

Medical Policy

Intensity Modulated Radiation Therapy, Outpatient

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Product Applicability

All Plan⁺ Products

WellSense Health Plan

- NH Medicaid
- NH Medicare Advantage

Boston Medical Center HealthNet Plan

- MassHealth ACO
- MassHealth MCO
- Qualified Health Plans/ConnectorCare/Employer Choice Direct
- Senior Care Options

+ Note: Disclaimer and audit information is located at the end of this document.

Policy Summary

The Plan considers intensity modulated radiation therapy (IMRT) with or without stereoscopic x-ray guidance to be **medically necessary** when Plan medical criteria are met. Prior authorization is required for IMRT when it is provided in an outpatient setting, as specified in the Medical Policy Statement section of this policy. All inpatient admissions require Plan prior authorization, as stated in the *Prior Authorization/Notification Requirements Matrix* available at www.bmchp.org for BMC HealthNet Plan products and www.wellsense.org for the WellSense Health Plan products. IMRT conducted during an authorized inpatient stay does NOT require a separate Plan authorization.

Clinical Criteria

According to the American Society for Radiation Oncology (ASTRO), intensity modulated radiation therapy (IMRT) should be considered the standard of care for radiation therapy for some anatomical locations such as the head and neck area (e.g., nasopharynx, oropharynx, hypopharynx, and larynx/except for early true vocal cord cancer), prostate, anus, and the central nervous system (e.g., brain, brain stem, and/or spinal cord); for other anatomical sites, documentation of the clinical benefit of using IMRT as the most appropriate treatment option for the member's condition is required. The

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Plan considers IMRT with or without stereoscopic x-ray guidance to be medically necessary when billed with a covered CPT code and/or HCPCS code (as specified in the Applicable Coding section) and EITHER of the criteria in item 1 or item 2 is met and documented in the member's medical record:

1. Prior authorization is **NOT** required for IMRT provided in an outpatient setting, either with or without stereoscopic x-ray guidance, when IMRT is used to treat for ANY of the conditions listed in items a through f according to standards that are consistent with current, applicable practice guidelines recommended by the American College of Radiology (ACR), the American Society for Radiation Oncology (ASTRO), and/or the National Comprehensive Cancer Network (NCCN) **ONLY when the service is billed with a waived PRINCIPLE (primary) ICD-10 diagnosis code** included in the Applicable Coding section and the principle (primary) diagnosis code identifies the type or location of the malignancy or tumor being treated:
 - a. Malignant lesions (carcinoma) of the **anus/anal canal**; ∞ OR
 - b. Malignant lesions (carcinoma) of the **prostate**; ∞ OR
 - c. Malignant lesions (carcinoma) of the **vulva**; ∞ OR
 - d. Primary tumors, metastatic tumors, and/or benign tumors of the **central nervous system** including the brain, brain stem, and/or spinal cord; ∞ OR
 - e. Merkel cell carcinoma of lip, eyelid, ear and external auricular canal, parts of face, scalp, and/or neck; ∞ OR
 - f. Primary tumors, metastatic tumors, and/or lymphoma with lymph node involvement of the **head and neck area** which may include but is not limited to ANY of the anatomical sites listed in items (1) through (11):
 - (1) Aerodigestive tract (i.e., the mixed airway/gastrointestinal tract that includes lips, mouth, tongue, nose, throat, trachea, and/or upper third of the esophagus); ∞ OR
 - (2) Cochlear; ∞ OR
 - (3) Larynx (except true vocal cord cancer€ since the use of IMRT for early true vocal cord cancer is NOT considered a standard of care); ∞ OR

€ Note: True vocal cord cancer is a type of laryngeal cancer in the glottis (i.e., middle part of the larynx) where cancer occurs in one or both vocal cords. The use of IMRT to treat a member with a diagnosis of malignant neoplasm of the glottis requires prior authorization with Medical Director review to determine if IMRT is the most appropriate treatment option for the member's condition and stage of cancer (since

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the treatment of early true vocal cord cancer with IMRT is NOT the standard of care). The ICD-10 diagnosis code for malignant neoplasm of the glottis is NOT waived for prior authorization, as specified in the Applicable Coding section.

