The Pediatric Foot and Ankle

Diagnosis and Management

Michelle L. Butterworth
John T. Marcoux
Editors

Springer

EXTRAS ONLINE

The Pediatric Foot and Ankle

Michelle L. Butterworth
John T. Marcoux
Editors

The Pediatric Foot and Ankle

Diagnosis and Management

Springer

Editors

Michelle L. Butterworth, DPM, FACFAS
Williamsburg Regional Hospital
Kingstree, SC
USA

John T. Marcoux, DPM, FACFAS
Steward - St. Elizabeth's Medical Center
Brighton, MA
USA

ISBN 978-3-030-29786-2 ISBN 978-3-030-29788-6 (eBook)
https://doi.org/10.1007/978-3-030-29788-6

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

This textbook is dedicated to our educators and training mentors at the Temple University School of Podiatric Medicine, the University of Pennsylvania Health Systems-Presbyterian Medical Center residency program, and the Podiatry Institute. Their professional guidance, motivation, and pursuit of excellence have always driven us to continuously keep raising the bar for the next generation of foot and ankle surgeons. In addition, this textbook is also dedicated to the many residents and students that we have had or will have the privilege to educate during our careers. May they all continue to pay it forward as we have!

Foreword

There are few accomplishments more satisfying for a foot and ankle surgeon than achieving a successful, long-term correction of a disabling and/or painful deformity in a child or adolescent's lower extremity.

Podopediatrics is a growing area of most foot and ankle surgeons' practices. The importance of addressing deformities early in their development has long been recognized for more severe lower limb, ankle, and foot deformities but now is being more fully explored, identified, and treated in many mild-to-moderate conditions. Surgery in the child or adolescent patient is much more than just "surgery on a small adult." The surgeries are often done on a growing lower extremity and foot and require careful planning with considerable attention to detail to achieve a lasting, good, long-term outcome. The timing of the surgery must often be deliberated and can affect the final result. Additionally, if present, neuromuscular disease can affect the treatment options and should be considered. The goal of surgery in the pediatric patient population often cannot entirely resolve a gait abnormality, neuromuscular disease, or pedal condition but should strive for lasting improvement in the quality of life for the juvenile patient.

The editors of this textbook have gathered together an outstanding, accomplished, and experienced group of surgeons who regularly perform foot and ankle surgery in the pediatric patient population. Among these authors are leading surgeons, traumatologists, professors, researchers, and most importantly parents. They clearly understand the trepidation of any parents electing to proceed with foot and ankle surgery on their child. Many of these authors have also given their time to medical mission trips to foreign countries, where surgery on the pediatric and adolescent foot and ankle are among the most common procedures performed.

This textbook has been carefully laid out to highlight the more common procedures done for this juvenile patient population. However, children are like "snowflakes," and no two congenital abnormalities or pediatric traumas are identical, further highlighting the criticality of proper patient and procedural selection. Therefore, this textbook is best used as a foundation for improving one's knowledge base in this continuously evolving and changing

area of foot and ankle surgery. The editors and authors of this fine textbook have certainly achieved this goal and have successfully completed their mission.

Michael S. Downey, DPM, FACFAS
Division of Podiatric Surgery
Penn Presbyterian Medical Center
Philadelphia, PA, USA

Department of Surgery
Temple University of Podiatric Medicine
Philadelphia, PA, USA

The Podiatry Institute
Decatur, GA, USA

Preface

It is with great excitement that we present this textbook on the pediatric foot and ankle. We are extremely grateful for our teachers and mentors throughout our education, training, and careers. Without them, we would not have our passion for teaching and our thirst for knowledge to share with students, residents, and our fellow colleagues. It is because of our great educators and role models that we had the ambition and chose to embark on this great endeavor so that we can pay it forward to our profession.

We were very fortunate to have completed a 4-year surgical residency specializing in reconstructive surgery of the foot, ankle, and leg. One aspect of training that our residency initially lacked, however, was the evaluation and management of pediatric foot and ankle deformities. Then, with a stroke of luck and good fortune and a lot of efforts by our attendings, especially Dr. Kieran Mahan, we gained privileges at the Temple Children's Hospital in Philadelphia, PA, and our eyes were opened to a whole new realm of medicine. This amazing opportunity helped us broaden our skills and become well-rounded physicians and surgeons, encompassing all aspects of foot and ankle care.

