Prior Authorization Review Panel
MCO Policy Submission

A separate copy of this form must accompany each policy submitted for review.
Policies submitted without this form will not be considered for review.

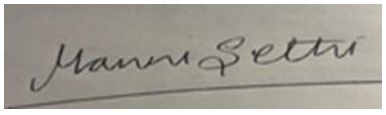
Plan: AmeriHealth Caritas Pennsylvania Community HealthChoices & Keystone First Community HealthChoices	Submission Date: 3/1/2026
Policy Number: CCP.1105	Effective Date: 6/1/2014 Revision Date: 2/1/2026
Policy Name: Computerized gait analysis	

Type of Submission:

☐ New Policy	☒ Prior Authorization Policy
☒ Revised Policy*	☐ Base Policy
☐ Annual Review- no revisions	☐ Experimental/Investigational Policy
	☐ Statewide PDL
	☐ Other:

*All revisions to the policy must be highlighted using track changes throughout the document.

Please provide any clarifying information for the policy below:

Name of Authorized Individual (Please type or print): Manni Sethi, MD, MBA, CHCQM	Signature of Authorized Individual: 

Keystone First
Community HealthChoices

Computerized gait analysis

Clinical Policy ID: CCP.1105

Recent review date: 2/2026

Next review date: 6/2027

Policy contains: Cerebral palsy; Progressive supranuclear Palsy; Parkinson's; gait dysfunction; instrumented gait analysis; quadriplegia; hemiplegia; orthopedic surgery; specialized laboratories; Spina Bifida; phenotypes.

Keystone First Community HealthChoices has developed clinical policies to assist with making coverage determinations. Keystone First Community HealthChoices' clinical policies are based on guidelines from established industry sources, such as the Centers for Medicare & Medicaid Services (CMS), state regulatory agencies, the American Medical Association (AMA), medical specialty professional societies, and peer-reviewed professional literature. These clinical policies along with other sources, such as plan benefits and state and federal laws and regulatory requirements, including any state- or plan-specific definition of "medically necessary," and the specific facts of the particular situation are considered by Keystone First Community HealthChoices, on a case by case basis, when making coverage determinations. In the event of conflict between this clinical policy and plan benefits and/or state or federal laws and/or regulatory requirements, the plan benefits and/or state and federal laws and/or regulatory requirements shall control. Keystone First Community HealthChoices' clinical policies are for informational purposes only and not intended as medical advice or to direct treatment. Physicians and other health care providers are solely responsible for the treatment decisions for their patients. Keystone First Community HealthChoices' clinical policies are reflective of evidence-based medicine at the time of review. As medical science evolves, Keystone First Community HealthChoices will update its clinical policies as necessary. Keystone First Community HealthChoices' clinical policies are not guarantees of payment.

Coverage policy

The use of computerized gait analysis is clinically proven and, therefore, may be medically necessary for the evaluation of musculoskeletal gait function to assess and aid in planning for orthopedic surgery or interventional neurology (e.g., nerve blocks to reduce spasticity, orthotic application) in ambulatory members with certain gait dysfunctions associated with the following conditions (National Institute for Health and Care Excellence, 2012; Spina Bifida Association, 2023a; States, 2024; Wren, 2020):

- Cerebral palsy.
- Spina bifida myelomeningocele.
- Traumatic brain injury.
- Incomplete quadriplegia.
- Spastic hemiplegia.
- Spastic diplegia.

For any determinations of medical necessity for medications, refer to the applicable state-approved pharmacy policy.

Limitations

All other uses of computerized gait analysis are not medically necessary.

Alternative covered services

Observational clinical gait analysis.

Background

Gait is the pattern of how a person walks or runs and the involvement of the muscles, joints, and neurological pathways. Deviations in gait are often distinctive of specific neurological, muscular, or skeletal conditions. Gait and balance disorders are common in the elderly, in whom they significantly contribute to falls; after orthopedic surgery; and in neurodevelopmental disorders such as spina bifida and cerebral palsy (Baker, 2018).