- (4) Lens;∞ OR
- (5) Retina;∞ OR
- (6) Optic chiasm;∞ OR
- (7) Orbits;∞ OR
- (8) Salivary glands;∞ OR
- (9) Sinuses;∞ OR
- (10) Skull base;∞ OR
- (11) Thyroid;∞ OR

∞ Note: Prior authorization is REQUIRED for conditions specified above when IMRT will NOT be billed with a waived principle/primary ICD-10 diagnosis code listed in the Applicable Coding section. For example, IMRT billed with ICD-10 principle diagnosis code Z51.0 as an encounter for antineoplastic radiation therapy REQUIRES prior authorization in all circumstances and regardless of secondary or additional ICD-10 diagnosis codes billed.

- 2. Plan prior authorization is **REQUIRED** for all other uses of IMRT provided in an outpatient setting and ALL of the criteria in items a through c must be met:
 - a. The member has a radiosensitive tumor; AND
 - b. The treatment plan and delivery of IMRT will be customized based on the member's medical condition/physical status according to standards that are consistent with current, applicable practice guidelines (including specific dose-volume threshold for the member's clinical indication, including tumor and adjacent tissues) recommended by the American College of Radiology (ACR), the American Society for Radiation Oncology (ASTRO), and/or the National Comprehensive Cancer Network (NCCN); AND
 - c. ANY of the criteria in items (1) through (3) is met:
 - (1) The treating provider has determined that the member's true vocal cord cancer meets BOTH of the criteria in items (a) and (b):

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- (a) True vocal cord cancer has progressed beyond the early stage and is categorized as T3 or greater and N1 or greater according to the AJCC staging system for the glottis (rather than early true vocal cord cancer categorized as T1/T2 and N0); AND
 - (b) IMRT is a more appropriate treatment option than conventional radiotherapy; OR
- (2) The member is diagnosed with stage III non-small cell lung cancer; OR
- (3) The use of standard external beam radiation therapy or 3D conformal radiation therapy is NOT appropriate for the member because ANY of the conditions listed in items (a) through (f) is present:
- (a) The target volume is in close proximity to critical structures that must be protected and a 3D conformal plan cannot safely deliver the desired dose of radiation without exceeding dose constraints (i.e., dose restriction to maintain adequate level of protection) for those critical structures; OR
 - (b) The volume of interest must be covered with narrow margins to adequately protect immediately adjacent structures and a non-IMRT technique would substantially increase the probability of clinically meaningful normal tissue toxicity; OR
 - (c) An immediately adjacent area has been previously irradiated and abutting portals must be established with high precision; OR
 - (d) The target volume is concave or convex, and the critical normal tissues are within or around that convexity or concavity and a non-IMRT technique would substantially increase the probability of clinically meaningful normal tissue toxicity; OR
 - (e) Dose escalation is planned to deliver radiation doses in excess of those commonly utilized for similar tumors with conventional treatment; OR
 - (f) Greater target dose homogeneity is required in targeted area(s) prone to hot spots/dose variation (e.g., treatment for a member with large breast volume who is diagnosed with invasive breast cancer).

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Limitations and Exclusions

1. Plan Medical Director Review is required when the Plan's medical necessity criteria are NOT met; requests will be evaluated based on current guidelines specified in the American Society for Radiation Oncology (ASTRO) Model Policy for IMRT and applicable National Comprehensive Cancer Network (NCCN) guidelines.
2. According to the American Society for Radiation Oncology (ASTRO) Model Policy for IMRT, IMRT is typically NOT medically appropriate for ANY of the clinical conditions in items a through e:
 - a. Clinical conditions where IMRT does not offer an advantage over conventional or three-dimensional conformal radiation therapy techniques that deliver good clinical outcomes and low toxicity; OR
 - b. Clinical urgency, such as spinal cord compression, superior vena cava syndrome or airway obstruction; OR
 - c. Palliative treatment for metastatic disease where the prescribed dose does NOT approach normal tissue tolerances; OR
 - d. Inability to accommodate for organ motion, such as for a mobile lung tumor; OR
 - e. Inability of the member to cooperate and tolerate immobilization to permit accurate and reducible dose delivery.

Variations

The Plan uses guidance from the Centers for Medicare & Medicaid Services (CMS) for medical necessity and coverage determinations for Senior Care Options (SCO) members and WellSense Medicare Advantage HOM members, including but not limited to national coverage determinations (NCCDs), local coverage determinations (LCDs), local coverage articles (LCAs), and documentation included in Medicare manuals. At the time of the Plan's most recent policy review, no applicable clinical guidelines were found. Verify CMS criteria in effect for the requested service on the date of the prior authorization request for a SCO or WellSense Medicare Advantage HMO member. When there is no guidance from CMS for the requested service for the specified indication on the date of the prior authorization request, Plan-adopted clinical review criteria will be used to determine the medical necessity of the service.