The pediatric population is a very special patient group, and we have found them to be some of the most rewarding. When these patients endure surgery, it is usually because of significant deformity and/or trauma. And although most of these patients are a true pleasure to treat, their deformities and pathology can be quite challenging. Their physiology and psychology are very different from the adult; therefore, they have to be treated differently than the adult. We do, however, have to deal with adults, as parents and chaperones of these patients, so the problem as a whole can be very complex. It takes a very patient and understanding physician to encompass the entire family, address their concerns, and gain their trust in treating their beloved child. But once that trust is achieved, an incredible relationship is created.

The goal of this textbook is to be all encompassing including normal anatomy and development and evaluation and management of most pediatric foot and ankle entities. The chapters include clinical and radiographic evaluation and treatment options, both conservative and surgical. The most common pediatric problems from digital deformities, neurological abnormalities, clubfoot, flatfoot, sports medicine, and trauma have been included.

This textbook has been a labor of love. It has been a true honor and pleasure to work with such talented authors, we are proud to call our friends and colleagues, as they have shared their areas of expertise for the benefit of us

all. It is our hope that this textbook will be a valuable and practical resource and provide you with great knowledge and assist you in evaluating and treating your pediatric patients. To be able to improve a juvenile's lifestyle, keep them mobile, eliminate or at least decrease their pain, and even return them to the athletic field makes a heart happy like no other. We hope you gain as much joy from treating this patient population as we do.

Kingstree, SC, USA
Brighton, MA, USA

Michelle L. Butterworth, DPM, FACFAS
John T. Marcoux, DPM, FACFAS

Acknowledgments

This textbook is the culmination of a journey that could not have been possible without the love, encouragement, support, and at times patience of our families, friends, and colleagues. We are deeply indebted to our contributing authors for their willingness to share their expertise on pediatric foot and ankle pathology. We appreciate the dedication and countless hours that were required to complete each chapter. They are truly experts in the field, and we are honored to have them as a vital part of this very special endeavor. We would also like to extend special thanks to Mr. Kristopher Spring and Prakash Jagannathan at Springer for their persistence and guidance throughout the editorial process.

Contents

Contributors

Patrick Stephen Agnew, DPM, FACFAS Family and Community Medicine, Eastern Virginia Medical School, Norfolk, VA, USA

Irina Bazarov, DPM Department of Podiatry, Kaiser Permanente, San Jose, CA, USA

Michelle L. Butterworth, DPM, FACFAS Williamsburg Regional Hospital, Kingstree, SC, USA

Craig A. Camasta, DPM, FACFAS Pediatric and Adult Reconstructive Foot & Ankle Surgery Fellowship, Atlanta, GA, USA

Department of Surgery, Emory St. Joseph's Hospital, Atlanta, GA, USA

Faculty, The Podiatry Institute, Decatur, GA, USA

Brian B. Carpenter, DPM, FACFAS Department of Orthopaedics, The University of North Texas Health Science Center, Fort Worth, TX, USA

Robert A. Christman, DPM, EdM College of Podiatric Medicine, Western University of Health Sciences, Pomona, CA, USA

Marissa S. David, DPM Podiatric Surgery Resident (PGY-III), Kaiser Permanente Santa Clara and GSAA, Santa Clara, CA, USA

Patrick A. DeHeer, DPM, FACFAP, FACFAS, FASPS, FFPM RCPS (Glasg) St. Vincent Hospital, Indianapolis, IN, USA

Private Practice Hoosier Foot & Ankle, Franklin, IN, USA

Robert Duggan, LAT, DPM, FACFAS Caldwell Foot and Ankle, Caldwell UNC Health Care, University of North Carolina Healthcare, Lenoir, NC, USA

University of Central Florida College of Medicine, Orlando, FL, USA

Timothy A. Graeser, DPM, AACFAS Private Practice, Motio Foot and Ankle Specialists, Winter Springs, FL, USA

Edwin J. Harris, DPM, FACFAS Loyola University Chicago, Stritch School of Medicine, Department of Orthopedics and Rehabilitation, Maywood, IL, USA

Rosiland Franklin University of Health Sciences, Dr. William M. Scholl College of Podiatric Medicine, Department of Podiatric Surgery and Applied Biomechanics, North Chicago, IL, USA

