

Corporate Medical Policy

Intensity Modulated Radiation Therapy for Tumors of the Central Nervous System

File Name: intensity_modulated_radiation_therapy_for_tumors_of_the_central_nervous_system
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Description of Procedure or Service

Radiation therapy is an integral component in the treatment of many brain tumors, both benign and malignant. Intensity modulated radiation therapy (IMRT) has been proposed as a method of radiation therapy that allows adequate radiation therapy to the tumor while minimizing the radiation dose to surrounding normal tissues and critical structures.

Background

Radiation therapy and brain tumors

The standard approach to the treatment of brain tumors depends on the type and location of tumor. For glioblastoma multiforme (GBM), a malignant high-grade tumor, treatment is multimodal, with surgical resection followed by adjuvant radiation therapy (RT) and chemotherapy.

For benign and low-grade brain tumors, gross total resection remains the primary goal. However, radiation therapy may be used in selected cases. Some examples are when total resection is not possible, when a more conservative surgical approach may be necessary to achieve long-term treatment goals, and with atypical tumors that may need radiotherapy even after gross total resection to reduce the risk of local recurrence. Therefore, radiation therapy, either definitive or in the postoperative adjuvant setting, remains an integral component in the management of residual, recurrent, and/or progressive benign and low-grade brain tumors for maximizing local control.

Brain metastases occur in up to 40% of adults with cancer and can shorten survival and detract from quality of life. Many patients who develop brain metastases will eventually die of progressive intracranial disease. Among patients with good performance status, controlled extracranial disease, favorable prognostic features, and a solitary brain metastasis, randomized studies have shown that surgical excision followed by whole brain radiotherapy (WBRT) prolongs survival. Stereotactic radiosurgery (SRS) may be able to replace surgery in certain circumstances, delivering obliteratively high single doses to discrete metastases. For bulky cerebral metastases, level one evidence has also shown that delivering a higher radiation dose with an SRS boost is beneficial in addition to standard WBRT. The use of a concomitant boost with IMRT during WBRT has been attempted to improve overall local tumor control without the use of SRS to avoid additional planned radiation after WBRT ("Phase 2" or SRS) and its additional labor and expense. Another indication for use of IMRT in WBRT is to avoid radiation exposure to the hippocampus. It is thought that avoiding the hippocampus may minimize cognitive decline associated with WBRT.

Radiation techniques

Conventional external beam radiation therapy. Over the past several decades, methods to plan and deliver radiation therapy have evolved in ways that permit more precise targeting of tumors with

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complex geometries. Most early trials used 2-dimensional treatment planning based on flat images and radiation beams with cross-sections of uniform intensity that were sequentially aimed at the tumor along 2 or 3 intersecting axes. Collectively, these methods are termed “conventional external beam radiation therapy.”

3-dimensional conformal radiation (3D-CRT).

Treatment planning evolved by using 3-dimensional images, usually from computed tomography (CT) scans, to delineate the boundaries of the tumor, and discriminate tumor tissue from adjacent normal tissue and nearby organs at risk for radiation damage. Computer algorithms were developed to estimate cumulative radiation dose delivered to each volume of interest by summing the contribution from each shaped beam. Methods also were developed to position the patient and the radiation portal reproducibly for each fraction, and immobilize the patient, thus maintaining consistent beam axes across treatment sessions. Collectively, these methods are termed 3-dimensional conformal radiation therapy (3D-CRT).

Intensity-modulated radiation therapy (IMRT).

IMRT, which uses computer software and CT and magnetic resonance imaging (MRI) images, offers better conformality than 3D-CRT as it is able to modulate the intensity of the overlapping radiation beams projected on the target and to use multiple shaped treatment fields. It uses a device (a multileaf collimator, MLC) which, coupled to a computer algorithm, allows for “inverse” treatment planning. The radiation oncologist delineates the target on each slice of a CT scan and specifies the target’s prescribed radiation dose, acceptable limits of dose heterogeneity within the target volume, adjacent normal tissue volumes to avoid, and acceptable dose limits within the normal tissues. Based on these parameters and a digitally reconstructed radiographic image of the tumor and surrounding tissues and organs at risk, computer software optimizes the location, shape and intensities of the beams ports, to achieve the treatment plan’s goals.

