of the skull are known as *fontanelles*. The sutures and fontanelles, shown in this figure, form the basis for much of the physical assessment of the infant's head.



The sutures feel like slightly depressed ridges and the fontanelles like soft concavities. The anterior fontanelle at birth measures 4 cm to 6 cm in its largest diameter and normally closes between 4 and 26 months of age; 90% close between 7 and 19 months. The posterior fontanelle measures 1 cm to 2 cm at birth and usually closes by 2 months of age. The intracranial pressure is reflected in the amount of tenseness and fullness seen and felt in the anterior fontanelle. Increased intracranial pressure produces a bulging, full anterior fontanelle. This is normally seen when a baby cries, coughs, or vomits. Pulsations of the fontanelle reflect the peripheral pulse.

**Palpate the anterior fontanelle for tenseness and fullness while the baby is sitting quietly or being held upright.**

#### **Inspect the scalp for dilated veins.**

The anterior fontanelle is such an important indicator of high or low intracranial pressure and of serious disease of the central nervous system that seasoned clinicians palpate it before doing any other part of the physical examination on an acutely ill baby.

The newborn infant's cranial bones may overlap at the sutures to a certain degree. This phenomenon, called *molding*, results from passage of the head through the birth canal and disappears within 2 days. It is not seen in babies born by cesarean section.

A newborn baby's scalp often is swollen from edema and bruising over the occipitoparietal region. This is the *caput succedaneum*, caused by the

drawing of that portion of the scalp into the cervical os when the amniotic sac ruptures. The negative pressure or vacuum effect caused by the loss of amniotic fluid produces distended capillaries with local extravasation of blood and fluid. These findings subside within the first 24 hours of life.

**Ascertain the shape and symmetry of the skull and the face.**

Asymmetry of the cranial vault (*plagiocephaly*) occurs when an infant lies constantly on one side. Such positioning results in a flattening of the occiput on the dependent side and a prominence of the frontal region on the opposite side. It disappears as the baby becomes more active and spends less time in one position. In almost all instances, symmetry is restored when the position of the head becomes less constant. *In utero* positioning may result in transient facial asymmetries. If the head is flexed on the sternum, a shortened chin (*micrognathia*) may result; pressure of the shoulder on the jaw may create a temporary lateral displacement of the mandible.

The premature infant's head at birth is relatively long in the occipitofrontal diameter and narrow in the bitemporal diameter (*dolichocephaly*). This relationship continues for most of the first year; in some it lasts indefinitely. An abnormally large head (*hydrocephaly*, Abnormal Enlargement of the Head in Infancy, or *megacephaly*) and an abnormally small head (*microcephaly*) should be recognized easily, but either condition initially requires frequent observation, including measurements, for early diagnosis and treatment.

If, in palpating the newborn's skull, you press your thumb or forefinger too firmly over the temporoparietal or parietooccipital areas, you may feel the underlying bone give momentarily, much as a ping-pong ball responds to similar pressure. This condition, known as *craniotabes*, is due to osteoporosis of the outer table of the involved membranous bone. It may be found in some normal infants. Purposeful elicitation of this finding is not recommended.

**Percuss the parietal bone on each side by tapping your index or middle finger directly against its surface.**

This will produce a "cracked pot" sound (*Macewen's sign*) in normal infants prior to closure of their cranial sutures.

**Check for Chvostek's sign. Percuss at the top of the cheek just below the zygomatic bone in front of the ear, using the tip of your index or middle finger.**

One or two contractions of the facial muscles in response to percussion (*Chvostek's sign*) are present in many newborn infants and can persist normally throughout infancy and early childhood.

**Transilluminate the skull during the initial examination of every infant suspected of having central nervous system disease.**

**In a completely darkened room, place a standard three-battery flashlight, with a soft rubber collar attached to the lighted end, flush**

against the skull at various points. In normal infants a 2-cm halo of light is present around the circumference of the flashlight when it is placed over the frontoparietal area, and a 1-cm halo is present when the flashlight is placed over the occipital area.

Routine auscultation of the skull over its front, back, and sides to detect the presence of a *bruit* is of little use until late childhood because a systolic or continuous bruit may be heard over the temporal areas in normal children until the age of 5. Similar findings may be found in older children who are significantly anemic.

The *neck* of the newborn is relatively short.

**While the infant is supine, palpate the neck with your thumb and forefinger, feeling for lymph nodes, masses, cysts, and the position of the thyroid cartilage and the trachea.**

*Cervical lymphadenopathy* is not seen often during infancy.

**Palpate the clavicles for evidence of a fracture (shortening, break in contour, and crepitus at the fracture site).**

**Move the head through its full range of motion at the neck (extension, flexion, lateral bending, and rotation 90° to the left and right).**

The neck is supple and easily mobile in all directions throughout infancy. Its musculature is not sufficiently developed to enable the infant to turn its head from side to side until 2 weeks of age, to lift its head 90° when lying prone until 2 months of age, or to hold its head upright when sitting until 3 months of age.

### **Early and Late Childhood**

Beyond infancy the head and neck, except as previously mentioned, should be examined with the procedures used in examining the adult. There are diagnostic facies in childhood that reflect chromosomal abnormalities, endocrine defects, social disease, chronic illness, and other categories of disease (Diagnostic Facies in Infancy and Childhood, for examples).

A swollen parotid gland may be difficult to detect during the early stages of mumps.

*Parotid swelling and tenderness suggest mumps, a bacterial infection, or a stone in the parotid duct.*

**With your index finger, palpate along a line extending from the outer canthus of the eye to the lower tip of the pinna.**

*Parotid tenderness is elicited when mumps is present.*

**Inspect the orifice of the parotid (Stenson's) duct, which emerges from the midportion of the buccal mucosa.**

*Redness and swelling are usually present in the conditions noted above.*

*Parotid gland swelling, from any cause, extends above and below the mandible at the angle of the jaw; the swelling due to cervical adenitis occurs only below these landmarks.*

## Abnormal Enlargement of the Head in Infancy

### Cephalhematoma

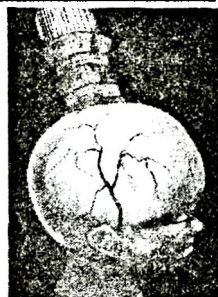


Although not present at birth, cephalhematomas appear within the first 24 hours and are due to subperiosteal hemorrhage involving the outer table of one of the cranial bones. The swelling (see illustration above, which shows a cephalhematoma overlying the left parietal bone), unlike the caput succedaneum and hematomas associated with skull fractures, does not extend across a suture. It may be small and well localized or may involve the entire bone. Occasionally, bilateral symmetrical swellings occur after difficult deliveries. Although initially soft, the swellings develop a raised bony margin within 2 to 3 days, due to the rapid deposition of calcium at the edges of the elevated periosteum. The entire process usually disappears within a few weeks, but may remain as a residual osteoma that is not resorbed for a year or two.

### Hydrocephaly










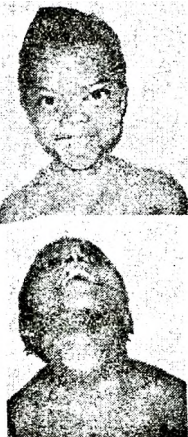
In hydrocephaly the anterior fontanelle is bulging and the eyes may be deviated downward, revealing the upper scleras and creating the "setting sun" sign, as shown in the figure above. The setting sun sign is also seen briefly in some normal newborns.



Transillumination of the skull in advanced cases of hydrocephaly produces a glow of light over the entire cranium, as illustrated above

*Diagnostic Facies in Infancy and Childhood*

Fetal Alcohol Syndrome	Congenital Syphilis	Congenital Hypothyroidism	Facial Nerve Palsy
			
<p>Babies born to women who are chronic alcoholics are at increased risk for growth deficiency, microcephaly, and mental retardation. Facial characteristics shown here include short palpebral fissures, a wide and flattened philtrum (the vertical groove in the midline of the upper lip), and thin lips.</p>	<p>In utero infection by <i>Treponema pallidum</i> usually occurs after the 16th week of gestation and affects virtually all fetal organs. If it is not treated, 25% of infected babies will die before birth and another 30% shortly thereafter. Signs of illness appear in survivors within the first month of life. Facial stigmata shown here include bulging of the frontal bones and nasal bridge depression (<i>saddle nose</i>), both due to periostitis; rhinitis from weeping nasal mucosal lesions (snuffles); and a circumoral rash. Mucocutaneous inflammation and fissuring of the mouth and lips (<i>rhagades</i>), not shown here, may also occur as stigmata of congenital syphilis, as may tibial periostitis (<i>saber shins</i>) and dental dysplasia (<i>Hutchinson's teeth</i>)</p>	<p>The child with congenital hypothyroidism (cretinism) has coarse facial features, a low-set hair line, sparse eyebrows, and an enlarged tongue. Associated features include a hoarse cry, umbilical hernia, dry and cold extremities, myxedema, mottled skin, and mental retardation. It is important to note that the majority of infants with congenital hypothyroidism have no physical stigmata; this has led to screening of all newborns in the United States and in most other developed countries, for depressed thyroxin or elevated thyroid-stimulating hormone levels.</p>	<p>Peripheral (lower motor neuron) paralysis of the facial nerve may be due to (1) an injury to the nerve from pressure during labor and delivery, (2) inflammation of the middle ear branch of the nerve during episodes of acute or chronic otitis media, or (3) unknown causes (Bell's palsy). The nasolabial fold on the affected left side is flattened and the eye does not close. This is accentuated during crying, as shown here. Full recovery occurs in <math>\geq 90\%</math> of those affected, usually within a few weeks.</p>

Down's syndrome	Battered-child syndrome	Perennial Allergic Rhinitis	Hyperthyroidism
 <p>The child with Down's syndrome (Trisomy 21) usually has a small, rounded head, a flattened nasal bridge, oblique palpebral fissures, prominent epicanthal folds, small, low-set, shell-like ears, and a relatively large tongue. Associated features include generalized hypotonia, transverse palmar creases (<i>simian lines</i>), shortening and incurving of the 5th fingers (<i>dinodactyly</i>) and so on.</p>	 <p>The child who has been physically abused (battered) may have old <i>and</i> fresh bruises about the head and face and may either look sad and forlorn or be actively seeking to please, sometimes even particularly involved with and attentive to the abusing parent. Other stigmata include: bruises in areas (axilla and groin) not usually subject to injury rather than the bony prominences, x-ray evidence of fractures of the skull, ribs, and long bones in various stages of healing, and skin lesions that are morphologically similar to implements used to inflict trauma (hand, belt buckle, strap, rope, coat hanger, or lighted cigarette).</p>	 <p>The child suffering from perennial allergic rhinitis has an open mouth (cannot breathe through the nose) and edema and discoloration of the lower orbitopalpebral grooves ("allergic shiners"). Such a child is often seen to push the nose upward and backward with a hand ("allergic salute") and to grimace (wrinkle the nose and mouth) to relieve nasal itching and obstruction. (Illustration reproduced with permission from Marks MB: Allergic shiners: Dark circles under the eyes in children.</p>	 <p>Thyrotoxicosis (<i>Graves' disease</i>) occurs in approximately 2 per 1000 children under the age of 10 years. Affected children exhibit hypermetabolism and accelerated linear growth. Facial characteristics shown if this 6-year-old girl are "staring" eyes (not true exophthalmos, which is rare in children) and an enlarged thyroid gland (<i>goiter</i>)</p>

The child's lymphatic system reaches its zenith of growth at 12 years of age; the size of its various components (lymph nodes and the tonsils and adenoids, in particular) is greater between the ages of 6 and 20 years than at other ages. Parents and clinicians who are unaware of this may become unduly concerned that large and even not so large visible nodes, especially in the neck, may be malignant.