Daniel J. Hatch, DPM, FACFAS Medical Center of the Rockies, Loveland, CO, USA

North Colorado Podiatric Surgical Residency, Greeley, CO, USA

Byron L. Hutchinson, DPM, FACFAS Franciscan Medical Group: CHIFranciscan Foot & Ankle Associates: Highline Clinic, Seattle, WA, USA

Jessica M. Knight, DPM, AACFAS Weil Foot and Ankle Institute, Northwest Community Hospital Medical Group, Arlington Heights, IL, USA

Bradley M. Lamm, DPM, FACFAS Foot and Ankle Deformity Center and Fellowship, Paley Orthopedic and Spine Institute at St. Mary's Medical Center and Palm Beach Childerns Hospital, West Palm Beach, FL, USA

Caitlin Mahan Madden, DPM Private Practice, Podiatry Care Specialists, West Chester, PA, USA

Kieran T. Mahan, DPM Department of Podiatric Surgery, Temple University School of Podiatric Medicine, Philadelphia, PA, USA

Department of Podiatric Medicine and Surgery, Temple University Hospital, Philadelphia, PA, USA

Faculty, The Podiatry Institute, Decatur, GA, USA

College of Physicians of Philadelphia, Philadelphia, PA, USA

John T. Marcoux, DPM, FACFAS Steward – St. Elizabeth's Medical Center, Brighton, MA, USA

Emily D. Pugh, DPM, AACFAS Foot and Ankle Surgeon, Harvard Vanguard Medical Associates, Wellesley, MA, USA

Glenn M. Weinraub, DPM, FACFAS Department of Orthopaedic Surgery, TPMG- GSAA, San Leandro, CA, USA

Midwestern University, Glendale, AZ, USA

Western University, Pomona, CA, USA

Mitzi L. Williams, DPM, FACFAS, FACFAP Kaiser San Francisco Bay Area Foot and Ankle Residency Program, Department of Orthopedics and Podiatric Surgery, Kaiser Permanente, Oakland, CA, USA

Pediatry Institute Faculty Member, American Academy of Foot and Ankle, Osteosynthesis, Oakland, CA, USA

1 The Pediatric History and Physical Examination

Edwin J. Harris

Introduction

The purpose of the pediatric history and physical examination is to collect information. The objectives of the history are to identify and fully understand the chief complaint or complaints and all of their ramifications, acquire pertinent past medical and surgical information relevant to the chief complaints, identify other factors that may influence diagnosis and treatment, and begin the formation of a differential diagnosis. Obtaining the history is not a passive process. The examiner questions the historian, and the historian responds. Answers to the questions lead to new questions and the data base grows. The differential diagnosis is narrowed based on this information. If the history is properly obtained, the physical examination can be focused to support one of the diagnoses or rule several out.

Diagnostic errors can result from misinterpretation of these data but more often result from inattention to detail and failure to appreciate the importance of information obtained in the history.

The Historian

In pediatric practice, the patient is rarely the historian. The child may provide some useful information and the examiner should try to obtain as much information from the child as possible taking the child's age into consideration. Somebody other than the person experiencing the problem is relating the information and may be interjecting his or her own personal experiences and biases complicated by misinformation volunteered by well-meaning friends and relations, medical students, nurses, resident physicians, primary care physicians, referring physicians, and Internet searches. On occasion, the historian may even purposely withhold information because he or she finds it embarrassing or may think that those data are none of the examiner's business.

The historian's command of English may require an interpreter who is versed in translating medical concepts. Professional interpreters make every effort to translate verbatim, but circumstances may arise when an appropriate word may not be available and the interpreter is forced to improvise. Friends and family members, especially children, make very poor interpreters, and their services should not be used.

E. J. Harris (✉)
Loyola University Chicago, Stritch School of Medicine, Department of Orthopedics and Rehabilitation, Maywood, IL, USA

Rosiland Franklin University of Health Sciences, Dr. William M. Scholl College of Podiatric Medicine, Department of Podiatric Surgery and Applied Biomechanics, North Chicago, IL, USA

M. L. Butterworth, J. T. Marcoux (eds.), *The Pediatric Foot and Ankle*,
https://doi.org/10.1007/978-3-030-29788-6_1

The Information

Certain portions of the past medical history take on special significance. Some concerns are developmental in origin and possibly hereditary, adding importance to the developmental and family histories. Gait disturbances may really be movement disorders, prompting the examiner to search for risk factors suggestive of neurological pathology. Some might be the result of past medical conditions that have left permanent anatomical change, while others may be the residual of past trauma.