Increased conformality may permit escalated tumor doses without increasing normal tissue toxicity and thus may improve local tumor control, with decreased exposure to surrounding, normal tissues, potentially reducing acute and late radiation toxicities. Better dose homogeneity within the target may also improve local tumor control by avoiding underdosing within the tumor and may decrease toxicity by avoiding overdosing.

Technologic development has produced advanced techniques that may further improve RT treatment by improving dose distribution. These techniques are considered variations of IMRT. Volumetric modulated arc therapy (VMAT) delivers radiation from a continuous rotation of the radiation source. The principal advantage of VMAT is greater efficiency in treatment delivery time, reducing radiation exposure and improving target radiation delivery due to less patient motion. Image-guided RT involves the incorporation of imaging before and/or during treatment to more precisely deliver RT to the target volume.

IMRT methods to plan and deliver RT are not uniform. IMRT may use beams that remain on as MLCs move around the patient (dynamic MLC) or that are off during movement and turn on once the MLC reaches prespecified positions (“step and shoot” technique). A third alternative uses a very narrow single beam that moves spirally around the patient (tomotherapy). Each method uses different computer algorithms to plan treatment and yields somewhat different dose distributions in and outside the target. Patient position can alter target shape and thus affect treatment plans. Treatment plans are usually based on 1 imaging scan, a static 3D-CT image. Current methods seek to reduce positional uncertainty for tumors and adjacent normal tissues by various techniques. Patient immobilization cradles and skin or bony markers are used to minimize day-to-day variability in patient positioning. In addition, many tumors have irregular edges that preclude drawing tight margins on CT scan slices when radiation oncologists contour the tumor volume. It is unknown whether omitting some tumor cells or including some normal cells in the resulting target affects outcomes of IMRT.

Regulatory status

The U.S. Food and Drug Administration (FDA) has approved a number of devices for use in intensity-modulated radiation therapy (IMRT), including several linear accelerators and multileaf collimators.

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Examples of approved devices and systems are the Prowess Panther (Prowess) in 2003, TiGRT (LinaTech) in 2009, and the Ray Dose (RaySearch Laboratories) the Varian Multileaf Collimator with dynamic arc therapy feature (Varian OncologySystems).

Related Policies:

Intensity-Modulated Radiation Therapy (IMRT) of the Prostate
Intensity-Modulated Radiation Therapy (IMRT) of the Head and Neck
Intensity-Modulated Radiation Therapy (IMRT) of the Chest
Intensity-Modulated Radiation Therapy (IMRT) of the Abdomen and Pelvis
Intensity-Modulated Radiation Therapy (IMRT) for Sarcoma of the Extremities
Maximum Units of Service
Radiation Therapy Services

****Note: This Medical Policy is complex and technical. For questions concerning the technical language and/or specific clinical indications for its use, please consult your physician.*

Policy

BCBSNC will provide coverage for Intensity Modulated Radiation Therapy (IMRT) for the treatment of tumors of the Central Nervous System (CNS), when determined to be medically necessary because the medical criteria and guidelines shown below are met.

Benefits Application

This medical policy relates only to the services or supplies described herein. Please refer to the Member's Benefit Booklet for availability of benefits. Member's benefits may vary according to benefit design; therefore member benefit language should be reviewed before applying the terms of this medical policy.

When Intensity-Modulated Radiation Therapy for Tumors of the Central Nervous System is covered

Intensity Modulated Radiation Therapy (IMRT) may be considered medically necessary for the treatment of tumors of the central nervous system when:

- 1) the tumor is in close proximity to tissues at risk (See Policy Guidelines); **AND**
- 2) 3-D CRT planning is not able to meet dose volume constraints for normal tissue tolerance; **AND**
- 3) IMRT dosimetry demonstrates reduced toxicity of non-target areas.

When Intensity-Modulated Radiation Therapy for Tumors of the Central Nervous System is not covered

Intensity Modulated Radiation Therapy (IMRT) is considered **investigational** and therefore not covered when above criteria are not met.

Policy Guidelines

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Organs at risk are defined as normal tissues whose radiation sensitivity may significantly influence treatment planning and/or prescribed radiation dose. These organs at risk may be particularly vulnerable to clinically important complications from radiation toxicity:

- brain stem
- spinal cord
- cochlea
- eye structures, including optic nerve and chiasm, lens, and retina

Because IMRT maximizes radiation dose distributions to the target while reducing exposure of adjacent non-target structures, it is more commonly utilized when there is particular concern about damage to an adjacent organ or vital tissue. A potential advantage to IMRT is its ability to limit dose to surrounding normal tissues of the central nervous system, such as the optic nerve, chiasm, lens, and brainstem, thereby possibly minimizing radiation morbidity.