*Cervical lymphadenopathy* may occur in a variety of circumstances, including:

1. *Viral upper respiratory infections*, in which enlarged lymph nodes are usually nontender.
2. *Infectious mononucleosis* caused by Epstein-Barr virus. Generalized lymphadenopathy may occur, but the cervical lymph nodes are most prominently involved and may be quite large and tender.
3. Malignant disease, including *leukemia, Hodgkin's disease, non-Hodgkin's lymphoma, and metastatic cancer*, with or without enlarged lymph nodes in other regions.
4. *Acute anterior cervical lymphadenitis* of bacterial origin, with concomitant *acute tonsillitis or pharyngitis*. The tonsillar lymph nodes are usually involved and are very swollen and tender. The figure below shows bilateral tonsillar lymph node enlargement due to acute tonsillitis.

Most lymph nodes, cervical or otherwise, that are enlarged in children are either just "normally so" or are due to local infections (mostly viral) and not to malignant disease. This is particularly the case if the node is less than 2 cm in diameter, if it is not hard or fixed to the skin or underlying tissues, and, in the case of cervical lymph nodes, if the chest x-ray findings are normal. Concern regarding malignancy is raised when a supraclavicular lymph node is enlarged, when fever lasting more than a week without apparent cause accompanies the lymphadenopathy, and when there has been a weight loss of 5 pounds or more within the previous 6 months.



5. *Acute posterior cervical lymphadenitis* secondary to acute otitis externa, acute or chronic *mastoiditis* (rare), and scalp lesions (*pediculosis capitis, tinea capitis*).

6. *Kawasaki's disease* (mucocutaneous lymph node syndrome) of unknown cause is a potentially life-threatening illness, characterized by fever, conjunctivitis, oral mucosal lesions, rash, cervical lymphadenitis, carditis, and coronary artery vasculitis.



7. Less common infections, including *tuberculosis*, *atypical mycobacterium infection*, and *cat-scratch disease*.

Occipital lymphadenopathy may occur with scalp lesions and is usually present with *rubella*.

Neck mobility is important when central nervous system diseases, especially meningitis, are considered, because the neck may be less supple than normal when such diseases are present.

**With the child supine, cradle the head in your hands so that you provide complete support as shown below. Move the head gently in all directions to determine any resistance to motion, especially to flexion.**



In infancy and early childhood, this is a more reliable test for nuchal rigidity and meningeal irritation than *Brudzinski's sign* or *Kernig's sign*. The infant's neck may retain its mobility, even when meningeal irritation, as with meningitis, is present.

**To detect nuchal rigidity in early and late childhood, ask the child to sit with legs extended on the examining table. Normally children should be able to sit upright and touch their chins to their chests.**

*Nuchal rigidity*, or marked resistance to movement of the head in any direction, suggests meningeal irritation, as from central nervous system infections, bleeding, and tumors.

When meningeal irritation is present, the child assumes the tripod position and is unable to assume a full upright position to perform the chin-to-chest maneuver.



**Younger children may be persuaded to flex their necks forward by getting them to look at a small toy or a light beam placed on their upper sternum.**



## The Eye

### Infancy

#### Inspecting the Eyes

Inspecting the newborn's eyes is somewhat difficult because the lids are ordinarily held tightly closed. Attempts at separating the lids usually increase the contraction of the orbicularis oculi muscles. Because bright light causes infants to blink their eyes, the newborn's eyes should be examined in subdued lighting.

**Hold the baby upright in your extended arms, fixing the head in the midline with your thumbs as illustrated below. Rotate yourself with the baby slowly in one direction. This usually causes the baby's eyes to open, providing a clear view of the scleras, pupils, irises, and extraocular movements. The eyes look in the direction you are turning. When the rotation stops, the eyes look in the opposite direction, following a few unsustained nystagmoid movements.**



Conjugate eye movements develop rapidly after birth, and most newborns will regard a face. While some will follow a face or a bright light, definitive following movements are not seen for a few weeks in most newborns. *Nystagmus* in one or many directions is common immediately after birth. During the first 10 days of life the eyes remain fixed, staring in one direction as the head is moved slowly through the full range of motion (*doll's eye test*). *Intermittent alternating convergent strabismus* (crossed eyes) is frequently seen or reported by parents during the first 6 months of life.

**Look at the scleras carefully.** Small subconjunctival and scleral hemorrhages are common in newborns.

**Observe the pupillary reactions by covering each eye with your hand, and then uncovering it.** Pupillary reactivity to light is poor during the first 4 to 5 months. Inequality of pupil size in both bright and subdued light is common, but should be considered significant only if constant over time and associated with other ocular or central nervous system findings. The corneal reflex is normally present at birth, but is not tested for unless a neurologic deficit is suspected.

**Inspect each iris for the presence of Brushfield's spots.** These appear as white specks, usually scattered around the entire circumference of the iris, and may be present in some normal infants.

*Chemical conjunctivitis* may occur following placement of silver nitrate in the eyes at birth as a prophylaxis against gonorrheal conjunctivitis (*ophthalmia neonatorum*). The latter is characterized by edema of the lids and inflammation of the conjunctivas with a purulent discharge. Many newborn nurseries now use erythromycin instead of silver nitrate because it produces much less irritation.

#### *Visual Acuity*

The development of central vision progresses from birth, when only light perception is thought to be present, to adult visual levels, which are attained at approximately 6 years of age.

Vision assessment in the newborn is based on the presence of visual reflexes—direct and consensual pupillary constriction in response to light, blinking and extending the head in response to bright light (*optical blink reflex*), and blinking in response to quick movement of an object toward the eyes.

Those visual reflexes imply that both light perception and some degree of visual acuity are present shortly after birth. That this acuity improves is evident even without specific refractive measurement. At 2 to 4 weeks of age, fixation on objects occurs; at 5 to 6 weeks, coordinated eye movements in following an object are seen; at 3 months, the eyes converge and the baby begins to reach for various-sized objects at various distances as eye-hand coordination and the ability to focus are accomplished. At the age of 1 year, normal visual acuity is in the range of 20/200.

#### *The Ophthalmoscopic Examination*

**Demonstrate the red retinal (or fundus) reflex by setting the ophthalmoscope at 0 diopters and viewing the pupil at a distance of approximately 10 inches. Normally a red or an orange color is reflected from the fundus through the pupil.**

**Perform an Ophthalmoscopic examination on all infants.** Usually this examination can be postponed until between 2 and 6 months of age, when the infant is most cooperative, unless the ocular or neurologic examination indicates that it should be done immediately. Such examinations

are not difficult to perform if one exercises patience and persistence. Occasionally, a mydriatic solution may be required to observe the fundus.

**Instill a sterile mydriatic (2.5% phenylephrine with 0.5% cyclopento-late—one drop in each eye). This can be repeated after 45 minutes if pupillary dilatation has not occurred. Place the baby supine on the examining table or on the parent's lap, or have the parent hold the baby upright over his or her shoulder. If the baby needs calming, use a pacifier. If necessary, retract the lids with your thumb and first finger. Funduscopic examination is otherwise the same as in adults. The cornea can ordinarily be seen at +20 diopters, the lens at +15 diopters, and the fundus at 0 diopters.**

#### **Look for retinal hemorrhages.**

Small retinal hemorrhages are often present. If they are extensive, severe *anoxia*, *subdural hematoma*, or *subarachnoid hemorrhage* should be suspected.

Babies with acute central nervous system disease should not have their pupils dilated, except as directed by a child neurologist or an ophthalmologist.

The optic disc is pale in infants, the peripheral vessels are not well developed, and the foveal light reflection is absent. *Papilledema* is rarely seen, even with markedly increased intracranial pressure, because the fontanelles and open sutures absorb the increased pressure, sparing the optic discs. Until age 3 years, the sutures will separate sufficiently to prevent papilledema. If vascular or optic disc anomalies are found, the parents' fundi should be examined to determine a possible genetic origin and a prognosis.

### *Early Childhood*

In this age group, the most important condition to detect is *amblyopia ex anopsia*. This is not the most serious ophthalmologic disease, but in comparison with others of significance it is the most prevalent and offers, with early intervention, the best prognosis. Improvement in this condition is unlikely if treatment is instituted after the sixth year of life, and is best if instituted in early infancy. *Amblyopia* means reduced vision in an otherwise normal eye, and is caused by disuse. Because of disconjugate fixation, one of the two images received by the optic cortex is suppressed to avoid *diplopia*, or images of unequal clarity. One eye then becomes, "lazy" and stops functioning to its full capacity; visual acuity in that eye is reduced markedly by suppression of central (foveal) vision. Since the two most common causes of *amblyopia ex anopsia* are *strabismus* and *anisometropia* (an eye with a refractive error 1.5 diopters or more greater than its pair), it is important to be able to test accurately for muscle weakness and visual acuity.

The methods for examining adults for the position and alignment of the eyes, each of their externally visible parts (eyebrows, eyelids, lacrimal

apparatus, conjunctivas, scleras, corneas, irises, and pupils), and the function of the extraocular muscles are equally applicable for examinations during early and late childhood.

### *Visual Acuity*

Testing visual acuity in early childhood is not simple. The variables of the child, the examiner, the test environment, and the test itself all contribute significantly to the outcome and should be carefully considered if valid results are to be obtained. Unfortunately, there is no test that accurately measures visual acuity in children under the age of 3 years. Since each eye must be tested separately to detect amblyopia, one eye must be covered by an elastoplast bandage to ensure complete occlusion. Resistance to placement of the patch may be overcome by calling it a "pirate's patch." A child with amblyopia might accept the patch on the amblyopic eye but *not* on the good eye.

*Opticokinetic testing* is the most accurate method for determining visual acuity in this age group; however, this method requires too much technical equipment to use in most practice settings.

