

The Promise of Achieving Higher Standards in Children's Health



Nemours/Alfred I. duPont Hospital for Children has consistently been ranked among the best in the nation for pediatric orthopedics by *U.S News and World Report*.

Nemours Alfred I. duPont
Hospital for Children

1600 Rockland Road ▪ P.O. Box 269 ▪ Wilmington, DE 19803

To schedule an appointment with the Gait Lab,
please call (302) 651-4248

Nemours.org/gaitlab

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The Gait and Motion Analysis Laboratory Referral Guide



Nemours Alfred I. duPont
Hospital for Children



Your patient. Our promise.

Difficulties with walking in children can occur with cerebral palsy, myelomeningocele, and other orthopedic, spinal and neuromuscular conditions. Treatments for gait dysfunction can include physical and occupational therapy, orthotic management, drug therapy and surgical intervention. Historically, these treatments have been prescribed based simply on visual observations of the child's walking.

The Gait and Motion Analysis Laboratory at Nemours/Alfred I. duPont Hospital for Children was created in 1993 to provide state-of-the-art, computer-assisted motion analysis of the complex gait cycle. Several computers in the lab collect three-dimensional video data and electromyographic data, perform kinematic and kinetic calculations, and process information for interpretation. Adhesive electrodes measure muscle activity and special reflective markers track joint and segment motion. Foot pressure measurements and metabolic analysis are also available to enhance the assessment and provide a complete picture of the child's gait. All of this data, combined with physical examination, visual observation and developmental history, provides greater insight into the causes of gait abnormalities.

Referring Patients to the Gait and Motion Analysis Laboratory

We truly appreciate all your referrals and hope you continue to refer your patients to the Gait and Motion Analysis Lab.

To Order Gait Analysis

We have been experiencing greater difficulty in obtaining insurance authorization for your patients. Most insurance carriers have policies requiring the referring physicians to provide any necessary referrals or obtain authorizations for any evaluations/tests they order for their patients.

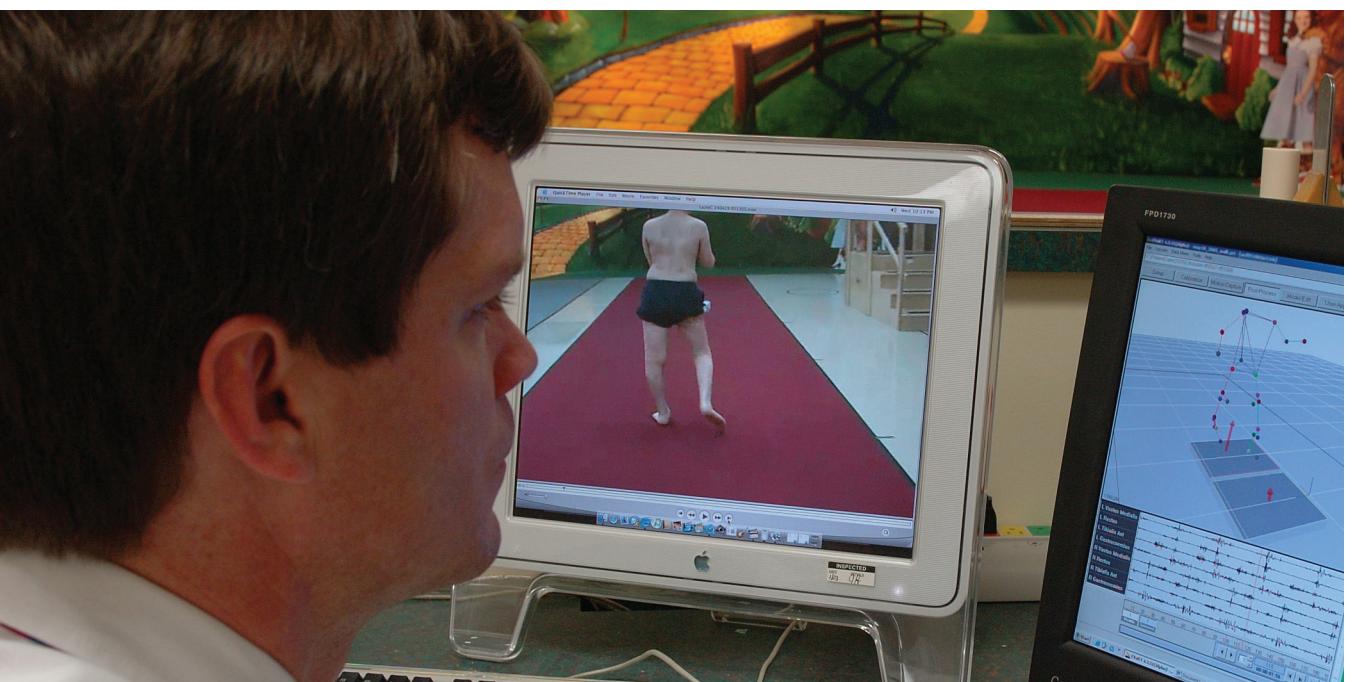
1. Contact *all* of the patient's insurance companies to verify they will cover the Gait Lab Procedure Codes and, if needed, obtain authorization and/or pre-determination.
 - 96001, 96002, 96004, 94680, 97750