Applicable Coding

The Plan uses and adopts up-to-date Current Procedural Terminology (CPT) codes from the American Medical Association (AMA), International Statistical Classification of Diseases and Related Health Problems, 10th revision (ICD-10) diagnosis codes developed by the World Health Organization and adapted in the United States by the National Center for Health Statistics (NCHS) of the Centers for

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Disease Control under the U.S. Department of Health and Human Services, and the Health Care Common Procedure Coding System (HCPCS) established and maintained by the Centers for Medicare & Medicaid Services (CMS). Since the AMA, NCHS, and CMS may update codes more frequently or at different intervals than Plan policy updates, the list of applicable codes included in this Plan policy is for informational purposes only, may not be all inclusive, and is subject to change without prior notification. Whether a code is listed in the Applicable Coding section of this Plan policy does not constitute or imply member coverage or provider reimbursement. Providers are responsible for reporting all services using the most up-to-date industry-standard procedure and diagnosis codes as published by the AMA, NCHS, and CMS at the time of the service.

Providers are responsible for obtaining prior authorization for the services specified in the Clinical Criteria and Limitations and Exclusions sections, even if an applicable code appropriately describing the service that is the subject of this Plan policy is not included in the Applicable Coding section of this Plan policy. Review the Plan’s reimbursement policies for Plan billing guidelines. Coverage for services is subject to benefit eligibility under the member’s benefit plan in effect at the time of the service. Member benefit documents are available at the following websites: www.bmchp.org for BMC HealthNet Plan members, www.SeniorsGetMore.org for Senior Care Options members, www.wellsense.org for WellSense New Hampshire Medicaid members, and www.WellSense.org/Medicare for WellSense Medicare Advantage HMO members.

CPT Codes	Description: Codes Covered for IMRT-Related Services When Medically Necessary
77301	Intensity modulated radiotherapy plan, including dose-volume histograms for target and critical structure partial tolerance specifications
77338	Multi-leaf collimator (MLC) device(s) for intensity modulated radiation therapy (IMRT), design and construction per IMRT plan
77385	Intensity modulated radiation treatment delivery (IMRT), includes guidance and tracking, when performed; simple Plan note: This code should ONLY be used for the technical component of the service. Code is NOT payable for WellSense New Hampshire Medicaid, WellSense Medicare Advantage HMO, and Senior Care Options (SCO) products.
77386	Intensity modulated radiation treatment delivery (IMRT), includes guidance and tracking, when performed; complex Plan note: This code should ONLY be used for the technical component of the service. Code is NOT payable for WellSense Medicare Advantage HMO and Senior Care Options (SCO) products.

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HCPCS Codes	Description: Codes Covered for IMRT-Related Services When Medically Necessary
G6015	<p>Intensity modulated treatment delivery, single or multiple fields/arcs, via narrow spatially and temporally modulated beams, binary, dynamic MLC, per treatment session</p> <p>Plan note: Code should ONLY be used for the technical component of the service. Code is ONLY payable for the WellSense New Hampshire Medicaid and Senior Care Options products.</p>
G6016	<p>Compensator-based beam modulation treatment delivery of inverse planned treatment using 3 or more high resolution (milled or cast) compensator, convergent beam modulated fields, per treatment session</p> <p>Plan note: Code should ONLY be used for the technical component of the service. Code is ONLY payable for the WellSense New Hampshire and Senior Care Options products.</p>