For the important aspects of treatment decision making, the provider must understand the ongoing relationship between orthopedic, neurological, and developmental considerations related to gait (States, 2021). The clinical heterogeneity of gait disorders reflects the large and complex neuromuscular systems involved and the vulnerability of walking to neurologic disease at every level of progression.

Providers have historically diagnosed and classified gait by visual observation, but this approach yielded more generalized results lacking information on more specific causes and treatment of failing gaits, balance and stability issues, and declining performance. In a review of 34 studies of gastrocsoleus lengthening surgery, outcomes improved, and authors found observational gait analysis and video recordings can be used to measure treatment outcomes as a comparison but are subjective in nature and have validity and reliability issues (Ma, 2021). More standardized gait analyses have been developed in specialized laboratories equipped with cameras, floor sensors, and other data collecting equipment inherent in more objective data classification.

Computerized gait analysis is the quantitative assessment of gait disturbances in order to support a functional diagnosis, assess for treatment planning, and monitor disease progress. The quantitative information correlates with the functional capacity of the patient and provides complementary information to clinical examination (Baker, 2018).

Types of gait analysis include but are not limited to: three dimensional gait analysis also known as 3DGA; optical tracking gait analysis; comprehensive computer-based motion analysis by videotaping; three-dimensional kinematics; dynamic plantar pressure measurements during walking; and dynamic surface electromyography of multiple muscles during walking or other functional activities. These analyses are used to assess, diagnose, develop a plan of care, and document treatment and surgical outcomes for multiple gait issues (Ma, 2021). Research into computerized gait analysis for early disease detection is emerging (Al-Hammadi, 2024; Čepukaitytė, 2024), as are wearable technologies using inertial sensors and markerless camera-based three-dimensional motion capture systems (Scataglini, 2024; Silva, 2024).

Findings

Evidence on computerized gait analysis supports clinical utility for surgical planning in ambulatory patients with cerebral palsy and spina bifida, where guidelines recommend its use and systematic reviews demonstrate that gait analysis data change treatment recommendations. For other populations, three-dimensional instrumented gait analysis is a quantitative method used to characterize gait patterns, though evidence strength and clinical utility vary by condition and clinical question. A systematic review of 30 studies found that most studies employ three-dimensional gait analysis, while evidence for two-dimensional video gait analysis remains insufficient for routine clinical application (Michelini, 2020). A consistent finding across the literature is that while gait analysis impacts clinical decisions, limited evidence directly addresses impacts on patient outcomes.

Guidelines

Professional guidelines from United States and international organizations consistently support computerized gait analysis for pre-operative surgical planning in ambulatory pediatric patients with spasticity and spina bifida. The Academy of Pediatric Physical Therapy of the American Physical Therapy Association, the National Institute for Health and Care Excellence, and the Spina Bifida Association all recommend gait analysis when orthopedic surgery is being considered for these populations (National Institute for Health and Care Excellence, 2012; Spina Bifida Association, 2023a; States, 2024). This convergence reflects agreement that computerized gait analysis provides objective, quantitative information beyond what clinical examination and observation alone can offer.

Guidelines also agree that gait analysis aids surgical planning by identifying specific patterns of muscle overactivity, joint deformity, and movement abnormalities that inform the selection of surgical procedures. The National Institute for Health and Care Excellence advises that any decision to perform orthopedic surgery to improve gait must include a pre-operative functional assessment, preferably to include gait analysis, and that surgical outcomes should be assessed one to two years post-operatively. The Spina Bifida Association similarly recommends computerized gait analysis when considering surgical intervention, noting that accurate identification of gait pathology is essential to maximize ambulatory function and aids in the selection of surgical procedures to improve function (Spina Bifida Association, 2023a).