Organizing the Medical History

The Chief Complaint or Complaints

More diagnostic errors occur at this portion of the workup than anywhere else by failing to fully understand the chief complaint or complaints. There may be communication problems resulting from misunderstanding or the examiner may fail to recognize that there are actually several complaints that may or may not be related. The result is failure to identify the problem or problems correctly, leading to incorrect diagnosis and faulty treatment.

The chief complaint or complaints should be expressed in lay terminology. Medical terms offered by the caregiver should be changed into simple non-medical terms that are easily understood and agreed on by both the historian and the physician because, more often than not, the historian does not really understand the meaning of these terms. Worst-case scenario is that the historian is inadvertently relating incorrect secondhand information obtained from other sources. Mindful that the information is most likely not provided by the child, the historian may superimpose his or her own ideas based on personal experience, interpretation of the situation, or both.

Careful study of the chief complaint may reveal that there are actually several complaints. The inexperienced physician may make the incorrect supposition that all of the complaints are related when they may be separate isolated complaints with different etiologies. Each of these must be carefully explored and prioritized.

The History of the Chief Complaint or Complaints

All complaints have a natural history that aids in their understanding. The age of the patient at the onset of symptoms is important, since many orthopedic abnormalities are clustered in specific age groups. For example, most of the intoeing and outtoeing problems recognized before the child begins to walk are usually found in the foot. Between the ages of 1 and 2, rotational limb abnormalities are most likely in the tibiofibular segment. Past the age of 2, intoeing problems are more likely in the femur.

The history of the chief complaint or complaints should include their manifestations, onset of the symptom, the circumstances in which they developed, and any treatment rendered to date. This includes the location, quality, severity, timing, circumstances producing the symptom, and associated manifestations. Timing should include onset, duration, and frequency. Significant negatives will also help in the differential diagnosis. At this point in the workup, it is acceptable to begin to formulate a list of differential diagnoses that will help guide the remainder of the history and focus the physical examination.

The Past Medical History

The past medical history has two components – the immediate or current medical history and the more remote past medical history. Since many problems encountered in pediatric practice are acute, it is better to start with current events.

Overall Impressions

Asking the parents for their impression of the child's general health may reveal more about the

caregiver's impression of the child than the actual medical state. This helps the examiner to better interpret what the caregiver relates. As an example, the caregiver may state that the child's general health is poor but, when questioned in detail, may actually indicate behavioral issues, dietary problems, or social interactions. Conversely, the caregiver may have a very cavalier attitude about more serious issues such as seizures, chronic diseases, and other illnesses.

Medications

All medications past and present should be reviewed. These may have immediate health implications or may suggest diseases that may have been forgotten or deliberately not divulged. Caregivers may be under the impression that only prescription drugs are important, but inquiries about over-the-counter medications, homeopathic remedies, and other alternative medications should be made. Some may be innocuous, but others have unappreciated pharmacological properties. The caregivers may be reluctant to report these medications because they fear that they might meet with physician disapproval. The same can be said for nontraditional medical treatments. As a part of the inquiry on medications, the examiner must specifically explore the effects of these medications both on the disease being treated and on the child in general. This should include the name of the medication, the dose, the response, the course of treatment, and the reason why the medication was used. This is especially important for medications having more than one indication. How far back in time the examiner probes the medication history is dictated by the chief complaint.

Alternative medical care includes massage therapy, acupuncture, chiropractic care, homeopathic medications, herbal medications, and vitamins. Most infants and children take vitamin supplements, but the clinician should be aware that certain vitamin therapies can become excessive and may actually be harmful.

