Medical Coverage Policy

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Gait Analysis

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Related Coverage Resources

Electrodiagnostic Testing (EMG/NCV)

INSTRUCTIONS FOR USE

The following Coverage Policy applies to health benefit plans administered by Cigna Companies. Certain Cigna Companies and/or lines of business only provide utilization review services to clients and do not make coverage determinations. References to standard benefit plan language and coverage determinations do not apply to those clients. Coverage Policies are intended to provide guidance in interpreting certain standard benefit plans administered by Cigna Companies. Please note, the terms of a customer's particular benefit plan document [Group Service Agreement, Evidence of Coverage, Certificate of Coverage, Summary Plan Description (SPD) or similar plan document] may differ significantly from the standard benefit plans upon which these Coverage Policies are based. For example, a customer's benefit plan document may contain a specific exclusion related to a topic addressed in a Coverage Policy. In the event of a conflict, a customer's benefit plan document always supersedes the information in the Coverage Policies. In the absence of a controlling federal or state coverage mandate, benefits are ultimately determined by the terms of the applicable benefit plan document. Coverage determinations in each specific instance require consideration of 1) the terms of the applicable benefit plan document in effect on the date of service; 2) any applicable laws/regulations; 3) any relevant collateral source materials including Coverage Policies and; 4) the specific facts of the particular situation. Each coverage request should be reviewed on its own merits. Medical directors are expected to exercise clinical judgment where appropriate and have discretion in making individual coverage determinations. Where coverage for care or services does not depend on specific circumstances, reimbursement will only be provided if a requested service(s) is submitted in accordance with the relevant criteria outlined in the applicable Coverage Policy, including covered diagnosis and/or procedure code(s). Reimbursement is not allowed for services when billed for conditions or diagnoses that are not covered under this Coverage Policy (see "Coding Information" below). When billing, providers must use the most appropriate codes as of the effective date of the submission. Claims submitted for services that are not accompanied by covered code(s) under the applicable Coverage Policy *will be denied as not covered. Coverage Policies relate exclusively to the administration of health benefit plans. Coverage Policies are not recommendations for treatment and should never be used as treatment guidelines. In certain markets, delegated vendor guidelines may be used to support medical necessity and other coverage determinations.*

Overview

This Coverage Policy addresses computerized gait analysis, also referred to as motion analysis.

Coverage Policy

Computerized gait analysis is considered medically necessary when BOTH of the following criteria are met:

- A child or adolescent has a diagnosis of cerebral palsy.
- The procedure is performed as part of a preoperative assessment, and the results will be used in surgical planning.

Gait analysis for any other indication is not covered or reimbursable.

Health Equity Considerations

Health equity is the highest level of health for all people; health inequity is the avoidable difference in health status or distribution of health resources due to the social conditions in which people are born, grow, live, work, and age.

Social determinants of health are the conditions in the environment that affect a wide range of health, functioning, and quality of life outcomes and risks. Examples include safe housing, transportation, and neighborhoods; racism, discrimination and violence; education, job opportunities and income; access to nutritious foods and physical activity opportunities; access to clean air and water; and language and literacy skills.

General Background

Gait analysis, also referred to as motion analysis, is the systematic evaluation of the dynamics of gait. It is a process of measuring and evaluating the walking patterns of patients with specific gait-related problems. Observational gait analysis, the standard method of evaluating gait, refers to the visual assessment of a patient’s gait, with specific attention to hips, knees and ankles. Gait analysis by observer assessment does not use any specialized equipment, can adequately assess most conditions, and is used to note gross abnormalities in gait.

Gait analysis may also be performed in a gait analysis laboratory using specialized technology. This is also referred to as computerized gait analysis, quantitative gait analysis or clinical gait analysis. This procedure has been used to understand the etiology of gait abnormalities and as part of the treatment decision-making in patients with complex walking problems. It has been most often used for patients with neuromuscular conditions, primarily as part of the surgical decision-making process when all conservative measures have been exhausted and surgical intervention is being considered. Computerized gait analysis is a process by which gait characteristics are measured, abnormalities are identified, causes are suggested, and treatments are proposed. It is not intended to replace the clinical examination, but rather serves as an adjunct to understand the impairment better. The treatment decision should be made in the total context of the patient's condition, physical examination and medical history.