In children over the age of 3 years, the *Snellen E chart* (a form of direct visual testing) is very adequate. Most youngsters cooperate in indicating the direction of the E, either orally or by pointing. For those who initially have difficulty with this test, an E card can be sent home with the child for practice. Charts with pictures instead of Es are often used but have no special advantage, nor have any other testing methods generally available. The normal visual acuity at age 3 years is  $\pm 20/40$ , at 4 to 5 years,  $\pm 20/30$ , and at 6 to 7 years, 20/20. Any difference in visual acuity between the eyes (e.g., 20/20 on the left and 20/30 on the right) is abnormal, might lead to amblyopia, and should be referred to an ophthalmologist.

### *Visual Fields*

The *visual fields* can be examined in infants and young children with the child sitting on the parent's lap. **Hold the head in the midline while bringing an object, such as a small toy, into the child's field of vision from behind the child, into the upper and lower temporal fields on both sides. Eyes deviating in its direction indicate that the child has seen the object.**

### *Late Childhood*

The eye problems and methods of examining the eye for this age group have been covered in the adult section. In general, vision testing machines used for mass screening in schools tend to underrate visual acuity and produce over-referrals. Because visual acuity may change during the school year, vision testing during periodic well-child visits is recommended

beginning at age 4 years. **Distinguish a simple refractive error from organic causes of diminished vision by asking the child to look through a pinhole punched in a card.** Visual acuity improves by using the pinhole card when refractive errors are present, but not when organic ocular disease exists.

## **The Ear**

### *Infancy*

**Note the position of the ears in relation to the eyes.** Normally the upper portion of the auricle (pinna) joins the scalp on or above the extension of a line drawn across the inner and outer canthi of the eye.

#### **Inspect the ear and surrounding skin.**

Small, deformed, or low-set auricles may indicate associated congenital defects, especially *renal agenesis (Potter's syndrome)* or anomalies.

A small skin tab, cleft, or pit found just forward of the tragus represents a remnant of the first branchial cleft.

Examination of the ear in the immediate neonatal period establishes only the patency of the ear canal, because the tympanic membranes are obscured by accumulated vernix caseosa for the first 2 or 3 days of life. In fancy the ear canal is directed downward from the outside; therefore, the auricle should be pulled gently downward for the best view of the ear drum. The light reflex on the tympanic membrane is diffuse and does not become cone-shaped for several months.

**Test the infant's hearing by eliciting the *acoustic blink reflex*, which is positive when the infant can hear. Observe blinking eyes in response to a sudden sharp sound produced at a distance of about 12 inches from the ear by snapping the fingers, clapping the hands, or using a bell or other kind of mechanical noisemaking device. Be sure that in generating the sound you do not produce an airstream that could cause the baby to blink.**

The acoustic blink reflex is difficult to elicit during the first 2 or 3 days of life, and may disappear temporarily after it is elicited a few times. This test is crude at best, and the absence of blinking in response to sound is not diagnostic of deafness, nor does its presence assure normal hearing. At 2 weeks of age, the infant may jump in response to a sudden noise; at 10 weeks, the infant may cease body movements momentarily. Between 3 and 4 months of age, the eyes and head will turn toward the sound. Even before this, the respiratory rate may increase and the facial expression may change when familiar sounds, generating anticipation of forthcoming pleasures such as feeding, are heard.

Screening of infants for hearing loss is very costly and produces unacceptable levels of false-positive and false-negative results. Selective screening of newborn infants who are at high risk for hearing deficits by

virtue of family history, physical findings, or perinatal difficulties should be performed using brainstem-evoked response audiometry.

### *Early Childhood*

#### *The Ear Canal and Drum*

The examination of the ear becomes more difficult as children grow. They resist because their ear canals are sensitive and they cannot observe the procedure.

Often it is helpful if you initially place the otoscopic speculum gently into the external auditory canal of one ear, remove it instantly, and repeat the procedure on the other. Then you can begin again, taking the necessary time in the actual examination, because the child's apprehensions have probably been allayed.

The ears can be examined successfully even in struggling children if you restrain them carefully and manipulate both ear and otoscope gently.

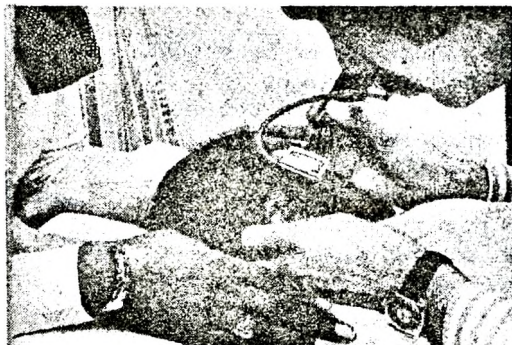
**Place the patient supine and ask the parent or an assistant to hold the child's arms extended and close to the sides of the head, thus limiting movement from side to side. Approach from the child's right side and lean across the lower chest and upper abdomen to restrict movements of the trunk. A third person may be needed to hold the feet and legs if the child struggles unduly; however, this is rarely necessary.**

This same restraining procedure may be used in examining the eyes, nose, and throat, as illustrated below.

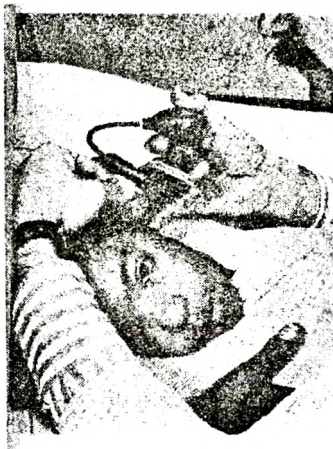


**When examining the right ear, turn the child's head to the left and hold it firmly with the lateral aspect of your right hand and wrist. Hold the otoscope inverted in your right hand and manipulate the auricle with your left hand, the lateral aspect of which can be used to help keep the child's head still. In this age group, the external auditory canal is directed upward and backward from the outside, and the auricle must**

be pulled upward, outward, and backward to afford the best view. The thumb and forefinger of your right hand, which holds the otoscope, should be buffered from sudden movements of the child's head by your restraining right hand and your forearm, which rests firmly on the examining table. See the illustration.

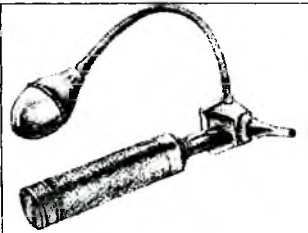


When examining the left ear, turn the patient's head to the right and hold it firmly with the lateral aspect of your left hand and wrist. The thumb and forefinger of your left hand should manipulate the auricle and your right hand should hold the otoscope inverted. The lateral aspect of the fifth finger of your right hand is held against the patient's head to provide a buffer against sudden movement by the patient. This procedure is illustrated at the left.



The speculum of the otoscope should be as large in diameter as will allow for comfortable ¼- to ½-inch penetration into the external auditory canal. This provides a maximum view of the canal and drum and a reasonable seal for observing the effects of pneumatic otoscopy. Some examiners attach a rubber tip to the end of the speculum to gain a tighter, more comfortable seal.

***Pneumatic otoscopy should be part of every otoscopic examination; it is accomplished by observing the tympanic membrane as the pressure in the external auditory canal is increased or decreased. You can do this by introducing and removing air from the canal—by applying positive and negative pressures with a rubber squeeze bulb, or by blowing and sucking on a rubber tube attached to the otoscope.***



When air is introduced into the normal ear canal, the tympanic membrane and its light reflex move inward. When air is removed, the tympanic membrane moves outward, toward the examiner. This to-and-fro movement of the tympanic membrane has been likened to the luffing of a sail.

Accumulation of cerumen in the ear canal commonly obscures the view of a child's tympanic membrane. Very often this accumulation is unilateral. There are several instruments and ear-washing techniques that may be used to remove ear wax comfortably.

Purulent material and debris in the ear canal are found both in otitis externa and in otitis media with a ruptured tympanic membrane. Washing out the ear canal is contraindicated, in the first instance because of the pain created by the procedure and in the second instance because the cleansing fluid and canal debris are forced into the middle ear through the perforated tympanic membrane.

Simple auditory screening in this age group can be accomplished by whispering at a distance of 8 feet.

**Ask the child questions or give commands, taking care that lip reading is not possible. In addition, you can use a tuning fork to screen for hearing, using your own auditory acuity as the control.**

If these screening methods reveal any diminution of hearing, full audiometric testing should be performed. Furthermore, all children should be given a full-scale acoustic screening test with an audiometer before beginning school, as should any child at whatever age with delayed speech



development. Because of their complexity, audiometric screening devices used for older children are often unsatisfactory for use in early childhood; when speech is delayed or defective, direct referral to a hearing and speech center may be more appropriate.

### *Late Childhood*

As the child grows, the ease and techniques of examining the ears and testing the hearing approach the levels and methods used for adults. There are no ear abnormalities or variations of normal unique to this age group. A possible exception is the "selective deafness" some children and adolescents demonstrate in hearing only what they choose when spoken to in either soft or loud voices by their parents and teachers.

## **The Nose and Throat**

### *Infancy*

**Test the patency of the nasal passages by occluding each nostril alternately while holding the infant's mouth closed.** This will not cause stress in a normal baby, since most newborns are nasal breathers. On the other hand, occluding both nares simultaneously and allowing the mouth to open will cause considerable distress. Indeed, some infants (*obligate* nasal breathers) are unable to breathe through their mouths. **Confirm obstructed posterior nasal passages by attempting to pass a number-14 French catheter through each nostril into the posterior nasopharynx.**

**Inspect the mouth and pharynx with a tongue blade and flashlight, while the baby is lying supine.**

The newborn's *mouth* is edentulous. The gums are smooth with a raised, 1-mm, serrated fringe of tissue on the buccal margins. Occasionally, pearl-like retention cysts are seen along the ridges and are easily mistaken for teeth—they disappear spontaneously within a month or two.

Petechiae are commonly found on the soft palate after birth.

The frenulum of the upper lip may be quite thick and extend from the superior aspect of the inner lip to the posterior portion of the upper gum, creating a deep notch in the gum's midline. The frenulum of the tongue varies in consistency from a thin, filamentous membrane to a thick, fibrous cord. Its length varies, such that it may attach midway on the undersurface of the tongue or at its very tip. A heavy fibrous frenulum that extends to the tip of the tongue may interfere with its protrusion (*tongue tie*). No difficulties will be encountered with nursing or speech, however, if the tongue can be extended as far forward as the anterior mandibular gum line, which is usually possible.

The *pharynx* can best be seen while the baby is crying. This is true throughout infancy and early childhood. A tongue blade produces strong reflex elevation of the base of the tongue and obstructs the view of the

infant's pharynx. Tonsillar tissue is not seen in the newborn.

Oral candidiasis (*thrush*) is a common malady in infants, usually contracted from mothers with *Candida* vaginitis. In thrush, a lacy white material with an erythematous base is seen on the surface of the oral mucous membranes. Difficulty in removing it distinguishes it from milk curds, which wipe away.

Little saliva is produced during the first 3 months of life. As infants begin to produce saliva, drooling occurs because there are no lower teeth to provide a dam for retention.