Allergies

Allergic reactions can be caused by medications, foods, and environmental allergen including latex and other contact allergens. The examiner must attempt to determine whether an adverse response to any of these is a true allergy, an idiosyncrasy, or a parental concern not based in fact. As examples, caregivers often relate that the child is allergic to penicillin. Penicillin is a broad term and it should be remembered that native penicillin is rarely used today because of antibiotic resistance. Most exposure is to the semisynthetic penicillins and cephalosporins. In some cases, penicillin-related antibiotics are avoided because another family member supposedly has an allergy to these medications. In this case, there is no documented allergy for that child. In other cases there may be nausea or vomiting following use of a drug that is actually the result of the disease being treated and not the medication. Other adverse responses are clearly allergic in nature. Respiratory difficulty, generalized urticaria, angioedema, and anaphylaxis result from a severe allergic reaction. In some cases, the caregiver will report somnolence or euphoria following ingestion of certain medications. Here, a true allergy is questionable. Similarly, macular rashes on the chest with certain antibiotics may be a nonallergic response. There is a fine line between an allergy and an idiosyncrasy. Placing the child at risk for subsequent adverse response is not justified. However, denying a child an entire class of medications when no true allergy exists is equally problematic. If a true allergy exists, this is an excellent educational opportunity to stress the need for immediate medical attention as soon as symptoms develop and to have injectable epinephrine on hand.

Childhood Illnesses

Childhood diseases for which vaccinations are available include rubella, rubeola, varicella, pertussis, mumps, poliomyelitis, diphtheria, and tetanus. Vaccination programs are highly successful

and carry very little risk. As the result, these diseases are uncommon in the community.

Other childhood illnesses include type I diabetes, scarlet fever, rheumatic fever, roseola, fifth disease, hand-foot-mouth disease, asthma, and other forms of reactive airway disease, respiratory syncytial viral infections, Asperger syndrome, autism, and learning and behavioral disorders.

Immunizations

Immunizations protect both the child and the community from the communicable diseases of childhood. These include mumps, measles, pertussis, polio, rubella, varicella, haemophilus infections, hepatitis B, and tetanus. Some parents refuse vaccinations based on religious beliefs or concerns that vaccinations may be harmful to the children. At the current moment, there is no supportive evidence that vaccinations cause autism or any of the group of illnesses purportedly caused by the vaccination programs. The harm of withholding vaccinations exceeds the theoretical risks. Every effort should be made to insure that the child's vaccinations are up to date. It should be kept in mind that some parents choose to decline vaccinations for their children and are unlikely to be persuaded.

Special inquiries about tetanus immunization and last booster injection are critical pieces of information when penetrating trauma is the chief complaint. Recent data suggests that certain vaccinations do not confer lifetime immunity and boosters are necessary.

Surgical History

The surgical history identifies past surgical diseases and responses to anesthesia. Caregivers remember major interventions, such as tonsillectomy, adenoidectomy, appendectomy, intussusception, hernia repair, and similar procedures. They often forget about others such as tympanostomy, dental procedures, and revision of circumcisions or do not consider these surgical even though they require general anesthesia. The same can be said for upper and lower endoscopies, urological imaging procedures, examination under anesthesia, and MRI. Infants and young children require general anesthesia or deep sedation for these procedures. Searching for the reason for these interventions often yields forgotten information regarding general health issues. Responses to anesthesia may help plan further lower extremity procedures and help select the appropriate facility for their performance.

Trauma

Fractures, lacerations, and other injuries should be noted. This includes the nature of the trauma, how it happened, treatment, and the sequel. The examiner should always be aware of repeat or unusual patterns of injury that might suggest non-accidental trauma.

Admissions

The dates and reasons for hospital admissions as well as the treatment rendered should be obtained. If indicated, medical records should be requested. Emergency room and urgent care visits should be identified as well.

Social and Developmental History

The number of siblings, their ages, and the patient's position in the sibship should be determined. This requires compassionate questions about the number of pregnancies and the number of live births and surviving children. Since the causes of sibling demise include stillborns, genetic events, childhood disease, and trauma, if possible, the cause of demise should be identified.

The living situation should also be explored. The number and relationships of other household dwellers should be determined. This may be important when other family members bring the child for examination and treatment. The principal responsible caregiver should be iden-

tified. If the principal caregiver is not a parent, the examiner must determine whether that person is empowered legally to give consent for any invasive treatment or even the initial physical examination.

Inquiry should be made about the child's educational status. This includes the academic year; performance in school; interaction with peers; in-school occupational, physical, and speech therapy; and any special educational needs. The examiner should also inquire about sports participation, hobbies, and other avocations.