For individuals who have malignant brain tumors who receive IMRT, the evidence includes dose-planning studies, nonrandomized comparison studies, case series, and a systematic review.. Relevant outcomes are overall survival, disease-specific survival, morbid events, functional outcomes, and treatment related morbidity. Dose-planning studies have shown that IMRT delivers adequate radiation doses to tumors at the same time as reducing radiation exposure to sensitive brain areas. Case series/study results are consistent with low radiation toxicity, but have not demonstrated better tumor control or improved survival with IMRT. The evidence is sufficient to determine qualitatively that the technology results in a meaningful improvement in the net health outcome.

For individuals who have benign brain tumors who receive IMRT, the evidence includes case series. Relevant outcomes are overall survival, disease-specific survival, morbid events, functional outcomes, and treatment related morbidity. The dose-planning studies evaluating IMRT in patients with malignant tumors should generalize to patients with benign brain tumors, because the benefit of minimizing radiation toxicity to sensitive brain areas is identical. Case series results are consistent with low radiation toxicity, but have not demonstrated better tumor control or improved survival with IMRT versus other radiotherapy techniques. The evidence is sufficient to determine qualitatively that the technology results in a meaningful improvement in the net health outcome.

For individuals who have brain tumor metastases who receive IMRT to avoid hippocampal exposure or radiation boost using IMRT, the evidence includes nonrandomized comparison studies and case series. Relevant outcomes are overall survival, disease-specific survival, morbid events, functional outcomes, and treatment related morbidity. One prospective nonrandomized comparison study using IMRT to avoid hippocampal exposure showed less cognitive decline with this technique compared to a prespecified historical control. One randomized trial and one prospective nonrandomized comparison study using IMRT to avoid hippocampal exposure showed less cognitive decline with IMRT than with either conventional WBRT or prespecified historical controls.

Due to the limitations in this evidence, this evidence review underwent clinical vetting in 2012. There was near-uniform consensus that use of IMRT in the central nervous system (CNS) is at least as effective as 3-dimensional conformal radiotherapy and that, given the possible adverse events that could result if nearby critical structures receive toxic radiation doses, IMRT dosimetric improvements should be accepted as meaningful evidence for its benefit. The results of the vetting, together with a strong indirect chain of evidence and the potential to reduce harms, led to the decision that IMRT may be considered medically necessary for the treatment of tumors of the CNS that are in close proximity to organs at risk.

CPT 77338 is reported once per IMRT plan and is limited to 3 units per 60 day treatment course.

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Billing/Coding/Physician Documentation Information

This policy may apply to the following codes. Inclusion of a code in this section does not guarantee that it will be reimbursed. For further information on reimbursement guidelines, please see Administrative Policies on the Blue Cross Blue Shield of North Carolina web site at www.bcsnc.com. They are listed in the Category Search on the Medical Policy search page.

Applicable codes: 77301, 77338, 77385, 77386, G6015, G6016

BCBSNC may request medical records for determination of medical necessity. When medical records are requested, letters of support and/or explanation are often useful, but are not sufficient documentation unless all specific information needed to make a medical necessity determination is included.

Scientific Background and Reference Sources

National Institutes of Health (NIH) Using Intensity Modulated Radiation Therapy (IMRT) for Brain Metastases. Retrieved on October 1, 2010 from <http://clinicaltrials.gov/ct2/show/NCT00328575>

Minniti G, Amichetti M, Enrici RM. Radiotherapy and radiosurgery for benign skull base meningiomas. *Radiat Oncol*. 2009 Oct 14;4:42. Retrieved on October 1, 2010 from <http://www.royal.socmed.com/content/4/1/42>

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BCBSA Medical Policy Reference Manual [Electronic Version]. 8.01.59, 4/11/13

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BCBSA Medical Policy Reference Manual [Electronic Version]. 8.01.59, 4/10/14