Guidelines provide condition-specific and age-specific implementation guidance. For cerebral palsy, the Academy of Pediatric Physical Therapy found three-dimensional instrumented gait analysis clinically useful to inform orthopedic surgical and non-surgical interventions, to identify or quantify gait deviations among segments, joints, and planes, and to evaluate the effectiveness of an intervention (States, 2024). The Academy also provided guidance on the preferred characteristics of appropriate gait analysis laboratories with respect to instrumentation, equipment, staffing, and reporting practices.

For spina bifida, age-specific recommendations indicate that gait analysis should be utilized if considering surgical intervention in children ages three years and older with low lumbar or sacral level lesions who have gait abnormalities (Spina Bifida Association, 2023a). The Spina Bifida Association Mobility Guideline additionally supports gait studies for monitoring ambulatory function and optimizing bracing decisions when ambulation is changing or when information is needed to optimize orthotic management (Spina Bifida Association, 2023b).

Despite agreement on surgical planning utility in specific populations, guidelines do not support routine use of computerized gait analysis across all patients or conditions. The National Institute for Health and Care Excellence notes that the routine use of computerized gait analysis remains controversial, and while it could alter decision making in some cases, it is less clear whether decisions based on computerized gait analysis lead to better patient outcomes (National Institute for Health and Care Excellence, 2012). This divergence between support for targeted surgical planning use and lack of support for routine application is consistent across guidelines.

Systematic reviews and meta-analyses

Systematic reviews consistently demonstrate that three-dimensional instrumented gait analysis changes clinical decision-making when used for surgical planning. A systematic review of 2,712 articles found that three-dimensional instrumented gait analysis can change treatment plans, increase clinicians' confidence in treatment decisions, and increase agreement among clinicians (Wren, 2020). Evidence cited in the Spina Bifida Association guideline demonstrates that the addition of gait analysis data, compared to clinical examination and video analysis alone, led to a change in surgical recommendations for 44% of patients with myelomeningocele (Mueske, 2019). This agreement across reviews establishes that gait analysis provides actionable information that influences surgical planning.

Reviews also agree that the evidence base is strongest for cerebral palsy. A scoping review of 161 studies found that 49% used instrumented gait analysis as an outcome measure for treatment in children with cerebral palsy, and the authors state the large number of studies provide a basis for developing guidelines for managing cerebral

palsy-related gait disorders (States, 2021). A systematic review of 34 studies on gastrocsoleus lengthening for equinus deformity secondary to cerebral palsy found that three-dimensional gait analysis can provide objective outcome measurement (Ma, 2021). The concentration of evidence in cerebral palsy supports its status as the primary covered condition.

Despite agreement on decision-making impact, systematic reviews consistently identify limitations in the evidence base. Reviews agree that evidence directly linking gait analysis to improved patient outcomes remains limited. The Wren (2020) systematic review found that patient outcomes, such as incidence of severe crouch gait, improved only when three-dimensional instrumented gait analysis was available and recommendations were followed, but only a small number of studies assessed outcomes. The Ma (2021) review found evidence to be of poor study quality and heterogeneous with respect to patient characteristics and interventions, concluding that further prospective studies and randomized controlled trials are needed to determine pre-operative predictors of surgical success.

Reviews also agree on methodological limitations that constrain the evidence base. Heterogeneity in patient populations, interventions, and outcome measures limits comparability across studies. Small sample sizes and lack of standardization are recurring limitations. A systematic review of 25 studies assessing instrumental evaluation in patients with chronic obstructive pulmonary disease, of which seven included three-dimensional gait analysis, found evaluation hampered by lack of standardization, small sample sizes, and study design issues, and noted that gait analysis is costly, requiring dedicated space and infrastructure (Zucchelli, 2022).