Certain information including smoking, alcohol consumption, drug, and sexual activity may be difficult to obtain. These are not encountered in the very young children, but may be activities engaged in by preteens or teenagers. The patient would be extremely unlikely to divulge this information in the presence of a parent or other caregiver. Separating the child from the caregiver to obtain this information is a technique employed by the primary care provider or pediatrician, but is usually not an option for a specialist.

The Developmental History

The developmental history is the chronology of the child's progression from fetal state to the current time. The status of the mother's health at the time of conception is important. Medications prescribed for the mother's health during pregnancy (sometimes before pregnancy is recognized) can have adverse effects on the developing fetus. For example, the effects of thalidomide were not recognized for several years. Recreational drug use, alcohol, and tobacco smoking also adversely affect the fetus.

Complications occurring during pregnancy affect fetal development and survival. Premature labor is often a sign of fetopathy. Uterine abnormalities such as bicornuate uterus and fibroids can also influence pregnancy. Placenta previa, placenta abruption, nuchal cord, and malpositioning can influence the survival and development of the fetus and increase the risk of neurological damage during delivery.

Length of gestation has significance. Labor may be premature, spontaneous, or induced. If induced, the examiner should determine the reason. Prolonged labor may be a factor in central nervous system pathology as the result of hypoxia and intracranial bleeding.

Assisted vaginal delivery can result in clavicular fractures and brachial plexopathy. Cesarean section carries its own set of risks and is not the method of choice for most pregnancies. If a cesarean section is required, the examiner should determine the reason.

Breech presentations carry their own sets of risks. Abnormal positioning can be corrected immediately prior to delivery with obstetrical maneuvers, but certain other presentations are not deliverable vaginally. Not only do these require cesarean section, but they carry their own orthopedic morbidities. For instance, frank breech presentation is often associated with the triad of hip dysplasia/dislocation, knee subluxation, and calcaneovalgus foot deformity.

Infant data associated with delivery include length, weight, and Apgar scores [1] (Table 1.1).

Identifying the length of stay after delivery may also give valuable information. A healthy

Table 1.1 Apgar score

Color	
Blue, pale	0
Body pink, extremities blue	1
Completely pink	2
Heart rate	
Absent	0
< 100 beats per minute	1
> 100 beats per minute	2
Response to nasal stimulation	
No response	0
Grimace	1
Sneeze, cough	2
Respiratory effort	
Absent	0
Slow, irregular	1
Crying	2
Muscle tone	
Limp	0
Some extremity flexion	1
Active movement	2

Scores determined at 1 and 5 minutes after birth. Healthy 7–10, mild to moderate depressed 4–6, seriously ill 0–3

neonate is usually discharged home with the mother within 48 hours. If there is significance post-delivery icterus, the length of stay may be increased. Initial difficulties with feeding and respiration and workup for neonatal fever and infection will increase the length of stay. These latter may require blood cultures, special imaging, and spinal tap.

Major motor landmarks include development of head control, rolling from prone to supine and supine to prone, sitting, crawling, standing, cruising, independent walking, speech, development of cerebral dominance, and bowel and bladder training (Table 1.2).

Family History

The examiner should begin by inquiring about the occurrence of the same or similar problems in other family members. Additional questioning searches for anemia, bleeding disorders, diabetes, hypertension, asthma, ischemic heart disease, tuberculosis, hypercholesterolemia, liver disease, cerebral vascular accident, renal disease, hepatic disease, cognitive dysfunction, immune diseases, epilepsy, alcohol and drug abuse, cancer, the various forms of arthritis, and blood dyscrasias. Inquiry about sickle cell trait and disease should be made in patients who are genetically prone. Questions about other family member response to general anesthesia might give information about possible malignant hyperthermia. Giving the caregiver some prompts by systems makes going through a long list unnecessary. The examiner needs to be aware that the historians may withhold information if they feel threatened by its revelation.

Table 1.2 Developmental milestones

Head control
One month moves head from side to side while prone
Two months holds head and neck up begins to push while prone
Three months will control head when supine and lifted by arms
Pushing up well on arms while prone
Rolling over
4–5 months rolling over first prone to supine
5 months rolling over both ways
Sitting
Six months sitting independently
Crawling
Seven months crawling, scooting, army crawling
Standing
Seven to nine months pulls to stand
Cruising
Nine to ten months cruising around objects
Walking
Twelve to thirteen months independent walking
Cerebral dominance
Twenty-four months develops hand preference
Bowel and bladder control
Thirty to forty months bowel and bladder trained

Systems Review

A general review includes both objective and subjective information such as nutritional status, weight stability, weakness, fatigue, unexplained fever, loss of appetite, and information on general well-being.