ICD-10 Diagnosis Codes	Description: Applicable Diagnosis Codes That May NOT Require Prior Authorization to Establish Medical Necessity of IMRT
	<p>Prior authorization is NOT required when ALL of the following Plan guidelines are met:</p> <ol style="list-style-type: none"> 1. IMRT is used for the treatment of one (1) of the following ICD-10 principle/primary diagnosis codes and is billed with a covered CPT code and/or HCPCS code, as specified above in this section; AND 2. To qualify for a waiver of the prior authorization requirement, one (1) of the listed ICD-10 diagnosis codes in this Applicable Coding section must be billed in the principal/primary diagnosis field. The principle/primary diagnosis code must identify the type or location of the malignancy or tumor being treated. <p>Prior authorization is REQUIRED for the following:</p> <ol style="list-style-type: none"> 1. ALL other billed principle/primary ICD-10 diagnosis codes REQUIRE Plan prior authorization for IMRT provided in an outpatient setting for any indication and regardless of the billed secondary or additional ICD-10 diagnosis codes (e.g., Z51.0 principle ICD-10 diagnosis code billed as an encounter for antineoplastic radiation therapy requires prior authorization); and/or 2. When any of the following ICD-10 diagnosis codes are NOT billed in the principle/primary diagnosis field, Plan prior authorization is REQUIRED for IMRT provided in an outpatient setting regardless of the member’s medical condition (i.e., prior authorization is REQUIRED even when the following ICD-10 diagnosis codes are billed as a secondary or additional diagnosis).
C00.0-C14.8	Malignant neoplasm of lip, oral cavity and pharynx

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C15.3	Malignant neoplasm of upper third of esophagus
C21.0-C21.8	Malignant neoplasm of anus and anal canal
C30.0-C30.1	Malignant neoplasm of nasal cavity and middle ear
C31.0-C31.9	Malignant neoplasm of accessory sinuses
C32.1	Malignant neoplasm of supraglottis
C32.2	Malignant neoplasm of subglottis
C32.3	Malignant neoplasm of laryngeal cartilage
C32.8	Malignant neoplasm of overlapping sites of larynx
C32.9	Malignant neoplasm of larynx, unspecified Plan note: This diagnosis code should not be used for true vocal cord cancer; prior authorization is required for the use of IMRT to treat a member with true vocal cord cancer/malignant neoplasm of the glottis. The ICD-10 diagnosis code for malignant neoplasm of the glottis is NOT listed as a waived primary diagnosis code.
C33	Malignant neoplasm of trachea
C41.0-C41.1	Malignant neoplasm of bones of skull, face and mandible
C43.0-C43.4	Malignant melanoma of skin of head and neck
C44.00-C44.09	Other and unspecified malignant neoplasm of skin of lip
C44.101-C44.1992	Other and unspecified malignant neoplasm of skin of eyelid, including canthus
C44.201-C44.299	Other and unspecified malignant neoplasm of skin of ear and external auricular canal
C44.300-C44.399	Other and unspecified malignant neoplasm of skin of other and unspecified parts of face
C44.40-C44.49	Other and unspecified malignant neoplasm of skin of scalp and neck
C49.0	Malignant neoplasm of connective and soft tissue of head, face and neck
C4A.0-C4A.4	Merkel cell carcinoma
C51.0-C51.9	Malignant neoplasm of vulva
C61	Malignant neoplasm of prostate
C69.00-C69.92	Malignant neoplasm of eye and adnexa
C70.0-C71.9	Malignant neoplasm of meninges and brain
C72.0-C72.9	Malignant neoplasm of spinal cord, cranial nerves and other parts of the central nervous system
C73	Malignant neoplasm of thyroid gland
C75.0-C75.3	Malignant neoplasm of parathyroid, pituitary and pineal glands and craniopharyngeal duct
C76.0	Malignant neoplasm of other and ill-defined sites of head, face and neck
C77.0	Secondary and unspecified malignant neoplasm of lymph nodes of head, face and neck
C79.31-C79.32	Secondary malignant neoplasm of brain and cerebral meninges