For populations beyond the covered conditions, systematic reviews demonstrate feasibility of gait characterization without establishing surgical planning utility. For Parkinson's disease, a systematic review of 95 studies characterized gait kinematic parameters (Bouça-Machado, 2020), and a systematic review with meta-analysis of 34 studies (n=2,626; 1,533 patients with Parkinson's disease and 1,093 healthy controls) characterized spatiotemporal, kinematic, and kinetic gait parameters compared to healthy individuals (Bonacina, 2024). A systematic review of four studies examined wearable devices and objective gait analysis for assessment and monitoring of patients with lumbar spinal stenosis (Chakravorty, 2019). A systematic review with meta-analysis of 36 studies (n=4,078; 3,369 patients with fibromyalgia and 709 controls) found that individuals with fibromyalgia have a different gait pattern and reduced walk functional capacity compared to individuals without fibromyalgia (Carrasco-Vega, 2022).

Post-surgical outcome measurement has been examined across multiple populations. A systematic review with meta-analysis of 13 studies (n=543; 267 patients with cervical spinal myelopathy and 276 healthy controls) examined gait function before and after surgical decompression (Mandelli, 2024). A systematic review with meta-analysis of 28 studies (n=976) examined long-term gait outcomes following total knee arthroplasty (Marino, 2024). A systematic review examined functional assessment in patients undergoing total hip arthroplasty (Rivera, 2024). These reviews demonstrate the utility of gait analysis for outcome measurement in surgical populations, though the clinical context differs from pre-operative surgical planning.

For the elderly, a systematic review of nine studies examined ecological gait as a fall indicator (Job, 2020), and a meta-analysis of 19 studies (n=2,626) examined quantitative assessment of lower extremity motor function (Liu, 2024). The procedure offers promise for identifying individuals in need of preventive measures regarding falls or ambulatory rehabilitation, but is a complex process producing vast amounts of data.

For hereditary spastic paraplegia, a systematic review of 38 studies found that instrumented gait analysis provides objective outcome measures for characterizing gait patterns, with walking speed and knee range of motion most consistently differentiating patients from healthy controls (Koch, 2025). However, the authors note there is no consensus on the most relevant disease-specific digital outcome measures and recommend longitudinal multicenter studies with larger sample sizes before broader clinical implementation. Unlike covered

conditions where gait analysis has been shown to change surgical recommendations, evidence for hereditary spastic paraplegia is limited to disease characterization.

A systematic review of 12 studies of instrumental gait assessments in persons with fractured ankles concluded that these assessments can objectively characterize gait alterations and may be useful in clinical practice to assess patient performance and in clinical research to evaluate rehabilitative interventions (Mirando, 2022). This reflects the broader pattern in which gait analysis demonstrates utility for characterization and outcome measurement without establishing the surgical planning benefit that supports coverage for cerebral palsy and spina bifida.

In 2026, we added the Spina Bifida Association Orthopedics Guideline (2023a), the Spina Bifida Association Mobility Guideline (2023b), the systematic review by Mueske (2019) on gait analysis in spina bifida, and the systematic review by Koch (2025) on hereditary spastic paraplegia.

References

On January 13, 2026, we searched PubMed and the databases of the Cochrane Library, the U.K. National Health Services Centre for Reviews and Dissemination, the Agency for Healthcare Research and Quality, and the Centers for Medicare & Medicaid Services. Search terms were “gait analysis,” “gait disorders, neurologic” [MeSH], “Cerebral Palsy/rehabilitation” [MeSH], “Cerebral Palsy/surgery” [MeSH], and “Spinal Dysraphism” [MeSH]. We included the best available evidence according to established evidence hierarchies (typically systematic reviews, meta-analyses, and full economic analyses, where available) and professional guidelines based on such evidence and clinical expertise.

Al-Hammadi M, Fleyeh H, Åberg AC, Halvorsen K, Thomas I. Machine learning approaches for dementia detection through speech and gait analysis: A systematic literature review. J Alzheimers Dis. 2024;100(1):1-27. Doi: 10.3233/jad-231459.