The presence of large amounts of saliva in the newborn may be a sign of *esophageal atresia*, since saliva cannot be swallowed.

**Listen to the infant's breathing and the quality of the cry.**

A shrill or high-pitched cry in infancy may indicate increased intracranial pressure. Such cries also occur in newborn infants born to narcotic-addicted mothers. A hoarse cry should make one suspect *hypocalcemic tetany* or congenital hypothyroidism; absence of any cry suggests severe illness, vocal cord paralysis, or profound mental retardation. A continuous inspiratory and expiratory stridor is caused by upper airway obstruction due to a variety of lesions (e.g., a polyp or hemangioma), a relatively small larynx (infantile laryngeal stridor) or a delay in the development of the cartilage in the tracheal rings (*tracheomalacia*).

*Early and Late Childhood*

**Look at the anterior portion of the nose by pushing up its tip. Use a large-bore speculum attached to the otoscope to look deeper into the nostrils. Inspect the nasal mucous membranes, noting their color and condition. Look for nasal septal deviation and the presence of polyps posteriorly.**

Pale, boggy nasal mucous membranes with or without the presence of gelatinous, peeled-pink-grape-appearing polyps in the posterior nasal passages, which are found with chronic (perennial) allergic rhinitis.

**Palpate over the frontal and maxillary sinuses, applying pressure to elicit tenderness.** When sinusitis is suspected because tenderness is elicited, transillumination should be performed. This requires a completely dark room and a cooperative child.

**Transilluminate the frontal sinuses by firmly placing the tip of the transilluminator light above each eye against the inner aspect of the supraorbital ridge of the frontal bone.**

Normally, one sees a faint glow of light transmitted through the bone outlining the frontal sinus on the same side. Frontal sinuses are not well enough developed for this procedure to be helpful until approximately age 10 years.

**To transilluminate the maxillary sinuses, cover the neck and head of**

the transilluminator light with a sleeve made by cutting the finger off of a plastic glove. Place the covered light in the patient's mouth and pressing the tip against first one side of the hard palate and then the other. Instruct the patient to seal both lips around the shaft of the transilluminator attachment while you look for the maxillary sinus glow on the corresponding side of the face. Discard the sleeve after use.

**Inspect the mouth and pharynx.**

This examination may present difficulties in early childhood, and restraints are usually needed. The young child may be more comfortable sitting in the parent's lap, as shown below.



**When children clamp their teeth and purse their lips, gently push the tongue blade through the lips along the buccal mucosa and between the gums behind the molars. This produces a gag reflex and, with it, a complete view of the *pharynx*.**

A direct assault on the front teeth will only meet with failure and a splintered tongue blade. Most children, however, are not that resistant and can be enticed easily to open their mouths, especially if they do not see a throat stick in the examiner's hand. Children who can stick out their tongues and say "ahhh!" do not require further manipulation for a complete view of the pharynx. A good examiner can determine all that needs to be known with one quick look. Older children will permit placement of the tongue blade on one side of the base of the tongue and then the other. A transilluminator attached to the otoscope handle is more useful than a penlight or flashlight because it delivers concentrated light closer to the recesses of the oral cavity and the pharynx.

**Examine the *teeth* for timing and sequence of eruption, number, character, condition, and position.** Abnormalities of the enamel may reflect past or present, general or localized disease.

*Dental caries*, caused by bacterial activity, reflect frequent consumption of carbohydrates. Extensive decay of the primary teeth may be due to prolonged bottle feeding ("nursing-bottle caries"), especially in children who are given bottles at night and during naps.

Irregular white specks or *patches* on tooth enamel are present with excess exposure to *fluorides*; grayish mottling of the enamel may result from giving tetracycline to infants and children under 8 years of age.

**Look for malocclusion in late childhood.** Most malocclusion and misalignment of teeth due to thumb sucking in early childhood are reversible if the habit is substantially arrested by age 6 or 7 years.

**When examining for maxillary protrusion (*overbite*) or mandibular protrusion (*underbite*), do not ask the child to "show your teeth," because the upper and lower teeth are aligned reflexly when they are presented for inspection. Rather, ask the child to bite down as hard as possible. Part the lips and observe the *true* bite.** In normal children the lower teeth are contained within the arch formed by the upper teeth.

The *primary teeth* erupt more predictably than do the permanent teeth. There is wide variation in age of eruption. Black children tend to have earlier eruption of permanent teeth than do white children. At age 10 months, most infants have two upper and two lower central incisors. From that point on, four teeth are added every 4 months, so that there are 8 at 14 months, 12 at 18 months, 16 at 22 months, and a full complement of 20 at 26 months. Normally, the shedding of primary teeth begins at about age 6 years; it precedes the eruption of corresponding *permanent teeth*, which begins at the beginning of late childhood between 6 and 7 years of age and ends in early adulthood at age 17 to 22 years.

**Inspect the dorsal and ventral surfaces of the tongue and its sides. Ask the patient to stick the tongue out and to move it from side to side.**

When the *throat* is examined, the size and appearance of the *tonsils* should be noted. In both early and late childhood the tonsils are relatively larger than in infancy and adolescence, as demonstrated by the abundance of lymphoid tissue at this time of life. They appear even larger as they move out of their fossae toward the midline and forward when the gag reflex is elicited or when the tongue is voluntarily protruded and the traditional "ahhh!" is sounded. The tonsils usually have deep crypts on their surfaces, which often have white concretions or food particles protruding from their depths. This does not indicate disease, current or past.

The *adenoids*, also called *pharyngeal tonsils*, consist of hyperplastic lymphoid tissue located on both sides of the nasopharynx, medial to the eustachian tube orifices. They are not ordinarily visible unless extremely enlarged or unless the soft palate is elevated with the tongue blade to expose them. Adenoidal size can be determined indirectly by noting the degree of posterior nasal obstruction present when the patient sniffs through each

nostril, and the nasal quality they produce in the voice. Their size may also be determined directly by palpation. Adenoidal palpation should be carried out when a history of recurrent fever, headaches, and cough suggest *chronic adenoiditis* or *adenoidal abscess*.

**Palpate the adenoids when these diagnoses are suggested. During this procedure, position and restrain the child as for examining the throat. Tape three tongue blades together and, with your left hand, place them between the molars and turn them on edge to ensure wide exposure. Place your plastic-gloved right index finger through the mouth into the nasopharynx behind the soft palate, and very rapidly and thoroughly massage the adenoidal and surrounding lymphoid tissue. The procedure is accomplished with three or four quick strokes of the finger from above downward, moving across the posterior nasopharynx.**

The child and parents should be warned that this procedure is uncomfortable and is likely to produce vomiting.

**Use this same method to palpate (1) a peritonsillar abscess to determine the presence of fluctuation, and (2) the posterior pharyngeal wall to determine the presence of a retropharyngeal abscess.**

**Note absence or asymmetrical movement of the soft palate in response to gagging and phonation, which indicates paralysis or weakness.**

**Do not examine the throat when acute epiglottitis is suspected.** Inadvertently invoking the gag reflex during the examination could produce complete laryngeal obstruction and death. Therefore, the throat should be examined only by an otolaryngologist or other physician who is skilled in placing an endotracheal tube in the event of laryngeal obstruction. This is done best in an operating room where resuscitation can be effected, if need be.

**Look for clues of a submucosal cleft palate, such as notching of the posterior margin of the hard palate or a bifid uvula.** Because the mucosa is intact, the underlying defect is easily missed.

## **The Thorax, Breasts, and Lungs**

### *Infancy*

The infant's *thorax* is rounded, with the anteroposterior diameter being equal to the transverse diameter. The *thoracic index*, which is the ratio of the transverse diameter to the anteroposterior diameter, is 1 at birth. At 1 year of age it is 1.25, and it reaches 1.35 at 6 years without much change thereafter.

The chest wall in infancy is thin with little musculature, and the bony and cartilaginous rib cage is very soft and pliant. The tip of the xiphoid process is often seen protruding anteriorly immediately beneath the skin at the apex of the costal angle.

The *breasts* of the newborn in both male and female are often enlarged

and engorged with a white liquid, sometimes colloquially called "witch's milk." This is due to maternal estrogen effect and usually lasts only a week or two. Supernumerary nipples occasionally are found on the thorax or the abdomen along a vertical line below the true nipple(s). They appear as small, round, flat or slightly raised, pigmented lesions and are not clinically significant.

Breathing is predominantly effected by movement of the diaphragm, with little assistance from the thoracic muscles. This results in protrusion of the abdomen on inspiration and the reverse on expiration - so-called abdominal breathing.

Newborn infants, especially those born prematurely, exhibit irregular breathing characterized by periods of breathing at normal rates (30 to 40 per minute) alternating with "periodic breathing," during which the respiratory rate slows markedly and may even cease (apnea) three or more times for 3 seconds or longer. These alternating respiratory patterns have been observed in 30% to 95% of premature babies during sleep, but less often in full-term infants. The short apneic periods are not accompanied by bradycardia.

**Feel for tactile fremitus in infants by placing your hand on the chest when the baby cries. Place your whole hand, palm and fingertips, over the anterior, lateral, or posterior thorax to detect gross changes in sound transmission through the chest. Percuss the infant's chest directly by tapping the thoracic wall with one finger or indirectly by using the finger-on-finger method.**

The percussion note is normally hyperresonant throughout. Any decrease in hyperresonance detected over the lung fields has the same significance as dullness in the adult.

**Use the bell or small diaphragm of the stethoscope when auscultating the infant's chest, to pinpoint findings.**

The breath sounds are louder and harsher than in adults because the stethoscope is closer to the origin of the sounds. Breathing in newborns is usually intermittently slow and shallow, then rapid and deep. Breath sounds are often diminished on the side of the chest opposite the direction which the head is turned. Fine crackles at the end of deep inspiration may be heard in normal newborns and older infants. Crying, fortunately, will produce all of the deep breaths one could want and actually enhances auscultation, except in the unusual baby who cries on inspiration as well as expiration.

In infants, it is difficult to distinguish transmitted upper airway sounds from sounds originating in the chest. Expiratory sounds usually originate below the vocal cords and inspiratory sounds from anywhere in the respiratory tract. Those from the upper airway are symmetrical and are louder closer to the head and on deep breathing.

Because of the smallness of the thoracic cage and the ease of sound transmission within it, breath sounds are rarely absent entirely. Even with

atelectasis, effusion, empyema, and pneumothorax, breath sounds are diminished rather than absent. In infants, pure bronchial breathing is rarely heard, even when consolidation is present. Wheezes, which are palpable and audible, occur more frequently in infancy and early childhood than in older children and adults because the small lumen of the tracheobronchial tree is easily narrowed by slight swelling of the mucous membranes or by small amounts of mucus. Often mucus and swollen nasal and pharyngeal mucous membranes cause loud, ronchorous inspiratory and expiratory sounds that are transmitted throughout the lung fields. Listening with the stethoscope placed over the cheeks and the lateral neck helps to localize the origin of these sounds—upper airway sounds being louder and lower airway sounds softer.