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C81.01, C81.11, C81.21, C81.31, C81.41, C81.71, C81.91	Hodgkin lymphoma, lymph nodes of head, face, and neck
C82.01, C82.11, C82.21, C82.31, C82.41, C82.51, C82.61, C82.81, C82.91	Follicular lymphoma, lymph nodes of head, face, and neck
C83.01, C83.11, C83.31, C83.51, C83.71, C83.81, C83.91	Non-follicular lymphoma, lymph nodes of head, face, and neck
C84.01, C84.11, C84.41, C84.61, C84.71, C84.91, C84.A1, C84.Z1	Mature T/NK-cell lymphomas, lymph nodes of head, face, and neck
C85.11, C85.21, C85.81, C85.91	Other and unspecified types of non-Hodgkin lymphoma, lymph nodes of head, face and neck
C86.0	Extranodal NK/T-cell lymphoma, nasal type
D00.00-D00.08	Carcinoma in situ of lip, oral cavity and pharynx
D01.3	Carcinoma in situ of anus and anal canal
D02.0	Carcinoma in situ of larynx
D02.1	Carcinoma in situ, trachea
D03.0	Melanoma in situ of lip
D03.10-D03.122	Melanoma in situ of eyelid, including canthus
D03.20-D03.22	Melanoma in situ of ear and external auricular canal
D03.30-D03.39	Melanoma in situ of unspecified part of face
D03.4	Melanoma in situ of scalp and neck
D04.0-D04.4	Carcinoma in situ of skin of head and neck
D07.5	Carcinoma in situ of prostate
D09.20-D09.22	Carcinoma in situ of eye
D09.3	Carcinoma in situ of thyroid and other endocrine glands
D32.0-D32.9	Benign neoplasm of meninges
D33.0-D33.9	Benign neoplasm of brain and other parts of central nervous system
D35.2	Benign neoplasm of pituitary gland
D35.3	Benign neoplasm of craniopharyngeal duct
D35.4	Benign neoplasm of pineal gland
D43.0-D43.9	Neoplasm of uncertain behavior of brain and central nervous system
D44.3	Neoplasm of uncertain behavior of pituitary gland

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D44.4	Neoplasm of uncertain behavior of craniopharyngeal duct
D44.5	Neoplasm of uncertain behavior of pineal gland

References

Agency for Healthcare Research and Quality (AHRQ). Ratko TA, Douglas G, de Souza JA, Belinson SE, Aronson N. Radiotherapy Treatments for Head and Neck Cancer Update. Comparative Effectiveness Review No. 144. Rockville, MD. 2014.

Agency for Healthcare Research and Quality (AHRQ). Samson DM, Ratko TA, Rothenberg BM, Brown HM, Bonnell CJ, Ziegler KM, Aronson N. Comparative Effectiveness and Safety of Radiotherapy Treatments for Head and Neck Cancer. Comparative Effectiveness Review No. 20. Rockville, MD. 2010.

Ahamad A, Weed DT, Pruett DD, Saulpaugh D, Neeranjan W, Fernandez E. Definitive radiotherapy for a head and neck Merkel cell carcinoma and comprehensive nodal volumes: a case for using a computer-designed variable-thickness compensator to reduce risk and severity of mucositis. *Med Dosim.* 2018 Spring; 43(1):69-73. doi: 10.1016/j.meddos.2017.08.006. Epub 2017 Oct 12. PMID: 29031904.

Aktan M, Koc M, Kanyilmaz G. Survival following reirradiation using intensity-modulated radiation therapy with temozolomide in selected patients with recurrent high grade gliomas. *Ann Transl Med.* 2015 Nov; 3(20):304. doi: 10.3978/j.issn.2305-5839.2015.11.29. PMID: 26697464.

American Cancer Society. Radiation Therapy for Vulvar Cancer.

American College of Radiology (ACR). ACR Practice Parameter for Intensity Modulated Radiation Therapy (IMRT). Revised 2016. Resolution 40.

American College of Radiology (ACR), American Society for Radiation Oncology (ASTRO). ACR-ASTRO Practice Parameter for Radiation Oncology. Revised 2018.

American College of Radiology (ACR). Chang JY, Kestin LL, Barriger RB, Chetty IJ, Ginsburg ME, Kumar S, Loo BW Jr, Movsas B, Rimner A, Rosenzweig KE, Stinchcombe TE, Videtic GM, Willers H, Expert Panel on Radiation Oncology-Lung. ACR Appropriateness Criteria® nonsurgical treatment for locally advanced non-small-cell lung cancer: good performance status/definitive intent Oncology (Williston Park). 2014 Aug 15; 28(8):706-10, 712, 714 passim. PMID: 25140629.

American College of Radiology (ACR). Expert Panel on Radiation Oncology – Hong TS, Pretz JL, Herman JM, Abdel-Wahab M, Azad N, Blackstock AW, Das P, Goodman KA, Jabbour SK, Jones WE 3rd, Konski AA, Koong AC, Rodriguez-Bigas M, Small W Jr, Thomas CR Jr, Zook J, Suh WW. ACR Appropriateness Criteria®- Anal Cancer. *Gastrointest Cancer Res.* 2014 Jan; 7(1):4-14. PMID: 24558509.