Information about the head includes such things as headache, dizziness, and history of head injury.

Assessment of the eyes includes the patient's perception of his or her vision, the use of glasses or contact lenses, redness, burning, excessive tearing, loss of vision, glaucoma, and cataracts.

Evaluation of the ears includes loss of hearing, tinnitus, and episodes of otitis.

The review of nose problems includes frequent upper respiratory infections, sinusitis, obstruction, discharge, and epistaxis.

Appraisal of the throat includes status of the dentition, mobility of the tongue, swallowing, throat pain, and hoarseness.

The neck is evaluated for known deformities, pain on range of motion, and general tenderness. Questions about thyroid pathology are also included.

Lymphatic pathology may occur in the neck, axilla, and inguinal and popliteal areas. Questions about local masses and pain will help identify generalized lymphatic pathology. The location of the involved nodes often identifies the remote site of the real pathology.

Pulmonary review includes presence of cough, dyspnea, wheezing, pain on inspiration or expiration, cyanosis, and exposure to chronic pulmonary diseases such as tuberculosis.

Cardiovascular evaluation includes chest pain, rhythm disorders, extremity edema, hypertension, and history of known cardiac disease such as rheumatic fever, murmur, and syncope.

Gastrointestinal review includes dysphagia, pain on swallowing, nausea, vomiting, abnormal bowel patterns, rectal bleeding, icterus, disease of the liver and gallbladder, and hepatitis.

Urinary tract review includes hematuria, dysuria, nocturia, and polyuria, incontinence, and urinary tract infection.

Genital tract review for males includes history of hernia, testicular pain, scrotal masses, and sexually transmitted diseases. For females, age at onset of menarche, history of sexually transmitted diseases, pregnancy, and use of contraceptives are explored.

Musculoskeletal review includes congenital and acquired deformities, joint pain, stiffness, edema, and history of fractures.

Neurological review includes syncope, seizures, muscle weakness, altered sensations, decreased sensation, loss of sensation, paralysis, tremors, and headaches.

Psychiatric review includes anxiety, nightmares, irritability, depression, learning difficulties, and behavioral disorders.

Endocrine review places particular emphasis on disease of the thyroid, adrenals, and diabetes.

Hematologic exploration includes anemia, abnormal bleeding, unexplained ecchymoses, and sickle cell status in the genetically predisposed.

The Physical Examination

Like the history, the physical examination can be tailored to meet the needs of the chief complaint or complaints. Subject to the complaint, the examination may be problem focused or comprehensive. However, all levels of physical examination have basic common components.

The physical examination often has to be modified depending on the child. The comprehensive nature of the examination must be maintained, but the examiner should not feel bound by any particular format. In general, components of the examination requiring patient cooperation should be performed first while the child's focus can be maintained. Portions of the examination based on observation should also be performed early in the encounter. Particularly in the young child, manipulation and position changes should be minimized. As much as possible, it should be performed in one anatomical position. This often means that the sequence of the examination needs to be modified. Unpleasant or painful portions of the examination should be performed last. As a final note, the safest place for an apprehensive or uncooperative child is on the parent's lap.

Vital Signs

Vital signs are considered integral to all physical examinations, and most electronic medical records systems require them with every patient encounter. These include temperature, heart rate, respiratory rate, height, weight, BMI, and pain rating.

Temperature

Temperature can be measured by a number of routes utilizing a variety of instruments. Mercury glass thermometers have been largely replaced with electronic digital thermometers because of the hazards of mercury. Procedures include oral, rectal, axillary, tympanic membrane, forehead skin, and temple artery routes. Tympanic and forehead skin measurements are not reliable. Temporal artery, tympanic membrane, and axillary measurements suffice for screening but lack reliability. Elevated measurements by these routes should be verified by repeating the oral or rectal routes. Current recommendations are the oral route for children 4 years and older and the rectal route for infants, toddlers, and children under 4 years of age. Results can be recorded in degrees Celsius and Fahrenheit (Table 1.3). When sequential temperatures are monitored,