### *Early and Late Childhood*

Breast development for girls may begin normally as early as 8 years of age. Asymmetrical growth with resulting differences in breast size during preadolescence is common. Completion of growth through adolescence usually corrects these inequalities. It is often helpful to explain this to parents and the young person herself, even if neither mentions the subject.

As in infancy, the breath sounds on auscultation of the lungs are louder and harsher in early and late childhood than in adulthood because of the continued relative lack of musculature and subcutaneous tissue overlying the thorax. Respiratory patterns are more regular than in infancy, and cooperation in taking deep breaths and conducting other breathing maneuvers during auscultation of the lungs increases with age.

The stethoscope may be threatening to the very young child; therefore, your success in placing it on the chest will be enhanced if you say what it is and if you allow the child to manipulate it or even listen through it.

**Generate tactile fremitus by feeling the chest wall while carrying on a conversation with the child. A surprising number say "99" or "1, 2, 3" when asked to. Gain the child's cooperation in deep breathing and breath holding by demonstrating each maneuver. If this is not successful, ask the child to blow out the light in your flashlight. This almost always produces full inspiration.**

### **The Heart**

The examination of the heart in infants and children is, with few exceptions, conducted like that in the adult.

**Feel for the femoral pulse along the inguinal ligament midway between the iliac crest and the symphysis pubis as the examiner is doing with her left hand in the figure on the next page.**

Because the respiratory rate may approximate the heart rate in infancy, breath sounds may be mistaken for murmurs. **Occlude the nares momentarily to interrupt the respirations long enough to clarify this**

## issue.

During the first 48 hours of life, heart murmurs caused by the transition from intrauterine to extrauterine circulation are heard frequently. These are systolic in timing, less than grade 2 in intensity, and disappear spontaneously upon closure of the ductus arteriosus and the foramen ovale.

There are some distinct cardiac characteristics in normal infants and children that are not found in adults. The apical impulse (PMI), which is often visible, is at the level of the 4th interspace until age 7 years, when it drops to the level of the 5th interspace. It is to the left of the midclavicular line until age 4 years, at the midclavicular line between ages 4 and 6, and to the right of it at age 7. On percussion the heart appears larger than it is because of its more horizontal position and the overlying thymus gland at its base. *Sinus arrhythmia* (heart rate faster on inspiration and slower on expiration) is almost always present, and *premature ventricular contractions* are quite common. The heart sounds are louder than those in adults because the chest wall is thinner, and they are of higher pitch and shorter duration.  $S_1$  is louder than  $S_2$  at the apex. Splitting of  $S_2$  at the apex is found in 25% to 33% of infants and children, but is of no significance.  $S_2$  is louder than  $S_1$  in the pulmonic area.

In the pediatric cardiac examination the *murmur* assumes great significance in differential diagnosis, because more than 50% of all children (indeed, some say all) develop an innocent murmur at some time during childhood and because significant heart disease in the pediatric age group is infrequent in the absence of a murmur. The examiner must therefore distinguish between the innocent and the organic murmur. The intensity of murmurs is graded on a scale of 1 to 6.

The *innocent murmur* has received more than 120 labels, indicative of its benign or functional nature, its origin, or its auscultatory characteristics. It is systolic, is usually of short duration and of less than grade 3 in intensity, and has a low-pitched, vibratory, musical groaning quality. It is usually loudest along the left sternal border, either in the 2nd or 3rd intercostal spaces or in the 4th or 5th intercostal spaces medial to the apex. It is poorly transmitted, and is heard best with the bell of the stethoscope with the patient supine. Its intensity may vary with change in position, with the phase of respiration, with exercise, with the presence or absence of fever, and from day to day. The most important characteristic of the innocent murmur is that it is heard in the absence of any other demonstrable evidence of cardiovascular disease.

A *venous hum* is heard commonly during childhood.

*Hemic murmurs* are caused by increased blood flow through the heart. This occurs when the body's tissues require more oxygen than usual (increased metabolism or muscular activity) or when hemoglobin-depleted red blood cells are not delivering ordinary amounts of oxygen to the tissues



(anemia). These murmurs are located at the base of the heart, are soft occur during systole, and are accompanied by tachycardia. Two other common "innocent" murmurs heard in childhood are the *carotid bruit*, which is loudest in the neck and transmitted over the entire precordium, and *pulmonary branch stenosis*, which is heard best in the pulmonic area, radiates loudly to the axillae and back, and should disappear after the first few months of life as the branch pulmonary arteries enlarge.

The noninnocent or *organic murmurs* are caused by congenital or acquired heart disease. *Acute rheumatic fever* is the major cause of acquired heart disease productive of murmurs of childhood. An organic murmur first appearing before 3 years of age is almost always caused by a congenital cardiac defect; one first appearing after that age is usually caused by rheumatic carditis.

The murmurs of congenital cardiac defects are caused either by abnormal communication between the arterial and venous circuits of the heart and great vessels or by valvular deformities. They are usually coarse in character, systolic in timing, and heard best at the base of the heart.

The presence or absence of cyanosis may be helpful to the examiner in differentiating the various types of congenital heart disease that have similar murmurs.

Murmurs of grade 3 or higher usually indicate heart disease.

In *atrial septal defect*, a grade 1 to 3 coarse systolic murmur is heard at the 2nd and 3rd left interspaces. It is less coarse than the murmur of a ventricular septal defect, is rarely accompanied by a thrill, and is not widely distributed. The murmur of *coarctation of the aorta* (adult type) is heard in the same area, is louder, is transmitted to the back medial to the scapula, and may be accompanied by a visible pulsation and a palpable thrill at the supra-sternal notch. It is also associated with decreased to absent femoral pulses and elevated blood pressure in the upper extremities. The murmurs associated with *tetralogy of Fallot*, *pure pulmonic stenosis*, *tricuspid atresia*, *transposition of the great vessels*, and *Eisenmenger's syndrome* are systolic and grades 3 to 5, may be heard best at the left 2nd and 3rd interspaces, are not well transmitted, may or may not be accompanied by a thrill, and have no distinguishing characteristics. These murmurs may be absent in infancy. In addition, palpable liver pulsations may be present with tricuspid atresia and pure pulmonic stenosis.

Usually the final diagnostic impression must await the results of electrocardiograms, chest x-rays, cardiac catheterization, echocardiograms, and more sophisticated studies.

Table 3

## Cyanosis and Congenital Heart Disease

No Cyanosis	Septal defects – small Patent ductus arteriosus Pure pulmonic stenosis – mild Coarctation of the aorta * Anomalous origin of left coronary artery * Subendocardial fibroelastosis * Glycogen storage disease
Early Cyanosis	Tetralogy of Fallot – severe Tricuspid atresia Transportation of the great vessels Two- and three-chambered hearts Severe pulmonic stenosis with intact ventricular septum
Late Cyanosis	Eisenmenger's complex Pure pulmonic stenosis—mild Tetralogy of Fallot Septal defects—large
* Presents with cardiac enlargement, tachycardia, and tachypnea, but without a heart murmur	

The murmurs associated with acquired rheumatic heart disease include those of mitral stenosis, mitral regurgitation, aortic stenosis, and aortic regurgitation. Stenosis and regurgitation usually occur concomitantly when either the mitral or the aortic valve is affected from rheumatic carditis. Mitral valvular disease occurs in 90% of children who develop heart disease following acute rheumatic carditis, either alone or in combination with aortic valvular disease. Aortic valve involvement occurs in approximately 25% of cases. The tricuspid and pulmonic valves are rarely involved in the rheumatic process.

The examiner should be able to differentiate normal from abnormal findings. Final decisions regarding specific abnormalities, however, must often be left to the pediatric cardiologist, whose experience and access to special diagnostic tools will be more likely to produce accurate diagnoses and appropriate management. Therefore, the infant or child with evidence of congenital or acquired heart disease should be referred to a pediatric cardiologist early on.

## The Abdomen

### *Infancy*

**Inspect the abdomen with the infant lying supine.** The abdomen in infants is protuberant, due to poorly developed abdominal musculature.

**Check the umbilical cord at birth for the number of vessels present.** Normally there are two thick-walled umbilical arteries and one thin-walled umbilical vein. The diameter of the arteries is smaller than that of the vein, and the vein is usually found at the 12 o'clock position at the level of the abdominal wall.

The umbilicus in the newborn may have a relatively long cutaneous portion (*umbilicus cutis*), which is covered with skin, or a relatively long amniotic portion (*umbilicus amnioticus*), which is covered by a firm gelatinous substance. The amniotic portion dries up within 1 week and falls off within 2, while the cutaneous portion retracts to become flush with the abdominal wall.

Infants are prone to *umbilical hernias*, *ventral hernias*, and *diastasis recti*. However, these are not usually discernible until 2 or 3 weeks of age. All are easily detected with crying.

A diastasis recti may reflect a congenital weakness of the abdominal musculature (rare) or result from a chronically distended abdomen. Most, however, are normal variants and disappear in early childhood.

A superficial abdominal venous pattern is observable until puberty. Abdominal reflexes are usually absent until after the first year of life.

**Auscultate the abdomen.** Metallic tinkling every 10 to 30 seconds is heard normally.

**Percuss the infant's abdomen as in the adult, but allow for a greater amount of air within the stomach and the intestinal lumen because infants frequently swallow air when feeding and crying.**

Palpation of the infant's abdomen is relatively easy. **Relax the infant by holding the legs flexed at the knees and hips with one hand; palpate with the other.**

The *liver edge* and *spleen tip* are more often palpable than not, and frequently both *kidneys* can be palpated by placing the fingers of one hand in front of and those of the other behind each kidney. The *bladder* is often felt and normally percussed to the level of the umbilicus. The *descending colon* is easily felt as a sausage-like mass in the left lower quadrant. Any abdominal masses of other origin are easily outlined.

**Avoid the spasm and rigidity encountered in palpating the abdomen of a crying infant by giving a bottle or a pacifier.**

#### *Special Technique for Pyloric Stenosis*

The abdominal examination technique is altered when *pyloric stenosis* is suspected.

**Place the unclothed infant supine and stand at the foot of the table. Direct a bright light at table height across the abdomen from the patient's right side. Feed the infant a bottle of sugar water or milk and observe the abdomen closely.** When pyloric stenosis is present, peristaltic waves are seen to go across the upper abdomen from left to right. These

become increasingly large and frequent as the feeding progresses, as shown in the figure below. Inevitably, the baby will vomit with projectile force.



Peristaltic waves

**At this point, palpate deeply in the right upper quadrant with your extended middle finger.** This will probably reveal the presence of a pyloric mass roughly 2 cm in diameter. Similar palpation with the baby prone may prove more successful.

#### *Early and Late Childhood*

A protuberant abdomen, apparent when the child is upright and disappearing when the child is supine, is typical in most children until adolescence.