American College of Radiology (ACR). Expert Panel on Radiation Oncology – Park CC, Sethi RA, Bailey L, Chadha M, Dutton SC, Freedman GM, Kaufman SA, Maletz Novic KL, Rabinovitch RA, Rewari A, Rudoler

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SB, Sub WW, Toppmeyer D, Walker EM, Zook JE, Harris EER. ACR Appropriateness Criteria® Conservative Surgery and Radiation – Stage I and II Breast Cancer. 1996. Last Review Date 2015.

American College of Radiology (ACR). Jones WE III, Thomas CR Jr, Herman JM, Abdel-Wahab M, Azad N, Blackstock W, Das P, Goodman KA, Hong TS, Jabbour SK, Konski AA, Koong AC, Rodriguez-Bigas M, Small W Jr, Zook J, Suh WW. ACR Appropriateness Criteria® Resectable Rectal Cancer. Radiation Oncology 2012; 7:161. doi: <https://doi.org/10.1186/1748-717x-7-161>.

The American Joint Committee on Cancer (AJCC). Edge S, Byrd D, Compton C. The AJCC: the 7th edition of the AJCC cancer staging manual and the future of TNM. AJCC Tumor-Node-Metastasis (TNM) Staging System for the Larynx. Ann Surg Oncol. 2010 Jun; 17(6):1471-4. doi: 10.1245/s10434-010-0985-4. PMID: 20180029.

American Society of Clinical Oncology (ASCO). Correa C, Harris EE, Leonardi MC, Smith BD, Taghian AG, Thompson AM, White J, Harris JR. Accelerated Partial Breast Irradiation: Executive summary for the update of an ASTRO Evidence-Based Consensus Statement. Practical Radiation Oncology. 2017; 7:73-9.

American Society of Clinical Oncology (ASCO). Freedland SJ, Rumble RB, Finelli A, Chen RC, Slovin S, Stein MN, Mendelson DS, Wackett C, Sandler HM; American Society of Clinical Oncology. Adjuvant and salvage radiotherapy after prostatectomy: American Society of Clinical Oncology clinical practice guideline endorsement. J Clin Oncol. 2014 Dec 1; 32(34):3892-8. doi: 10.1200/JCO.2014.58.8525. Epub 2014 Nov 3. PMID: 25366677.

American Society of Clinical Oncology (ASCO). Guidelines, Tools, & Resources. Guidelines by Clinical Area.

American Society for Radiation Oncology (ASTRO). ASTRO Model Policies. Intensity Modulated Radiation Therapy (IMRT). Updated 2019 Jun 6.

American Society for Radiation Oncology (ASTRO). Clinical Practice Statements.

American Society for Radiation Oncology (ASTRO). News and Publications. ASTRO issues guidelines for use of stereotactic radiation in early-stage lung cancer. 2017 Jun 11.

Balaji K, Subramanian B, Yadav P, Anu Radha C, Ramasubramanian V. Radiation therapy for breast cancer: Literature review. Med Dosim. 2016 Autumn; 41(3):253-7. doi: 10.1016/j.meddos.2016.06.005. PMID: 27545009.

Beriwal S, Shukla G, Shinde A, Heron DE, Kelley JL, Edwards RP, Sukumvanich P, Richards S, Olawaiye AB, Krivak TC. Preoperative intensity modulated radiation therapy and chemotherapy for locally advanced vulvar carcinoma: analysis of pattern of relapse. Int J Radiat Oncol Biol Phys. 2013 Apr 1; 85(5):1269-74. doi: 10.1016/j.ijrobp.2012.11.012. Epub 2012 Dec 27. PMID: 23273997.

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Bezjak A, Rumble RB, Rodrigues G, Hope A, Warde P; Members of the IMRT Indications Expert Panel. Intensity-modulated radiotherapy in the treatment of lung cancer. *Clin Oncol (R Coll Radiol)*. 2012 Sep; 24(7):508-20. doi: 10.1016/j.clon.2012.05.007. Epub 2012 Jun 20. PMID: 22726417.

Buwenge M, Cammelli S, Ammendolia I, Tolento G, Zamagni A, Arcelli A, Macchia G, Deodato F, Cilla S, Morganti AG. Intensity modulated radiation therapy for breast cancer: current perspectives. *Breast Cancer (Dove Med Press)*. 2017 Mar 6; 9:121-6. doi: 10.2147/BCTT.S113025. eCollection 2017. PMID: 28293119.