2. Fax to the Gait Lab:

- What procedure codes will/will not be covered and by which insurance carrier
- Any authorization or pre-determination numbers you receive and the name of the insurance carrier who issued them
- Current contact information and demographics for the patient
- Copy of the patient's last visit summary
- Copy of the prescription for the Gait Lab

Upon request, we can also email a copy of the Gait Lab Letter of Medical Necessity template, which has descriptions of what we do for each procedure code and our Gait Lab references. We fax this letter to insurance companies who deny coverage.

If you have any questions or require additional information, please feel free to contact our administrative assistant at:
Phone: (302) 651-4248 | Fax: (302) 651-5144



The Collection and Interpretation of Motion Analysis Data Is a Team Effort.

Pediatric Orthopedic Surgeon: Leads the team in interpreting the test results and recommending treatment

Freeman Miller, MD
Medical Director
(302) 651-5921

Physical Therapists: Supervise the child throughout the gait analysis, assist with the interpretation of the results and can also help educate the family regarding possible recommendations.

Chris Church, MS, PT
(302) 651-4614
Nancy Lennon, MS, PT
(302) 651-6799
Daveda Taylor, MSPT, DPT
(302) 651-4611

Biomechanist: Runs the hardware and software necessary for data collection, processes the data to generate graphics for the compendium report and maintains the wide array of technical equipment in the laboratory.

John Henley, PhD
Program Manager
(302) 651-4615

Administrative Assistant: Schedules appointments and works with families regarding insurance, reports and general questions.

(302) 651-4248

Intrinsic Foot Kinematics

With improved motion analysis systems we are now capable of precisely tracking multiple reflective markers attached to the skin of the foot.

Purpose

Use of the foot model can assist in surgical planning and monitoring the progress of dynamic foot anomalies.

Ideal for Children With

- cerebral palsy
- clubfoot
- other dynamic foot deformities

Referral Criteria

- at least four years old (secondary to foot size and cooperation)
- presence of a dynamic foot deformity

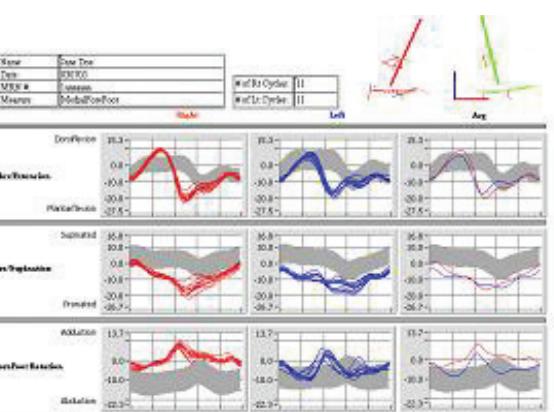
Description

By measuring the relative positions of these markers, we can quantify the relative motion of multiple sub-segments of the foot (hindfoot, medial and lateral forefoot and hallux). This data is subdivided into stride cycles and compared to and contrasted with normative data.