Children are almost universally ticklish when you first place your hand on their abdominal wall. This reaction disappears in most cases, particularly if you distract the child by conversation and place your whole hand flush on the surface for a few moments without probing with your fingers. **With children whose sensitivity persists, place the child's hand under yours, as shown in the illustrations below, to reduce apprehension and increase relaxation of the abdominal musculature.**





**Flexing the knees and hips also relaxes the abdominal wall. Palpate lightly and then deeply in all quadrants. Examine last the area that the history suggests as the site of pathology.**

Tenderness may be detected by the child's telling you, by a change in the child's facial expression, or in the pitch of the child's cry.

*The liver* is easily palpated in most children. The edge of the liver is normally felt 1 cm to 2 cm below the right costal margin. It is sharp and soft and moves easily when pushed from below upward during deep inspiration. The size of the liver is determined better by percussion than by palpation. The table below shows the expected liver span by percussion in the right midclavicular line for male and female patients by age.

Table 4  
Expected Liver Span of Infants, Children, and Adolescents by Percussion

Age in Years	Mean Estimated Liver Span (cm)		Age in Years	Mean Estimated Liver Span (cm)	
	Males	Females		Males	Females
0.5 (6 mo)	2.4	2.8	8	5.6	5.1
1	2.8	3.1	10	6.1	5.4
2	3.5	3.6	12	6.5	5.6
3	4.0	4.0	14	6.8	5.8
4	4.4	4.3	16	7.1	6.0
5	4.8	4.5	18	7.4	6.1
6	5.1	4.8	20	7.7	6.3

The lower border of the liver can be determined with a *scratch test*. Place the diaphragm of your stethoscope just above the right costal margin at the midclavicular line. With your fingernail, lightly scratch the skin of the abdomen along the midclavicular line, moving from below the umbilicus towards the costal margin. When your scratching finger reaches the liver's edge, you will hear the scratching sound as it passes through the liver to your stethoscope.

As a rule the *spleen*, like the liver, is felt easily in most children. It too is soft with a sharp edge, and it projects downward like a tongue, from under the left costal margin.

**You can often palpate the spleen between the thumb and forefinger of your right hand, and find it to be moveable.**

Pulsations in the epigastrium caused by the aorta are seen normally.

**Deeply palpate the abdomen to the left of the midline to feel the aorta and its pulsations.**

Because the omentum is poorly developed in early childhood, localization of intraabdominal infection or other inflammatory reaction is less apt to occur than in late childhood and adolescence.

**Ask the child to sit up from a supine position while you push down against the forehead with your hand.**

This maneuver will elicit pain in the right lower quadrant in *acut appendicitis* when the appendix is lying anteriorly. When the appendix lies retroceally over the psoas and obturator muscles, *psoas* and *obturator signs* are often present.

## The Genitalia and Rectum

### *Infancy*

Examine the *male genitalia* with the infant in the supine position. The *foreskin* adheres to the *glans penis*, covers it completely, and has a tiny orifice at its distal end. Retraction of the foreskin over the glans in the uncircumcised male occurs months to years later, after regular gentle retraction. Circumcision exposes the *glans penis* to its base. The rate of circumcision has declined in recent years, but is still a common practice.

**Locate the urethral orifice and inspect the shaft of the penis.**

**Palpate the contents of the scrotal sacs and the inguinal canal. Locate the testes, which are found normally in the scrotal sacs. If found in the inguinal canal, use steady, gentle pressure to pull them down into the scrotum.**

In approximately 3% of all male neonates, one or both testes cannot be felt in the scrotum or inguinal canal. By age 1 year, two thirds of these testes will have descended into the scrotum.

Generalized scrotal edema may be present for several days postdelivery due to the effects of maternal estrogens and of breech delivery, when bruising is also present.

In the newborn female, the *mons pubis*, *labia majora*, and *labia minora* are prominent due to the effects of maternal estrogen; this prominence decreases within a month or two. Sometimes there is a bloody, vaginal discharge during the first weeks of life, which may be replaced by a serosanguineous discharge for several more weeks.

**Examine the female genitalia with the infant in the supine position.**

Separate the labia majora at their midpoint with the thumb of each hand, applying traction laterally and posteriorly. Inspect the *urethral orifice* and the *vestibule*, defined by the labia minora laterally, the clitoris anteriorly, and the posterior fourchette. Look for the *hymen*, a thickened, avascular structure with a central orifice, covering the vaginal opening.

Enlargement of the clitoris and posterior fusion of the labia majora are signs of *ambiguous genitalia* due to inborn errors of testosterone biosynthesis, a chromosomal defect, teratogenic agents, or a simple developmental abnormality. When ambiguous genitalia are present, it is essential that the sex of the child be determined before sex assignment is made.

The absence of a central hymenal orifice (*imperforate hymen*) is rare and of no clinical significance in the neonate; should it persist, *hydrocolpos* may occur during childhood, and *hematocolpos* will occur following initial menstruation in the adolescent girl. Both conditions are rare.

The genitalia of female breech babies may be markedly edematous and bruised for several days following delivery.

The *rectal examination* is not routinely performed during infancy, but should be done whenever intraabdominal, pelvic, or perirectal disease is suspected. It should be performed with the patient supine. This allows for deeper penetration of the examining finger and for combined abdominal and rectal examination.

**Hold the feet together and flex the knees and hips on the abdomen with one of your hands while introducing the gloved and lubricated index finger of your other hand into the rectum. Then place your first hand on the abdomen to conduct a bimanual examination.** The index finger is preferred for the rectal examination, even for infants, because of its greater length and tactile sensitivity. Regardless of the size of your examining finger, slight bleeding and protrusion of the rectal mucosa will usually occur upon its removal.

### *Early and Late Childhood*

The size of the *penis* in early childhood and prepubescence is of little significance unless it is very large. In obese boys the fat pad over the symphysis pubis may envelop the penis, obscuring it completely. The testes in young boys are quite retractile and are often found in the inguinal canal rather than in the scrotum.



The testes should be well descended into the scrotum. They may be seen to move upward when the medial aspect of the ipsilateral thigh is scratched lightly (*cremasteric reflex*).

Warm your hands when attempting to locate undescended or retractile testes. Overcome the cremasteric reflex by having the child sit cross-legged on the examining table, as illustrated here. Undescended testicle should not be diagnosed until you have palpated the inguinal canal and scrotum with the patient in this position.

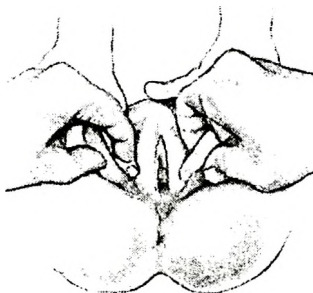
The examination for *inguinal hernia* in this age group is similar to that performed on the adult and should be done with the patient standing.

The child's cough or attempts at performing a Valsalva maneuver may not be strong enough to demonstrate a reduced hernia. The hernia can sometimes be made evident if the child attempts to lift a heavy object, such as the end of the examining table or the chair in which you are sitting.

*Tanner staging* is used to track the sexual maturation of males during puberty, characterizing pubic hair distribution and penile, and testicular size.

Examine the female *external genitalia* while the patient is in the supine, frog-leg position on the examining table, or, for a young girl, while she is lying in the parent's lap.

You can often make the examination of the female genitalia easier for yourself and more comfortable for the young child by using the child's own hands to distract and reassure her and to assist you, as shown in the figure on the next page.



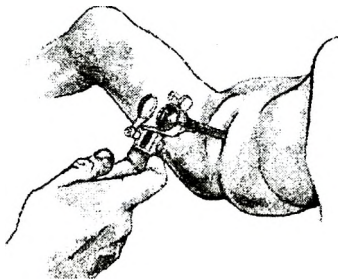
During the preschool years, the external genitalia are characterized by flattened labia majora, thin labia minora, and a small clitoris. The hymen,



once thickened and avascular, becomes thin, with a well defined edge and a lacy vascular pattern. The hymenal orifice is usually easily appreciated with lateral labial traction.

During the early school years, the external genitalia show signs of estrogen stimulation. The labia majora and minora become fuller, and the hymen becomes thicker. These changes progress as the child nears puberty and the genitalia assume adult characteristics. *Tanner staging* is also used to track the sexual maturation of pubertal females. This system includes a description of pubic hair and breast development. Girls as young as 8 years may develop these secondary sexual characteristics.

Vaginoabdominal palpation as a method of examining the pelvic structures and direct inspection of the vagina and cervix are not considered part of the ordinary physical examination in childhood. When inspection of the vagina and cervix is indicated, it is done best with an otoscope equipped with a vaginal speculum, as shown below.



In the prepubertal and pubertal female, examination of the external genitalia is sufficient. The presence of vaginal bleeding in the prepubertal female is one of the few indications for a pelvic examination. These examinations are best left to an experienced practitioner. A speculum examination is indicated if the patient is sexually active, has nonmenstrual bleeding, or has a vaginal discharge.

The *rectal examination* is not part of the routine pediatric examination, but should be done whenever intraabdominal, pelvic, or perirectal disease is suspected.

**Place the child in the supine position with the knees and hips flexed and the legs abducted. Drape from the waist down. Provide frequent reassurance during the course of the examination. Try to gain greater relaxation and cooperation by first demonstrating and then asking the child to breathe in and out through the mouth rapidly, "like a puppy dog." Spread the buttocks and observe the anus. Look for perianal skin tags (frequently present but usually of no significance). Insert the lubricated index finger of your gloved hand slowly and gently through**

the anal sphincter, aiming it toward the umbilicus. Ask the child to "push down" to relax the sphincter. Proceed with a bimanual rectoabdominal examination. With the fingers of your other hand, palpate deeply in the lower abdomen, trying to feel the lower abdominal and pelvic structures between your two hands.

The prostate gland is not palpable in young boys.

Bimanual rectoabdominal palpation in females reveals a small midline mass, which is the *cervix*. Any other mass that is palpable on this examination should be considered abnormal, since none of the other anatomical structures are normally palpable until adolescence.

## The Musculoskeletal System

### Infancy

The **range of motion** at all joints is greatest in infancy, and gradually lessens throughout childhood to adult levels.

At birth, the *feet* may appear deformed if they retain their intrauterine positioning. Such positional deformities can be distinguished by the ease with which the affected foot can be manipulated to neutral and overcorrected positions. Scratching or stroking along the outer edge of the positionally-deformed foot will cause it to assume a normal position.

**Look for inversion of the feet (a turning inward so that the medial margin is elevated). Note the relationship of the forefoot to the hindfoot. Is the forefoot adducted at the metatarsal-tarsal line (a line across the junctions of the tarsal and metatarsal bones)?**



When the forefoot is twisted inward on its longitudinal axis (inverted) in addition to being adducted, *metatarsus varus* exists, as shown in the figure below.