Specialty Matched Consultant Advisory Panel 6/2014

BCBSA Medical Policy Reference Manual [Electronic Version]. 8.01.59, 4/23/15

Specialty Matched Consultant Advisory Panel 5/2015

Specialty Matched Consultant Advisory Panel 5/2016

BCBSA Medical Policy Reference Manual [Electronic Version]. 8.01.59, 8/11/16

Specialty Matched Consultant Advisory Panel 5/2017

BCBSA Medical Policy Reference Manual [Electronic Version]. 8.01.59, 7/13/17

Specialty Matched Consultant Advisory Panel 5/2018

Medical Director review 5/2018

BCBSA Medical Policy Reference Manual [Electronic Version]. 8.01.59, 7/12/18

Medical Director review 11/2018

Specialty Matched Consultant Advisory Panel 5/2019

BCBSA Medical Policy Reference Manual [Electronic Version]. 8.01.59, 7/11/19

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Final results of NRG Oncology CC001, *International Journal of Radiation Oncology, Biology, Physics* (2023), <https://doi.org/10.1016/j.ijrobp.2023.04.030>

Policy Implementation/Update Information

- 10/26/10 New policy implemented. Intensity Modulated Radiation Therapy (IMRT) may be considered medically necessary for the treatment of malignant (primary and secondary) and benign neoplasms of the Central Nervous System (CNS), including brain, brain stem, and spinal cord, when those lesions are in close proximity to the optic nerve or brain stem.
- 9/13/11 Specialty Matched Consultant Advisory Panel review 8/31/2011. No changes to policy statement. (lpr)
- 11/13/12 Extensively revised the Description and Policy Guidelines sections. Deleted table for radiation tolerance doses. Under “When Covered” section: added statement 3)IMRT dosimetry demonstrates reduced toxicity of non-target areas. No change to policy statement. Specialty Matched Consultant Advisory Panel review 8/15/12. (lpr)
- 6/11/13 Specialty Matched Consultant Advisory Panel review meeting 5/15/2013. No changes to policy statement. Reference added. (lpr)
- 7/29/14 Specialty matched consultant advisory panel review meeting 6/24/2014. No changes to policy statement. Reference added. (lpr)
- 12/30/14 Added CPT codes 77385, 77386 and HCPCS codes G6015, G6016; Deleted CPT codes 77418, 0073T from Billing/Coding section effective 1/1/2015 for code update. (lpr)
- 7/1/15 Under Policy Guidelines section added the statement: “CPT 77338 is reported once per IMRT plan and is limited to 3 units per 60 day treatment course.” Also added “Maximum Units of Service” to Related Policies under Description section. Reference added. Specialty Matched Consultant Advisory Panel review 5/27/2015. No change to policy statement. (lpr)
- 7/1/16 Specialty Matched Consultant Advisory Panel review 5/25/2016. No change to policy statement. (lpr)
- 10/25/16 Updated Description and Policy Guidelines sections. No change to policy statement. Reference added. (lpr)
- 6/30/17 Specialty Matched Consultant Advisory Panel review 5/31/2017. No change to policy statement. (lpr)
- 8/25/17 Reference added. No change to policy statement. (lpr)
- 6/8/18 Specialty Matched Consultant Advisory Panel review 5/2018. No changes to policy statements. Medical Director review 5/2018. (mco)

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- 11/30/18 Updated Policy Guidelines section. No change to policy statement. Medical Director review 11/2018. Reference added. (lpr)
- 5/28/19 Specialty Matched Consultant Advisory Panel review 5/15/2019. No changes to policy statement. (lpr)
- 6/9/20 Specialty Matched Consultant Advisory Panel review 5/20/20. Updated Regulatory Status. Reference added. No change to policy statement. (lpr)
- 6/15/21 Specialty Matched Consultant Advisory Panel review 5/19/2021. Reference added. No change to policy statement. (lpr)
- 5/31/22 Specialty Matched Consultant Advisory Panel review 5/18/2022. Added Radiation Therapy Services to related policies section. No change to policy statement. (lpr)
- 6/12/23 Specialty Matched Consultant Advisory Panel review 5/17/2023. Updated policy guidelines and reference added. No change to policy statement. (lpr)

Medical policy is not an authorization, certification, explanation of benefits or a contract. Benefits and eligibility are determined before medical guidelines and payment guidelines are applied. Benefits are determined by the group contract and subscriber certificate that is in effect at the time services are rendered. This document is solely provided for informational purposes only and is based on research of current medical literature and review of common medical practices in the treatment and diagnosis of disease. Medical practices and knowledge are constantly changing and BCBSNC reserves the right to review and revise its medical policies periodically.