Diagnostic Dynamic Spinal Visualization and Vertebral Motion Analysis

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Instructions for Use

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Community Plan Policy
• Diagnostic Dynamic Spinal Visualization and Vertebral Motion Analysis

Application

UnitedHealthcare Commercial

This Medical Policy applies to UnitedHealthcare Commercial benefit plans.

UnitedHealthcare Individual Exchange

This Medical Policy applies to Individual Exchange benefit plans.

Coverage Rationale

The following dynamic spinal visualization techniques when used to visualize movement of the back or spine are unproven and not medically necessary due to insufficient evidence of efficacy.

- Digital motion x-ray of the spine
- Cineradiography/videofluoroscopy

Vertebral motion analysis is unproven and not medically necessary due to insufficient evidence of efficacy.

Applicable Codes

The following list(s) of procedure and/or diagnosis codes is provided for reference purposes only and may not be all inclusive. Listing of a code in this policy does not imply that the service described by the code is a covered or non-covered health service. Benefit coverage for health services is determined by the member specific benefit plan document and applicable laws that may require coverage for a specific service. The inclusion of a code does not imply any right to reimbursement or guarantee claim payment. Other policies and guidelines may apply.

CPT Code	Description
0693T	Comprehensive full body computer-based markerless 3D kinematic and kinetic motion analysis and report
76120	Cineradiography/videoradiography, except where specifically included

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CPT Code	Description
76125	Cineradiography/videoradiography to complement routine examination (List separately in addition to code for primary procedure)

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Description of Services

Dynamic spinal visualization is a general term addressing different imaging technologies that simultaneously visualize spine (vertebrae) movements and external body movement.

Digital motion x-ray involves the use of either film x-ray or computer-based x-ray snapshots that are taken in sequence as an individual moves in front of an x-ray camera. Film x-rays are digitized into a computer for manipulation, while computer-based x-rays are automatically created in a digital format. The digitized snapshots are then put in order using a computer program and played on a video monitor, creating a moving image of the inside of the body. This moving image can then be evaluated by a physician alone or by using a computer that evaluates several aspects of the body's structure to determine the presence or absence of abnormalities.

Videoradiography and cineradiography are different names for the same procedure that uses fluoroscopy to create real-time video images of internal body structures. Videoradiography works like a video camera, providing motion pictures of the inside of the body. The results of these techniques can be displayed on a video monitor as the procedure is being conducted. They can also be viewed or digitally analyzed.

Vertebral motion analysis systems provide assisted bending with fluoroscopic imaging and computerized analysis. The device uses facial recognition software to track vertebral bodies across the images. Proposed benefits of the vertebral motion analysis are a reduction in individual-driven variability in bending and assessment of vertebral movement across the entire series of imaging rather than at the end range of flexion and extension bending with fluoroscopic imaging and computerized analysis.

Clinical Evidence

Cineradiography/Videoradiography

The current literature evaluating the clinical utility of dynamic spinal visualization techniques, including digital motion x-ray and cineradiography (video fluoroscopy), remains limited and is characterized by small sample sizes and study design limitations. Broader evaluations further report insufficient and low-quality evidence to support improvements in clinical outcomes or diagnostic accuracy that is associated with these technologies. Therefore, additional high-quality, large-scale, controlled studies are needed to determine the clinical impact and establish the advantages over existing assessment methods.

Scataglini et al. (2024) performed a systematic review and meta-analysis to compare the accuracy, validity, and reliability of markerless camera-based 3D motion capture systems (MCBSs) and marker-based 3D motion capture systems (MBSs). MCBSs, despite their advantages, still fall short of the gold standard set by MBSs. Ongoing research that addresses issues such as occlusions, noise, and computational complexity, with advances in computer vision, machine learning, and sensor technologies, is helping to close the gap. However, there is still no clear consensus on the accuracy, validity, and reliability of markerless systems in gait analysis. There were 2,047 potential records that were screened, with a total of 22 retained for inclusion in this systematic review after the screening process. After review, the results showed that spatiotemporal parameters had overall good to excellent accuracy, validity, and reliability. For kinematic variables, the hip and knee showed moderate to excellent agreement between the systems, while for the ankle joint, there was poor concurrent validity and reliability measured. The accuracy and concurrent validity of walking speed were considered excellent in all cases, with only small bias. The meta-analysis of the interrater reliability and concurrent validity of walking speed, step time, and step length resulted in a good to excellent intraclass correlation coefficient (0.81; 0.98). There are several limitations that were identified. Most studies focused on spatial and temporal outcomes rather than kinematic outcomes of the lower limb during gait. The heterogeneity in reliability types (interrater, intersession, and intrasession) made it difficult to draw firm conclusions about the reliability of markerless systems compared with that of marker-based systems. The wide range of methodological approaches complicated general conclusions about concurrent validity and accuracy. Small numbers of individuals lead to inaccurate estimates, and most studies involved young, healthy individuals, which limits generalizability to clinical settings. The risk of bias and incomplete methodological descriptions made it challenging to generalize results. Some articles indirectly addressed the review question, which raised concerns about their relevance and applicability. The results indicated that MBSs are the gold standard, although MCBSs show