Adduction of the forefoot distal to the metatarsal-tarsal line (*metatarsus adductus deformity*) is common; spontaneous correction occurs within the first 2 years of life.

During infancy there is a distinct *bowlegged growth pattern*. This begins to disappear at 18 months of age, when a transition from bowlegs to knock-knees occurs. The *knock-knee pattern* usually persists from age 2 years until age 6 to 10 years, when a balancing takes place and, for most, the legs

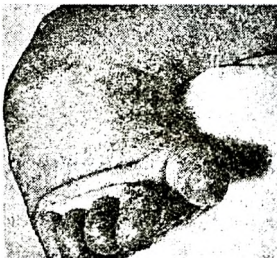
straighten. Some babies exhibit a twisting or torsion of the tibia inwardly or outwardly on its longitudinal axis. This invariably corrects itself during the second year of life.



**GENU VARUM  
(BOW LEGS)**



**GENU VALGUM  
(KNOCK-KNEES)**



*Talipes varus* is present when the forefoot is adducted and the entire foot is inverted.

*Talipes equinovarus (clubfoot)* is characterized by forefoot adduction and inversion and plantar flexion (equinus position) of the entire foot, as shown below.

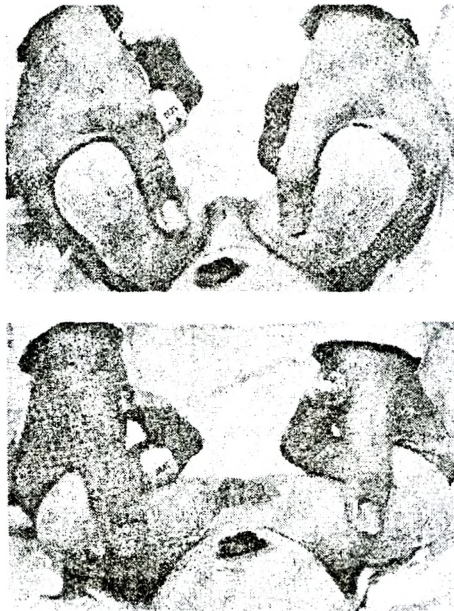
When infants stand, their legs are set wide apart and the weight is borne on the inside of the feet. When they walk, a wide-based gait is used for the first year or two. This causes a certain degree of *pronation of the feet* and incurving of the Achilles tendons (viewed from behind).

The longitudinal arch in infancy is obscured by adipose tissue, giving the foot a flat appearance. This is accentuated by pronation of the foot, so the infant is often misdiagnosed as being flatfooted.

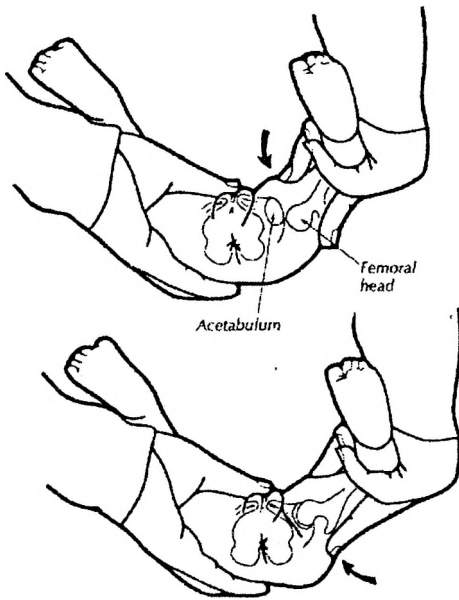
The *hips* of all infants should be examined for signs of dislocation.

**Place the baby supine with the legs pointing toward you. Flex the legs to right angles at the hips and knees, placing your index finger over the greater trochanter of each femur and your thumb over the lesser trochanter, as shown in the figures below. Abduct both hips simultaneously until the lateral aspect of each knee touches the**

examining table. This maneuver is known as the *Ortolani test*.



Detect an unstable (nondislocated but potentially dislocatable) hip by placing your thumb medially over the lesser trochanter and your index finger laterally over the greater trochanter, as shown in the figure below; press your thumb backward and outward. Feel for movement of the head of the femur laterally against some resistance as it slips out onto the posterior lip of the acetabulum. Normally no movement is felt. Then, with your index finger, press the greater trochanter forward and inward. Feel for a sudden movement of the femoral head inward as it returns to the hip socket. Again, movement is not normally felt. Movement in both directions constitutes *Barlow's sign*.



Barlow's sign is not diagnostic of a congenital dislocated hip, but it indicates the need to observe every baby very carefully for this possibility.

Massive defects in the spine, such as meningocele, are quite obvious at birth, but others that may lead to serious consequences present more subtly.

**Palpate the spine carefully, particularly in the lumbosacral region, to determine if there are any deformities of the vertebrae or any abnormalities of the overlying skin, pigmented spots, hairy patches, or deep pits that might overlie external openings of sinus tracts that extend to the spinal canal.**

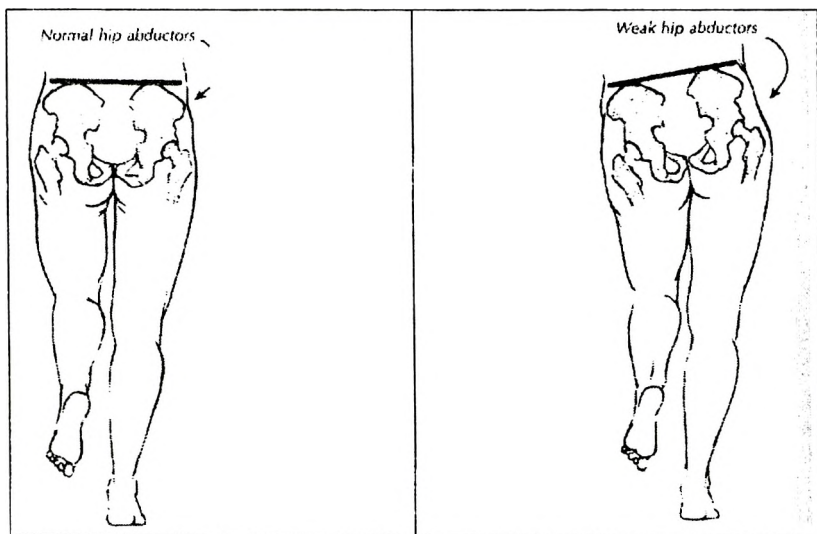
### *Early and Late Childhood*

**From both in front and behind, watch the child standing upright. Closely observe the child in various postures from the front and the rear (e.g., while the child is standing upright with the feet together, walking, stooping to obtain an object from the floor, rising from the supine position, and touching the toes or the shins while standing).**

In childhood, the thoracic convexity is decreased and the lumbar concavity increased. Lordosis is common and rarely causes symptoms.

**Test for severe hip disease with its associated weakness of the gluteus medius muscle by observing the child from behind as the weight is shifted from one leg to the other. The pelvis remains level when the**

weight is borne on the unaffected side (*negative Trendelenburg sign*).



Determine any *leg shortening* in hip disease by comparing the distance from the anterior superior spine of the ilium to the medial malleolus on each side.

When you suspect *scoliosis*, ask the child to bend forward. Mark the spinous processes with a felt-tip pen. From behind, watch for asymmetry of the scapulas, rib cage, and hips, as the child slowly stands erect. Then look for a curve in the line of ink dots.

## The Nervous System

### *Infancy*

Neurologic screening includes assessment of positioning, spontaneous and induced movements, cry, and knee and ankle jerk reflexes, and elicitation of the rooting, grasp, tonic neck, and Moro automatisms. It should be performed on all newborns. Babies showing abnormalities in these areas and those at risk for central nervous system disease should be completely assessed neurologically at frequent intervals.

The findings during the neurologic examination in infancy, especially in the newborn period, differ markedly from those present in children and adults.

The central nervous system at birth is underdeveloped, and cortical function cannot be tested entirely until early childhood. Findings of normal

brainstem and spinal functioning do not ensure an intact cortical system, and abnormalities of the brain-stem and spinal cord may exist without concomitant cortical abnormalities. A number of specific reflex activities (*infantile automatisms*) are found in the normal newborn that disappear in early infancy.

**Assess mental status by observing the ease of transition between states of alertness and drowsiness, ease of consolability, orientation to visual or auditory stimuli, and habituation to various stimuli.**

The neurologic examination in infancy will enable the clinician to detect extensive disease of the central nervous system, but will be of little use in pinpointing minute lesions and specific functional deficits.

The general appearance, positioning, activity, cry, and alertness of the newborn baby should be noted, because these observations are important in the neurologic assessment of this age group.

**Test for motor function by putting each major joint through its range of motion to determine whether normal muscle tone, spasticity, or flaccidity is present.**

Beyond the newborn period, throughout infancy, specific gross and fine motor coordination testing can be done using an age-appropriate protocol, such as the Denver Developmental Screening Test. This is also a test of social and language development. Discrepancies in achievement in the motor and communication areas may suggest whether the deficit is in the motor, sensory, or intellectual spheres. Knowledge of when developmental landmarks are normally achieved is essential in assessing the function of the infant's nervous system.

The sensory examination for infants is rather limited in terms of defining neurologic disease. Thresholds of touch, pain, and temperature are higher in older children, and reactions to these stimuli are relatively slow.

**Test for pain sensation by flicking the infant's palm or sole with your finger. Observe for withdrawal, arousal, and change in facial expression. Do not use a pin to test for pain sensation.**

The cranial nerves are tested in infancy as in the adult. The difficulties encountered in assessing the function of the 2nd and 8th nerves have already been mentioned.

Absence of withdrawal when a painful stimulus is applied to an extremity indicates anesthesia or paralysis. If a facial expression or a cry changes in the absence of withdrawal, paralysis rather than anesthesia is indicated. With spinal cord lesions, the extremity withdraws reflexly in response to pain, but the baby's facial expression or cry will not change.

**The 12th nerve is easily tested. Pinch the nostrils of the infant. This produces a reflex opening of the mouth and raising of the tip of the tongue.**

Because the corticospinal pathways are not fully developed in infants,

the *spinal reflex mechanisms* (deep tendon reflexes and plantar response) during infancy are variable. Their exaggerated presence, or their absence, has very little diagnostic significance unless this response is different from that in a previous testing.

**The technique for eliciting these reflexes is similar to that used with adults, except that your semiflexed index or middle finger can substitute for the neurologic hammer, its tip acting as the striking point. Your thumbnail may be used to elicit the plantar response.**

The *Babinski response* to plantar stimulation can be elicited in some normal infants, and sometimes until 2 years of age. However, a flexion response to plantar stimulation is elicited in more than 90% of normal newborns. The *triceps reflex* is usually not present until after 6 months of age. Rapid, rhythmic plantar flexion of the foot in response to eliciting of the ankle reflex (*ankle clonus*) is common in newborns; as many as eight to ten such contractions in response to one stimulus may occur normally (*unsustained ankle clonus*).