Prior to utilization of the multi-segment foot marker set, the foot was modeled as a single rigid unit and it was impossible to gather information regarding the rigidity or suppleness of the foot. Therefore, midfoot motion would be lost or incorrectly attributed to the ankle.

Previously, we could hypothesize the extent of some function through analysis of pedobarographs which measure the amount of foot ground interaction during stance. For example, through examination of abnormal medial midfoot pressures we can identify excessively high medial midfoot pressures which might be indicative of a midfoot break. However, no information would be available to distinguish a rigid versus a pliable foot abnormality.



This technology is currently being used in the Gait and Motion Analysis Laboratory at Alfred I. duPont Hospital for Children and can be integrated into the gait analysis at the physician's request.

Dynamic (In)Stability

Purpose

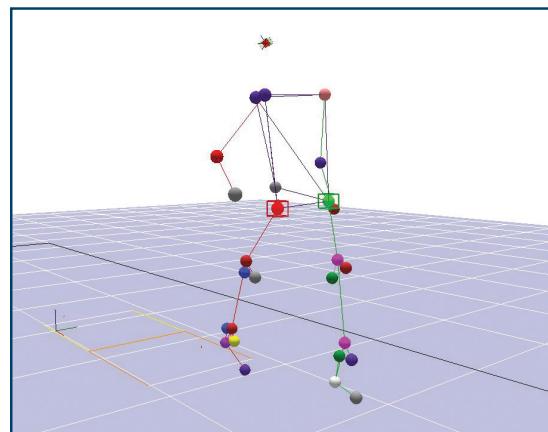
To accurately quantify and monitor the progress of balance control in walking.

Ideal for Children With

- vestibular anomalies
- head trauma
- general gait ataxia

Referral Criteria

- at least four years old with the ability to walk unassisted



Description

Currently the gait analysis laboratory can quantify the progression of the total body center of mass (CM) as an individual walks. The CM is the point that an individual tries to balance or control through interaction with the ground.

In walking, this interaction involves placing and replacing the feet to stabilize and move the body forward as walking progresses. In essence, the walking individual strives to provide a moving base of support by precise placement of the feet through coordinated action of intermediate joints.

In normal gait, the path of the CM, pattern of angular joint motion, and the resulting placement of the feet should all follow a well-defined and coordinated pattern. By quantifying deviations and variability in these parameters, an individual's ability to control balance during gait can be quantified.



Upper Extremity Kinematics

Use of motion analysis system to accurately quantify the kinematics of the upper extremity during walking and functional tasks.

Purpose

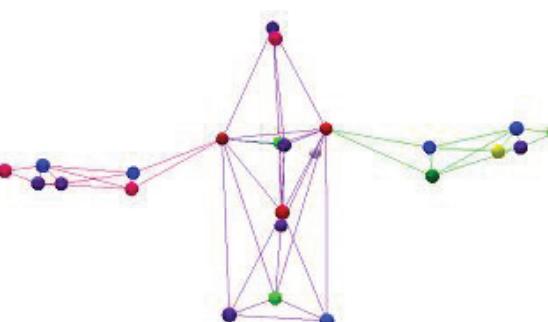
To accurately quantify the dynamic functional motion and to monitor the progress of the capabilities of the upper extremity.

Ideal for Children With

- brachial plexus
- hemiplegic cerebral palsy
- upper extremity injury

Referral Criteria

- at least four years old with the ability to mirror directions



Description

Previously with brachial plexus palsy, the Mallet test has been utilized to define the state and progression of an individual's upper extremity function. The Mallet movements are simply classified on a five-point ordinal scale.