Baker JM, Sudarsky LR. Chapter 23: Gait disorders, imbalance, and falls. In: Jameson JL, Fauci AS, Kasper DL, Hauser SL, Longo DL, Loscalzo J, eds. Harrison's principles of internal medicine. 20th edition. New York, NY: McGraw-Hill Education. https://accesspharmacy.mhmedical.com/Content.aspx?bookid=2129&sectionid=192011531. Published 2018.

Bonacina D, Tosatto D, Ugolini A, et al. Spatiotemporal, kinematic and kinetic gait characteristics in Parkinson's disease compared to healthy individuals: A systematic review with meta-analysis. Clin Biomech (Bristol). 2024;120:106359. Doi: 10.1016/j.clinbiomech.2024.106359.

Bouça-Machado R, Jalles C, Guerreiro D, et al. Gait kinematic parameters in Parkinson's disease: A systematic review. J Parkinsons Dis. 2020;10(3):843-853. Doi: 10.3233/jpd-201969.

Carrasco-Vega E, Ruiz-Muñoz M, Cuesta-Vargas A, Romero-Galisteo RP, González-Sánchez M. Individuals with fibromyalgia have a different gait pattern and a reduced walk functional capacity: A systematic review with meta-analysis. PeerJ. 2022;10:e12908. Doi: 10.7717/peerj.12908.

Čepukaitytė G, Newton C, Chan D. Early detection of diseases causing dementia using digital navigation and gait measures: A systematic review of evidence. Alzheimers Dement. 2024;20(4):3054-3073. Doi: 10.1002/alz.13716.

Chakravorty A, Mobbs RJ, Anderson DB, et al. The role of wearable devices and objective gait analysis for the assessment and monitoring of patients with lumbar spinal stenosis: Systematic review. BMC Musculoskelet Disord. 2019;20(1):288. Doi: 10.1186/s12891-019-2663-4.

Job M, Dottor A, Viceconti A, Testa M. Ecological gait as a fall indicator in older adults: A systematic review. Gerontologist. 2020;60(5):e395-e412. Doi: 10.1093/geront/gnz113.

Koch V, Ibrahim A, Winkler J, Eskofier B, Regensburger M, Gassner H. Outcome measures of instrumented gait analysis in hereditary spastic paraplegia: A systematic review. J Neuroeng Rehabil. 2025;22(1):129. Published 2025 Jun 5. Doi: 10.1186/s12984-025-01646-4.

Liu W, Bai J. Meta-analysis of the quantitative assessment of lower extremity motor function in elderly individuals based on objective detection. J Neuroeng Rehabil. 2024;21(1):111. Doi: 10.1186/s12984-024-01409-7.

Ma N, Sclavos N, Passmore E, Thomason P, Graham K, Rutz E. Three-dimensional gait analysis in children undergoing gastrocsoleus lengthening for equinus secondary to cerebral palsy. Medicina (Kaunas). 2021;57(2):98. Doi: 10.3390/medicina57020098.

Mandelli F, Zhang Y, Nüesch C, et al. Gait function assessed using 3D gait analysis in patients with cervical spinal myelopathy before and after surgical decompression: A systematic review and meta-analysis. Spine J. 2024;24(3):406-416. Doi: 10.1016/j.spinee.2023.09.030.

Marino G, De Capitani F, Adamo P, Bolzoni L, Gatti R, Temporiti F. Long-term gait analysis in patients after total knee arthroplasty: A systematic review and meta-analysis. Gait Posture. 2024;113:75-98. Doi: 10.1016/j.gaitpost.2024.06.002.

Michelini A, Eshraghi A, Andrysek J. Two-dimensional video gait analysis: A systematic review of reliability, validity, and best practice considerations. Prosthet Orthot Int. 2020;44(4):245-262. Doi: 10.1177/0309364620921290.