The technologies involved in clinical gait analysis include:

- Specialized computer-interfaced video cameras that measure patient motion. An initial videotape is recorded to provide documentation of how a patient walks and the patient's gait pattern.
- Passive reflective markers are placed on the surface of a patient's skin, aligning with specific bony landmarks and joints. As the patient walks along a straight pathway in the laboratory, the locations of the markers are monitored with a three-dimensional motion data-capture system comprising five or six special video cameras, all interfaced with a central controlling computer. An infrared light is reflected from the markers back to the cameras. Marker position data allow for the computation of the angular orientation of particular body segments as well as of the angles between segments (joint angles); these data are collectively referred to as kinematics.
- Multicomponent force platforms imbedded in the walkway provide measurement of reaction between foot and ground as the patient walks. The data are assessed directly or used to calculate the load in and across the joints. The joint load is referred to as kinetics.
- Electrodes placed on the surface of the skin or inserted as fine wires into specific muscles allow the muscle to be monitored as the patient walks. This is referred to as dynamic electromyography (EMG). This technique measures the electrical potential generated by a muscle when it is activated. This information, along with joint kinematic and kinetic results, is used to assess the gait abnormalities.

An extensive physical examination of the patient at rest should be performed. This information may then be correlated with the gait data. The gait analysis will usually take two to four hours to complete. In order to perform gait analysis, the patient must be ambulatory with or without assistive devices for a minimum of 10 consecutive steps. The patient must also be able to follow directions and be cooperative during the procedure. The gait analysis data are often interpreted by a team that includes the orthopedic surgeon; the physical therapist or kinesiologist who collected the data; and, at times, the engineer who collected data or the biomechanical engineer who developed the mathematical models used for processing the data. The information from the gait analysis is used along with results of the clinical examination to identify gait deviations, determine potential causes and determine treatment.

The most frequent application of gait analysis is in the treatment of children and adolescents with cerebral palsy, when surgical treatment is being considered. The orthopedic difficulties encountered in children with cerebral palsy are frequently a result of high muscle tone, spasticity and rigidity that prevent normal growth of muscle and cause contractures. Treatment of this condition includes physical therapy, occupational therapy, casting, orthotics and medication. Surgery is often recommended when contractures are severe enough to cause movement problems. Gait analysis may be utilized to determine if surgery is necessary and to determine which surgical procedure is appropriate. There are several published studies regarding the use of gait analysis to provide objective information in the surgical planning process for this condition.

Literature Review—Cerebral Palsy Treatment Planning

There have been several prospective and retrospective studies that have been published regarding the utilization of gait analysis in the surgical decision-making process in children and adolescents with cerebral palsy (Reisig, et al., 2025; Dugan, et al., 2020; Khouri, et al., 2017; Wren, et al., 2013; Wren, et al., 2011). Studies have demonstrated that the use of gait analysis alters the decision making and changes the treatment that these patients receive, including confirming clinical indications for surgery, and for excluding or delaying surgery that was clinically proposed.

A retrospective review was conducted by Bent et al. (2024) to determine if social determinants of health impact access to computerized gait analysis (CGA). The study included 223 patients seen for clinical gait analysis in the Motion Analysis Laboratory at a pediatric tertiary care center in California. Age range was 3 – 22 years and there was a variety of diagnoses, the most common being cerebral palsy. The authors found:

- Insurance type affected time to authorization (p=0.0004). Once authorized, insurance type did not
- affect time to schedule and complete CGA (p=0.76).
- Lower neighborhood socioeconomic status was associated with longer time to authorization but shorter time to complete CGA once authorized.
- Rescheduling was associated with longer time to complete CGA once authorized (p<0.0001). White, non-Hispanic families tended to reschedule more often than non-white or Hispanic families (p=0.07).

The authors concluded this is a multi-faceted issue that requires further research.

Literature Review—Other Conditions
Gait Analysis has been proposed for various other conditions. There is insufficient evidence in the published, peer-reviewed scientific literature that demonstrate improved long term health outcomes with the use of dynamic gait analysis for other conditions.

Hosl et al. (2025) conducted a retrospective, database study of 31 children and youth with achondroplasia (ACH) and determined that 3D gait analysis may be an objective screening method for dynamic knee alignment and stability. It may complement radiography in monitoring ACH.

