Public Statement:

Gait analysis, or motion analysis, is the quantitative laboratory assessment of coordinated muscle function, typically requiring a dedicated facility and staff. This procedure is covered for patients with cerebral palsy or spina bifida who have disorders of gait.

Medical Policy Statement:

Gait analysis is considered medically necessary and is covered for either the pre-operative or post-operative assessment of patients with cerebral palsy or spina bifida who have disorders of gait.

Background:

Gait analysis, or motion analysis, is the quantitative laboratory assessment of coordinated muscle function, typically requiring a dedicated facility and staff. At its core is videotaped observation of patient walking. Videos can be observed from several visual planes at slow speed, allowing detection of movements not detectable at normal speed. Joint angles can be measured, and various time-distance variables can be measured including step length, stride length, cadence and cycle time. Electromyography (EMG) assessed during walking measures timing and intensity of muscle contractions. This allows determination of whether a certain muscle’s activity is normal, out of phase, continuous or clonic.

Kinematics is the term used to describe movements of joints and limbs such as angular displacement of joints and angular velocities and accelerations of limb segments. The central element of kinematic assessment is some type of marker system that is used to represent anatomic landmarks, which are then visualized and quantitatively assessed during analysis of videotaped observations. Movement data is compiled by computer from cameras oriented in several planes and process the movement data so that the motion of joints and limbs can be assessed in three dimensions. The range and

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direction of motion of a particular joint can be isolated from all the other simultaneous motions that are occurring during walking. Graphic plots of individual joint and limb motion as a function of gait phase can be generated.

Kinetics is the term used to describe those factors that cause or control movement. Evaluating kinetics involves the use of principles of physics and biomechanics to explain the kinematic patterns observed and generate analyses that describe the forces generated during normal and abnormal gait analysis.

Gait analysis has been proposed as an aid in surgical planning, primarily for cerebral palsy or spina bifida, and for planning for rehabilitative strategies for a variety of disorders.

- There are no generally recognized standards of performance and interpretation of gait analysis. Different labs use different computer systems, and there are no standards for training in gait analysis techniques and interpretation. Comparison between laboratories is difficult, and there could be many interpretations of the same data.
- Gait analysis has been used extensively as an outcome tool in research on gait, however, much is still unknown about the specific correlation of gait analysis parameters to overall functional status.
- Gait analysis can be evaluated in terms of accuracy relative to some reference standard, but the available comparators only allow evaluation in a very limited sense. For example, accuracy of gait analysis in determining some specific parameters of gait such as joint flexion could be compared to clinical observations, and likely show that gait analysis is most reliable and valid. However, such information is of limited utility in making diagnostic decisions. The purpose of both clinical assessment and gait analysis is not to determine specific quantifiable deficits in gait but to interpret the whole clinical picture and make clinical decisions that result in the best patient outcomes.
- The scientific evidence directly addressing the question of improved patient outcomes due to gait analysis is limited. However, there is evidence that pre-operative gait analysis does alter the approach to surgical correction.

One prospective study assessed the relation between blinded gait analysis data and clinical measurements in 200 randomly selected patients. (Desloovere, 2006) The study found only fair to moderate correlations between the measures \( r^2 \leq 0.60 \), none of the correlations were considered good. The authors suggested that gait analysis can provide different information than clinical measurement, but no data were presented to indicate that this additional information improved outcomes.

A prospective single-institution study evaluated the effect of gait analysis on surgical planning. (Lofterod, 2007) Preoperative surgical plans derived from clinical assessments were found to have been modified in 70% of patients following multi-
disciplinary team gait assessment. Thirty-nine (65%) of the 60 patients had been referred by an orthopedic surgeon who was a member of the gait laboratory. A retrospective study of the influence of gait analysis recommendations reported that the surgeries performed matched those recommended in 23 (77%) of 30 consecutive patients who underwent orthopedic surgery at the author’s institution. (Wren, 2005) The gait laboratory physician was also the referring physician for nearly 65% of the 30 patients.

Although these studies indicate that gait analysis can influence clinical decision making, results cannot be generalized beyond these institutions. In a 2003 study funded by the United Cerebral Palsy Foundation, 4 different gait analysis centers gave different treatment recommendations after evaluating the same 11 patients. (Noonan, 2003) Thus, there appears to be little consistency in gait analysis recommendations between centers. Questions remain, therefore, about both the reliability and the validity of gait analysis recommendations. Multicenter controlled studies are needed to determine whether gait analysis can improve clinical outcomes.

A study was published by Cimolin and colleagues in Italy (Cimolin, 2011). It included 19 children with cerebral palsy scheduled for gastrocnemius fascia lengthening surgery and 20 healthy controls (for establishment of preoperative normative values). Patient evaluation included videotaping and three-dimensional gait analysis. The study used the Gait Deviation Index (GDI) to summarize data; this is a measure derived from comparing nine kinematic variables of a person’s gait to those of a control group. A GDI value of approximately 100 or higher indicates an absence of gait pathology. Every decrease in 10 points below 100 indicates 1 standard deviation from normal kinematics. All participants completed the study. The mean preoperative GDI value among the 19 children with cerebral palsy was 70.4 +/- 14.8 (i.e., three standard deviations away from healthy children). After surgery, the mean GDI was 82.9 +/- 7.4. The improvement in GDI was statistically significant compared to the presurgery value (p<0.05). The study did not evaluate whether there was incremental value with use of the postoperative GDI compared to postoperative observation alone.

Codes Used in This Policy

96000 Comprehensive computer-based motion analysis by video-taping and 3-D kinematics;
96001 Comprehensive computer-based motion analysis by video-taping and 3-D 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

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activities, 1 muscle

96004 Physician review and interpretation 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

References


Application to Products

This policy applies to ARBenefits. Consult ARBenefits Summary Plan Description (SPD) for additional information.

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