Mirando M, Conti C, Zeni F, Pedicine F, Nardone A, Pavese C. Gait alterations in adults after ankle fracture: A systematic review. Diagnostics (Basel). 2022;12(1):199. Doi: 10.3390/diagnostics12010199.

Mueske NM, Õunpuu S, Ryan DD, et al. Impact of gait analysis on pathology identification and surgical recommendations in children with spina bifida. Gait Posture. 2019;67:128-132. Doi: 10.1016/j.gaitpost.2018.10.003.

National Institute for Health and Care Excellence. Spasticity in under 19s: Management. Clinical guideline 145. https://www.nice.org.uk/guidance/CG145. Published July 2012. Updated 2016.

Rivera RJ, Karasavvidis T, Pagan C, et al. Functional assessment in patients undergoing total hip arthroplasty. Bone Joint J. 2024;106-b(8):764-774. Doi: 10.1302/0301-620x.106b8.Bjj-2024-0142.R1.

Scataglini S, Abts E, Van Bocxlaer C, Van den Bussche M, Meletani S, Truijen S. Accuracy, validity, and reliability of markerless camera-based 3d motion capture systems versus marker-based 3d motion capture systems in gait analysis: A systematic review and meta-analysis. Sensors (Basel, Switzerland). 2024;24(11). Doi: 10.3390/s24113686.

Silva RSD, Silva STD, Cardoso DCR, et al. Psychometric properties of wearable technologies to assess post-stroke gait parameters: A systematic review. Gait Posture. 2024;113:543-552. Doi: 10.1016/j.gaitpost.2024.08.004.

Spina Bifida Association. Guidelines for the care of people with spina bifida: Mobility. https://www.spinabifidaassociation.org/blog/mobility/. Published August 2023b.

Spina Bifida Association. Guidelines for the care of people with spina bifida: Orthopedics. https://www.spinabifidaassociation.org/blog/orthopedics-guideline/. Published May 2023a.

States RA, Krsak JJ, Salem Y, Godwin EM, Winter-Bodkin A, McMulkin ML. Instrumented gait analysis for management of gait disorders in children with cerebral palsy: A scoping review. Gait Posture. 2021;90:1-8. Doi: 10.1016/j.gaitpost.2021.07.009.

States RA, Salem Y, Krzak JJ, Godwin EM, McMulkin ML, Kaplan SL. Three-dimensional instrumented gait analysis for children with cerebral palsy: An evidence-based clinical practice guideline. Pediatr Phys Ther. 2024;36(2):182-206. Doi: 10.1097/pep.0000000000001101.

Wren TAL, Tucker CA, Rethlefsen SA, Gorton GE, 3rd, Õunpuu S. Clinical efficacy of instrumented gait analysis: Systematic review 2020 update. Gait Posture. 2020;80:274-279. Doi: 10.1016/j.gaitpost.2020.05.031.

Zucchelli A, Pancera S, Bianchi LNC, Marengoni A, Lopomo NF. Technologies for the instrumental evaluation of physical function in persons affected by Chronic Obstructive Pulmonary Disease: A systematic review. Sensors (Basel). 2022;22(17):6620. Doi: 10.3390/s22176620.

Policy updates

6/2016: Policy references updated.

5/2017: Policy references updated. Coverage changed.

3/2018: Policy references updated.

3/2019: Policy references updated. Policy ID changed.

2/2020: Policy references updated.

2/2021: Policy references updated.

2/2022: Policy references updated.

2/2023: Policy references updated.

2/2024: Policy references updated.

2/2025: Policy references updated.

2/2026: Policy references updated.

Related Codes

Below are the most commonly submitted codes for the service(s)/item(s) subject to this policy CCP.1105. This is not an exhaustive list of codes. Providers are expected to consult the appropriate coding manuals and bill accordingly.

Code	Code Description
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
96004	Physician or other qualified health care professional review and interpretation by physician or other qualified health care professional with written report