Robinault et al. (2023) utilized high-density electromyography when evaluating subjects with non-specific low back pain. The study design did not include evaluating the efficacy of EMG on health outcomes.

Campanini et al. (2020) proposed the use of dynamic EMG in the assessment of the equinus and the equinovarus foot deviation in stroke patients. The article included individual patient case reports.

Radler et al. (2010) conducted a prospective study to investigate the correlation of femoral torsion and tibial torsion as measured by using computed tomography with transverse plane gait data for patients with rotational malalignment of the lower extremities in 26 patients (26 limbs). The authors note that further studies are needed to define more accurate methods for assessment of transverse plane rotation and the relationship of the joint partners during walking. The study was limited with a small number of subjects and that it was not randomized.

A systematic review was conducted by Ornetti et al. (2010) that examined gait analysis as a quantifiable outcome measure in hip and knee osteoarthritis (OA). The review included 30 reports (19 knee OA studies, 11 hip OA studies) studying 781 knee OA patients and 343 hip OA patients). It was found that gait analysis presents various feasibility issues and there was limited evidence regarding reliability (three studies, 67 patients). The authors concluded that available data concerning validity and reliability of kinematic gait analysis are insufficient to date to consider kinematic parameters as valuable outcome measures in OA and further studies evaluating a large number of patients are needed.

Sankar et al. (2009) evaluated 35 patients (56 feet) with recurrent clubfoot in a retrospective study. According to the investigators, after quantitative gait analysis there were 28 changed procedures in 19 of 30 patients (63%) compared to pre-study surgical plans. Study limitations include small study size, retrospective design and the study did not address how computerized gait analysis affects patient outcomes.

Williams et al. (2008) investigated objective measures to compare gait before and after cerebrospinal fluid (CSF) drainage and shunt surgery. Gait abnormalities are an early clinical symptom in normal pressure hydrocephalus (NPH) and subjective improvement in gait after temporary removal of CSF is often used to decide to perform shunt surgery. The study included 20 patients and nine controls. Quantitative gait measures were obtained at baseline, after three days of controlled CSF drainage, and after shunt surgery. The authors concluded that there are significant, quantifiable changes in gait after CSF drainage that corresponds to improvement after shunt surgery for patients with NPH. Use of objective gait assessment may improve the process of identifying these candidates when response to CSF removal is used as a supplemental prognostic test for shunt surgery. These findings require confirmation in a larger study.

Professional Societies/Organizations

American Physical Therapy Association (APTA): The American Physical Therapy Association's Academy of Pediatric Physical Therapy published an Evidence-Based Clinical Practice Guideline on Three-Dimensional Instrumented Gait Analysis for Children With Cerebral Palsy (3D-IGA) (States, et al., 2024). The Clinical Practice Guideline (CPG) aims to help PTs, physicians, and associated clinicians involved in the care of children with CP to determine how 3D-IGA can be used to guide decision making about potential examinations and interventions, and to improve clinical outcomes. The guideline is focused on the use of 3D-IGA in the management of children with CP who can walk with or without an assistive mobility device and who have gait dysfunction. Throughout this guideline, 3D-IGA refers to analysis of 3-dimensional kinematic data from a motion capture system; it may be accompanied by related measurement technologies including force plates (kinetics) and electromyography (EMG), often done simultaneously.

Level of Evidence:
I = A = Strong
II = B = Moderate
III = C = Weak
IV = C = Weak
V = P (practice) = Option
Best Practice = P = Varies

B. Informing Orthopedic Surgical Interventions: Physical therapists, physicians, and associated clinicians should recommend 3D-IGA when a child with CP who walks with or without an assistive mobility device is considered for orthopedic surgery to improve gait. (Evidence Quality: II, Rec. Strength: Moderate)

B. Gait Deviation Analysis: Physical therapists, physicians, and associated clinicians should recommend 3D-IGA when a child with CP presents with gait dysfunction and there is a need to identify, quantify, and differentiate deviations among individual segments/ joints and planes (sagittal, coronal, and transverse). (Evidence Quality: II, Rec. Strength: Moderate)