Canyilmaz E, Uslu GD, Colak F, Hazeral B, Hacıislamoglu E, Zengin AY, Sari A, Yoney A. Comparison of dose distributions hippocampus in high grade gliomas irradiation with linac-based IMRT and volumetric arc therapy: a dosimetric study. *Springerplus*. 2015 Mar 5; 4:114. doi: 10.1186/s40064-015-0894-x. eCollection 2015. PMID: 25815244.

Castaneda SA, Romak LB. Radiotherapy for Anal Cancer: Intensity-Modulated Radiotherapy and Future Directions. *Surg Oncol Clin N Am*. 2017 Jul; 26(3):467-475. doi: 10.1016/j.soc.2017.01.004. Epub 2017 May 11. PMID: 28576183.

Chan TY, Tan PW, Tang JI. Intensity-modulated radiation therapy for early-stage breast cancer: is it ready for prime time? *Breast Cancer (Dove Med Press)*. 2017 Mar 20; 9:177-183. doi: 10.2147/BCTT.S127583. eCollection 2017. PMID: 28360536.

Centers for Medicare & Medicaid Services (CMS). Comparative evaluation of radiation treatments for clinically localized prostate cancer: an update.

Centers for Medicare & Medicaid Services (CMS). Manuals. Publication # 100-02. Medicare Benefit Policy Manual.

Centers for Medicare & Medicaid Services (CMS). Manuals. Publication # 100-03. Medicare National Coverage Determinations (NCD) Manual.

Centers for Medicare & Medicaid Services (CMS). Medicare Coverage Database (MCD) Reports.

Centers for Medicare & Medicaid Services (CMS). Transmittals.

Chen AL, Kim J, Boucher K, Terakedis B, Williams B, Nickman NA, Gaffney, DK. Toxicity and cost-effectiveness analysis of intensity modulated radiation therapy versus 3-dimensional conformal radiation therapy for postoperative treatment of gynecologic cancers. *Gynecol Oncol*. 2015 Mar; 136(3):521-8. doi: 10.1016/j.ygyno.2014.12.039. Epub 2015 Jan 3. PMID: 25562668.

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Chuong MD, Freilich JM, Hoffe SE, Fulp W, Weber JM, Almhanna K, Dinwoodie W, Rao N, Meredith KL, Shridhar R. Intensity-Modulated Radiation Therapy vs. 3D Conformal Radiation Therapy for Squamous Cell Carcinoma of the Anal Canal. *Gastrointest Cancer Res.* 2013 Mar; 6(2):39–45. PMID: 2374515.

Commonwealth of Massachusetts. Division of Insurance (DOI) Bulletins.

Commonwealth of Massachusetts. MassHealth Provider Bulletins

Commonwealth of Massachusetts. MassHealth Provider Manuals.

Commonwealth of Massachusetts. MassHealth Transmittal Letters.

Corbin KS, Kunnavakkam R, Eggener SE, Liauw SL. Intensity modulated radiation therapy after radical prostatectomy: Early results show no decline in urinary continence, gastrointestinal, or sexual quality of life. *Pract Radiat Oncol.* 2013 Apr-Jun; 3(2):138-44. doi: 10.1016/j.ppro.2012.05.005. Epub 2012 Jun 13. PMID: 24674317.

D'Souza DP, Rumble RB, Fyles A, Yaremko B, Warde P; Members of the IMRT Indications Expert Panel. Intensity-modulated radiotherapy in the treatment of gynaecological cancers. *Clin Oncol (R Coll Radiol).* 2012 Sep; 24(7):499-507. doi: 10.1016/j.clon.2012.05.005. Epub 2012 Jun 13. PMID: 22703725.

Edwards AA, Keggin E, Plowman PN. The developing role for intensity-modulated radiation therapy (IMRT) in the non-surgical treatment of brain metastases. *Br J Radiol.* 2010 Feb; 83(986):133-6. doi: 10.1259/bjr/28596848. Epub 2009 Dec 17. PMID: 20019176.

Ferrigno R, Santos A, Martins LC, Weltman E, Chen MJ, Sakuraba R, Lopes CP, Cruz JC. Comparison of conformal and intensity modulated radiation therapy techniques for treatment of pelvic tumors. Analysis of acute toxicity. *Radiat Oncol.* 2010 Dec 14; 5:117. doi: 10.1186/1748-717X-5-117. PMID: 21156076.