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promising results. Further research is needed to compare the accuracy, concurrent validity, and reliability of markerless and marker-based gait analysis systems.

ECRI (2023) performed a Clinical Evidence Assessment for dynamic spinal visualization in assessing lumbar spine abnormalities. They concluded that evidence from one cohort study and two diagnostic cohorts on dynamic magnetic resonance imaging compared with flexion/extension radiography did not suggest that dynamic spinal visualization improves outcomes or diagnoses in those with lumbar spine abnormalities. The studies suggest that dynamic spinal visualization may identify lumbar abnormalities; however, too few data exist per dynamic visualization technique, and the studies are of too low quality to provide conclusive evidence of efficacy.

Vertebral Motion Analysis

For individuals with back or spine pain who undergo vertebral motion analysis, the available evidence includes studies that compared the technology with standard flexion-extension radiographs. Although vertebral motion analysis may reduce measurement variability, it remains uncertain whether this improvement translates into greater diagnostic accuracy or improved health outcomes. Therefore, the evidence is insufficient to determine whether the technology has a positive impact on clinical health outcomes.

Hurley et al. (2021) compared leg length measurements (LLMs) and varus/valgus knee measurements (VVMs) that were performed clinically, radiologically, and using markerless motion analysis (MMA) in participants who were being assessed for potential total knee replacement. Overall, 23 participants who were awaiting unilateral primary total knee replacement were included in the study. According to the authors, the most important finding of this study was that significant differences were reported between results obtained for calculating LLMs and VVMs clinically, radiologically, and using MMA. Limitations of this study include its small sample size, which restricts generalizability, and its single-center design, which limits external validity and reduces applicability to other clinical settings. While literature has previously validated the use of clinical and radiological methods in obtaining LLMs, this study poses the question as to whether the results obtained using MMA for LLMs and VVMs can be used.

U.S. Food and Drug Administration (FDA)

This section is to be used for informational purposes only. FDA approval alone is not a basis for coverage.

Products used for diagnostic dynamic spinal visualization and vertebral motion analysis are extensive. Refer to the following website for more information, and search by product name in the device name section: http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfPMN/pmn.cfm. (Accessed May 28, 2026)

References

ECRI Institute. Dynamic spinal visualization for assessing lumbar spine abnormalities. July 2023. (Clinical Evidence Assessment).

Hurley RJ, Davey MS, Newell M, et al. Assessing the accuracy of measuring leg length discrepancy and genu varum/valgum using a markerless motion analysis system. J Orthop. 2021 Jul;26:45-48.

Scataglini S, Abts E, Van Bocxlaer C, et al. 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). 2024 Jun;24(11):3686.

Policy History/Revision Information

Date	Summary of Changes
10/01/2026	**Supporting Information** • Updated *Clinical Evidence* and *References* sections to reflect the most current information • Archived previous policy version 2026T0633I

Instructions for Use

This Medical Policy provides assistance in interpreting UnitedHealthcare standard benefit plans. When deciding coverage, the member specific benefit plan document must be referenced as the terms of the member specific benefit plan may differ from the standard plan. In the event of a conflict, the member specific benefit plan document governs. Before using

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this policy, check the member specific benefit plan document and any applicable federal or state mandates. UnitedHealthcare reserves the right to modify its policies and guidelines as necessary. This Medical Policy is provided for informational purposes. It does not constitute medical advice.

This Medical Policy may also be applied to Medicare Advantage plans in certain instances. In the absence of a Medicare National Coverage Determination (NCD), Local Coverage Determination (LCD), or other Medicare coverage guidance, CMS allows a Medicare Advantage Organization (MAO) to create its own coverage determinations, using objective evidence-based rationale relying on authoritative evidence (Medicare IOM Pub. No. 100-16, Ch. 4, §90.5).

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