B. 3D-IGA to Evaluate Biomechanical Outcomes: When physical therapists, physicians, and associated clinicians need to evaluate biomechanical aspects of gait related to an intervention for children with CP, they should recommend baseline and post-intervention 3D-IGA. (Evidence Quality: III, Rec. Strength: Weak upgraded to Moderate for consistent results)

C. Non-Surgical Interventions: Physical therapists, physicians, and associated clinicians may recommend 3D-IGA to inform non-surgical interventions for children with CP with gait dysfunction whose progress from rehabilitative interventions and conservative management has plateaued or shown substantial deterioration. (Evidence Quality: III, Rec. Strength: Weak)

P. Instrumented Gait Analysis Equipment: When 3D-IGA is recommended for children with CP to assess gait patterns, physical therapists, physicians, and associated clinicians should recommend gait laboratories that can collect 3-dimensional kinematic, kinetic, and electromyography (EMG) data. (Evidence Quality: V, Rec. Strength: Best Practice)

P. Interdisciplinary Team Approach: When 3D-IGA is recommended for children with CP to assess gait patterns, physical therapists, physicians, and associated clinicians should recommend a 3D-IGA laboratory that has an interdisciplinary team approach. (Evidence Quality: V, Rec. Strength: Best Practice)

P. Comprehensive Reports: When 3D-IGA is recommended for children with CP to assess gait patterns, physical therapists, physicians, and associated clinicians should recommend 3D-IGA laboratories that provide comprehensive, timely, and interdisciplinary reports including: (a) referral source and reason for referral; (b) diagnosis including Gross Motor Function Classification System (GMFCS) level; (c) primary concerns or goals of the child, family, and health care professionals including physical therapists; (d) pertinent past medical history; (e) current orthoses and adaptive equipment; (f) findings of physical exam; (g) documentation of 3D-IGA results; (h) limitations in conducting the assessment and or technical issues; (i) interpretation of findings by licensed clinician(s) (eg, MD and/or PT); and (j) suggestions for interventions by licensed clinician(s). (Evidence Quality: V, Rec. Strength: Best Practice) (States, et al., 2024).

These APTA CPGs do not address computer-based motion analysis or dynamic surface electromyography, only functional gait assessment:

- Physical Therapist Management of Parkinson Disease CPG (Osborne, et al., 2022).
- A Core Set of Outcome Measures for Adults With Neurologic Conditions Undergoing Rehabilitation CPG (Moore, et al., 2018)

Medicare Coverage Determinations

	Contractor	Determination Name/Number	Revision Effective Date
NCD	National	No Determination found	
LCD		No Determination found	

Note: Please review the current Medicare Policy for the most up-to-date information.
(NCD = National Coverage Determination; LCD = Local Coverage Determination)

Coding Information

Notes:

1. This list of codes may not be all-inclusive since the American Medical Association (AMA) and Centers for Medicare & Medicaid Services (CMS) code updates may occur more frequently than policy updates.
2. Deleted codes and codes which are not effective at the time the service is rendered may not be eligible for reimbursement.

Considered Medically Necessary when criteria in the applicable policy statements listed above are met:

CPT®* Codes	Description
96000	Comprehensive computer-based motion analysis by video-taping and 3D kinematics
96001	Comprehensive computer-based motion analysis by video-taping and 3D kinematics; with dynamic plantar pressure measurements during walking
96002	Dynamic surface electromyography, during walking or other functional activities, 1-12 muscles
96003	Dynamic fine wire electromyography, during walking or other functional activities, 1 muscle (Code deleted 12/31/2024)
96004	Review and interpretation by physician or other qualified health care professional of comprehensive computer-based motion analysis, dynamic plantar pressure measurements, dynamic surface electromyography during walking or other functional activities, and dynamic fine wire electromyography, with written report

ICD-10-CM Diagnosis Codes	Description
G80.0	Spastic quadriplegic cerebral palsy
G80.1	Spastic diplegic cerebral palsy
G80.2	Spastic hemiplegic cerebral palsy
G80.4	Ataxic cerebral palsy
G80.8	Other cerebral palsy
G80.9	Cerebral palsy, unspecified

Not Covered or Reimbursable:

ICD-10-CM Diagnosis Codes	Description
	All other codes

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Revision Details

Type of Revision	Summary of Changes	Date
Annual Review	• No clinical policy statement changes.	4/15/2025
Annual Review	• No clinical policy statement changes.	4/15/2024