We currently utilize motion analysis to quantify the same five movements along with measurements of forearm supination and pronation, lifting a ball overhead, and arm carriage in walking and running. With motion analysis, we can measure the path distance and direction of movement of all the major joints of the upper extremity.

This model gives us a much better method for characterizing the functional ability of the arms and the shoulder girdle at any one time and thus an improved tool for tracking the status and progress of an individual.

This technology is currently being used in the Gait and Motion Analysis Laboratory at Alfred. I. duPont Hospital for Children and can be integrated into the gait analysis at the physician's request.



Accessing Completed Gait Analysis Reports

All the data is available on a secure website. It can be accessed with most web browsers at the following address:
<https://gait.adi.udel.edu/clinconn/lab>

1. To obtain a log-in and password, please contact the Gait and Motion Analysis Lab at (302) 651-4248.

2. After you log in you will see the following:

Find a specific patient:

MRN:

Last Name:

Note: Name searches are not case-sensitive and automatically wildcard. e.g., hen would match for Henley and henderson.

3. Enter part or all of the patient's last name or the whole health record number, and click on the search button. Next you see:

Search Results:

Click on the patient's MRN number to go to their home page.

[9999950] Henley, John (DOB: 01/01/1988)

4. This will bring up the following:

Clinicians:	Visits: (date – attendance)
	10/12/66 -- 0 1/2/60 -- (Foot Eval) 9/3/56 -- 0 1/1/23 -- (Chair Research) 9/2/08 -- (MODEMS Survey)

5. Highlight the date of interest and click the "Go To Selected Date" button. Now you will see the following:

[COMPENDIUM REPORT](#) | [VIEW VIDEO](#) | [INTERPRETATION REPORT](#)

6. Click on the desired report.

- **Compendium Report** will bring up all the data collected on that visit date.
- **View Video** will bring up all the videos for this patient, back to 2002. Videos prior to 2002 are available in the Gait and Motion Analysis Lab on VHS. Videos can be viewed by clicking on the desired date, (some are large and slow to load and some are smaller and faster).
 - *QuickTime player is required to view video files. It can be downloaded at no cost from Apple.com/quicktime.*

- **Interpretation Report** will show the data that is abnormal from each test plus an assessment and recommendation for treatments. Both reports can be downloaded and printed as PDF files.

We hope to continue to serve your needs for clinical motion analysis. The lab routinely does full kinematic and kinetic analysis, with foot pressure assessment, energy consumption measurement and complete physical examinations.

We have recently added the ability to do upper extremity motion analysis and five-segment foot motion analysis to better assess intrinsic foot deformity and motion.

Please call the Gait and Motion Analysis Lab with website or general questions at (302) 651-4248.



The Department of Orthopedic Surgery at Nemours/Alfred I. duPont Hospital for Children

The Department of Orthopedic Surgery at Nemours/Alfred I. duPont Hospital for Children has provided regional, national and international leadership in pediatric orthopedics for more than 65 years. Providing comprehensive care for children and adolescents with bone, joint, muscular and nerve conditions, we treat a broad range of orthopedic conditions including clubfoot, scoliosis and spinal disorders, gait and leg length discrepancies, cerebral palsy, bone tumors, skeletal dysplasia, arthrogryposis, upper extremity problems, fractures and sports injuries. Outpatient orthopedic services are available in clinics throughout the region Monday through Friday, and full orthopedic coverage is available 24 hours a day for emergency cases at duPont Hospital for Children. With capabilities for daily evaluations, patients are admitted to the hospital when surgical correction is required.

The duPont Hospital for Children offers inpatient and outpatient services to support the orthopedics program. These include:

- brace, orthotic and prosthetic services
- cast room
- Center for Sports Medicine
- Gait and Motion Analysis Lab
- medical imaging
- pharmacy
- rehabilitation services
- physical and occupational therapy