**You can also elicit ankle clonus by pressing your thumb over the ball of the infant's foot and abruptly dorsiflexing the foot.**

The *abdominal reflexes* are absent in the newborn but appear within the first 6 months of life. The *anal reflex*, however, is normally present in newborns, and is important to elicit when spinal cord lesions are present or suspected.

**With the baby supine, straighten and raise the lower legs, stroke the perianal region with a paper clip, and observe the external anal sphincter contract.**

### *Infantile Automatism*s

The infantile automatism are reflex phenomena present at birth or appearing shortly thereafter. Some remain only a few weeks while others persist well into the second year of life. Automatism have prognostic value for central nervous system integrity. Eliciting any of them (except the rooting, grasp, tonic neck, and Moro responses) should be attempted only when central nervous system function is questionable. Each automatism is listed here with the method of elicitation and the prognostic significance of its presence or absence. All are present at birth unless otherwise indicated. The time of disappearance is also shown.

***Blinking (Dazzle) Reflex.*** Disappears after first year. The eyelids close in response to bright light.

Absence may indicate blindness.

***Acoustic Blink (Cochleopalpebral) Reflex.*** Disappearance time is variable. Both eyes blink in response to a sharp loud noise.



Absence may indicate decreased hearing.

**Palmar Grasp Reflex.** Disappears at 3 or 4 months.

With the baby's head positioned in the midline and the arms semiflexed, place your index fingers from the ulnar side into the baby's hands and press against the palmar surfaces. The baby responds by flexing all of its fingers to grasp your fingers. This method allows for comparison of both hands. If the reflex is absent or weak, you can enhance it by offering the baby a bottle, since sucking facilitates grasping.

Persistence of the grasp reflex beyond 4 months suggests cerebral dysfunction. Note that babies normally clench their hands during the first month of life. Persistence of the clenched hand beyond 2 months also suggests central nervous system damage, particularly when the fingers overlap the thumb.

**Rooting Reflex.** Disappears at 3 or 4 months; may be present longer during sleep.

Absence of this reflex indicates severe generalized or central nervous system disease.

With the baby's head positioned in the midline and the hands held against the anterior chest, stroke with your forefinger the perioral skin at the corners of the baby's mouth and at the midline of the upper and lower lips.



In response, the mouth will open and turn to the stimulated side. When the upper lip is stimulated, the head will extend; when the lower lip is stimulated, the jaw will drop. This response will also occur when the infant's cheek is stimulated at some distance from the corners of the mouth.

**Trunk Incurvation (Galant's) Reflex.** Disappears at 2 months



Hold the baby horizontally and prone in one of your hands. Stimulate one side of the baby's back approximately 1 cm from the midline along a paravertebral line extending from the shoulder to the buttocks. This produces a curving of the trunk toward the stimulated side, with shoulders and pelvis moving in that direction.

This reflex is absent in transverse spinal cord lesions or injuries.

**Vertical Suspension Positioning.** Disappears after 4 months

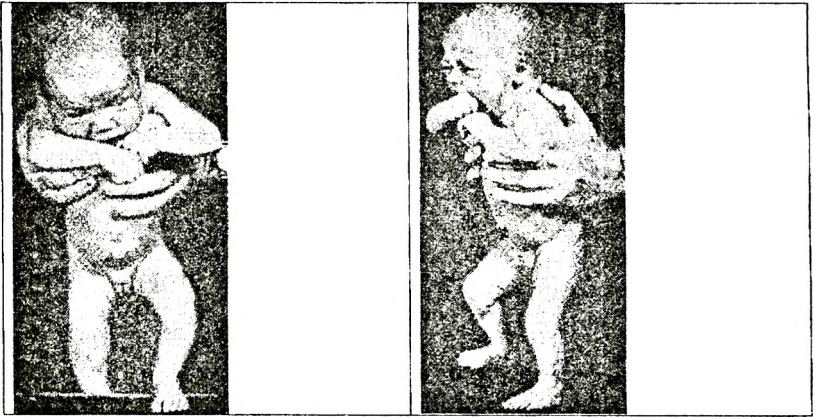
While you support the baby upright with your hands under the axillae, the head is normally maintained in the midline and the legs are flexed at the hips and knees.

Fixed extension and adduction of the legs (scissoring) indicates *spastic paraplegia* or *diplegia*.



**Placing Response.** Best elicited after the first 4 days. Disappearance time is variable.

Hold the baby upright from behind by placing your hands under the baby's arms with your thumbs supporting the back of the head, and allow the dorsal surface of one foot to touch the undersurface of a table top. Take care not to plantar flex the foot.



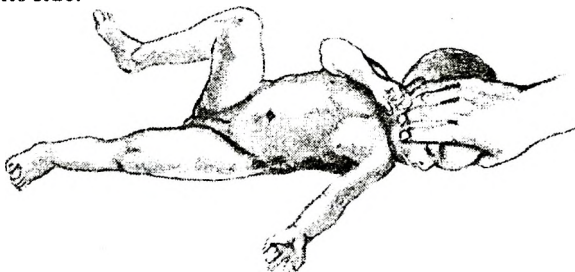
The baby responds by flexing the hip and knee and placing the stimulated foot on the table top. With one foot placed on the table, the opposite leg steps forward and a series of alternate stepping movements occurs as you move the baby gently forward.

**Rotation Test.** Disappearance time is variable.

Hold the baby under the axillae, at arm's length facing you, and turn him or her in one direction and then the other. The head turns in the direction in which you turn the baby. If you restrain the head with your thumbs, the baby's eyes will turn in the direction in which you turned.

**Tonic Neck Reflex.** May be present at birth, but usually appears at 2 months and disappears at 6 months.

With the baby supine, as shown below, turn the head to one side, holding the jaw over the baby's shoulder. The arm and the leg on the side to which the head is turned extend, while the opposite arm and leg flex. This "fencing posture" response does not normally occur each time this maneuver is performed. Repeat the maneuver, turning the head to the opposite side.



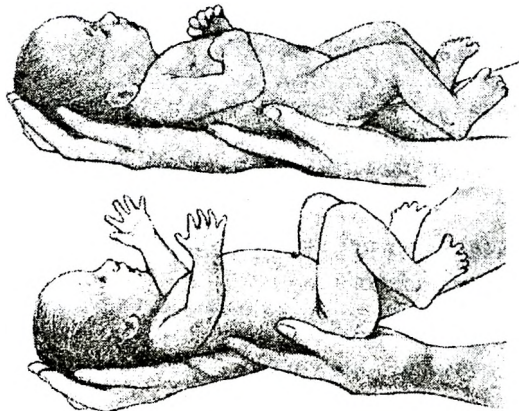
**Other Reflexes.** Two mass reflexes occur in the presence of normal subcortical mechanisms that are not yet under significant inhibitory control from higher cerebral centers. They are present at birth and disappear by the third month.

**Perez Reflex.** Suspend the baby prone in one of your hands. Place the thumb of your other hand on the baby's sacrum and move it firmly toward the head along the entire length of the spine. Extension of the head and spine, flexion of the knees on the abdomen, a cry, and emptying of the bladder are the usual responses.

The last part of the response occurs with sufficient frequency to be useful in the collection of urine specimens from neonates.

**Moro Response (Startle Reflex).** You can produce the Moro response in several ways; the two most commonly used are described below.

- **Hold the baby in the supine position, supporting the head, back, and legs. Then suddenly lower the entire body about 2 feet and stop abruptly, as shown below.**



Persistence of the Moro response beyond 4 months may indicate neurologic disease; persistence beyond 6 months is almost conclusive evidence of such. An asymmetrical response in the upper extremities suggests hemi paresis, injury to the brachial plexus, or fracture of the clavicle or humerus. Low spinal injury and congenital dislocation of the hip may produce absence of the response in one or both legs.

Certain combinations of findings in infancy suggest specific diagnoses. In a baby with a history of hemolytic disease of the newborn and extreme neonatal jaundice, the presence of the setting sun sign, opisthotonos, and a disappearing or absent Moro response suggest kernicterus.

- **Produce a loud noise (e.g., strike the examining table with the palms**

**of your hands on both sides of the baby's head).**

The response itself (elicited using either method) is one in which the arms briskly abduct and extend with the hands open and fingers extended, and the legs flex slightly and abduct (but less so than the arms). The arms then return forward over the body in a clasping maneuver and the baby cries simultaneously.

### *General Indicators of General Nervous System Disease During Infancy*

The following should suggest to the clinician the presence of central nervous system disease:

1. Abnormal localized neurologic findings
2. Asymmetry of movements of extremities
3. Failure to elicit expected infantile automatisms
4. Late persistence of infantile automatisms
5. Reemergence of vanished infantile automatisms
6. Delays in reaching developmental milestones  
(See Denver Developmental Screening Test)

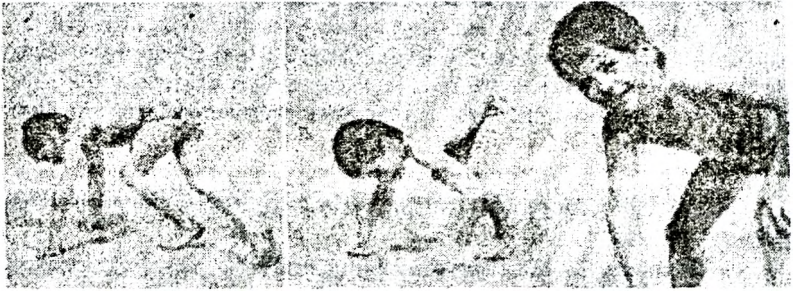
### *Early and Late Childhood*

Beyond infancy when the infantile automatisms have disappeared, the neurologic examination is conducted much like the adult examination. Samples of handwriting and figure drawing with both hands help to detect fine motor defects. Capacities for stereognosis, sensing vibration and position, two-point discrimination, number identification, and extinction are not usually testable in the child under 3 years of age and in many under 5 years. Hand preference is demonstrated by age 1 to 2 years and is firmly established by age 5.

The gait should be observed with the child both walking and running. Asymmetric arm movements in walking or running may indicate a hemiparesis, as may unequal wear of the soles and heels of the child's shoes. There are also localized neurologic and orthopedic conditions that may produce unequal wear.

**Observe the child rising from the floor from a supine position so that you can note the manner in which the muscles of the neck, trunk, arms, and legs are used to assume the standing position.** Normally, the sitting position is first assumed; the legs are then flexed at the knees, while the arms are extended to the side of the body to push off from the floor, gaining an upright position in one smooth motion.

Evidence of neurologic deficits, muscular weaknesses, and orthopedic defects may be detected here that would not otherwise be noted.



### *At All Ages*

The neurologic examination in infancy and childhood includes elements from the general physical examination as well as from the more specific techniques outlined in this section. Correlate all these observations to assess the integrity of the central and peripheral nervous systems. This principle also applies to evaluating adults.

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**Пособие**

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