Fredman ET, Abdel-Wahab M, Kumar AMS. Influence of radiation treatment technique on outcome and toxicity in anal cancer. *J Radiat Oncol.* 2017; 6(4):413-21. doi: 10.1007/s13566-017-0326-3. Epub 2017 Aug 22. PMID: 29213359.

Gaffney DK, King B, Viswanathan AN, Barkati M, Beriwal S, Eifel P, Erickson B, Fyles A, Goulart J, Harkenrider M, Jhingran A, Klopp A, Koh WJ, Lim K, Petersen I, Portelance L, Small W Jr, Stewart A, Wiebe E, Wolfson A, Yashar C, Bosch W. Consensus Recommendations for Radiation Therapy Contouring and Treatment of Vulvar Carcinoma. *Int J Radiat Oncol Biol Phys.* 2016 Jul 15; 95(4):1191-200. doi: 10.1016/j.ijrobp.2016.02.043. Epub 2016 Feb 21. PMID: 27130794.

Intensity Modulated Radiation Therapy, Outpatient

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Gandaglia G, Karakiewicz PI, Briganti A, Trinh QD, Schiffmann J, Tian Z, Kim SP, Nguyen PL, Graefen M, Montorsi F, Sun M, Abdollah F. Intensity-modulated radiation therapy leads to survival benefit only in patients with high-risk prostate cancer: a population-based study. *Ann Oncol*. 2014 May; 25(5):979-86. doi: 10.1093/annonc/mdu087. Epub 2014 Feb 20. PMID: 24562445.

Gasent Blesa JM, Garde Noguera J, Laforga Canales JB, Giner Bosch V, Alberola A, Soler Tortosa M, Peris Godoy M, Sanchez JL, Provencio Pulla M, Alberola Candel V. Phase II trial of concomitant neoadjuvant chemotherapy with oxaliplatin and capecitabine and intensity-modulated radiotherapy (IMRT) in rectal cancer. *J Gastrointest Cancer*. 2012 Dec; 43(4):553-61. doi: 10.1007/s12029-012-9364-7. PMID: 22371167.

Ghosh-Laskar S, Yathiraj PH, Dutta D, Rangarajan V, Purandare N, Gupta T, Budrukkar A, Murthy V, Kannan S, Agarwal JP. Prospective randomized controlled trial to compare 3-dimensional conformal radiotherapy to intensity-modulated radiotherapy in head and neck squamous cell carcinoma: Long-term results. *Head Neck*. 2016 Apr;38 Suppl 1:E1481-7. doi: 10.1002/hed.24263. Epub 2015 Nov 11. PMID: 26561342.

Gondi V, Pugh SL, Tome WA, Caine C, Corn B, Kanner A, Rowley H, Kundapur V, DeNittis A, Greenspoon JN, Konski AA, Bauman GS, Shah S, Shi W, Wendland M, Kachnic L, Mehta MP. Preservation of memory with conformal avoidance of the hippocampal neural stem-cell compartment during whole-brain radiotherapy for brain metastases (RTOG 0933): a phase II multi-institutional trial. *J Clin Oncol*. 2014 Dec 1;32(34):3810-6. doi: 10.1200/JCO.2014.57.2909. Epub 2014 Oct 27. PMID: 25349290.

Gupta T, Wadasadawala T, Master Z, Phurailatpam R, Pai-Shetty R, Jalali R. Encouraging early clinical outcomes with helical tomotherapy-based image-guided intensity-modulated radiation therapy for residual, recurrent, and/or progressive benign/low-grade intracranial tumors: a comprehensive evaluation. *Int J Radiat Oncol Biol Phys*. 2012 Feb 1; 82(2):756-64. doi: 10.1016/j.ijrobp.2010.12.044. Epub 2011 Feb 23. PMID: 21345610.

Guttmann DM, Gabriel P, Kennedy C, Rate W, Grizos W, Nagda S, Wojtowicz L, Lin L, Freedman GM. Comparison of acute toxicities between contemporary forward-planned 3D conformal radiotherapy and inverse-planned intensity-modulated radiotherapy for whole breast radiation. *Breast J*. 2018 Mar; 24(2):128-132. doi: 10.1111/tbj.12857. Epub 2017 Jul 13. PMID: 28703444.

Harris JP, Murphy JD, Hanlon AL, Le QT, Loo BW Jr, Diehn M. A population-based comparative effectiveness study of radiation therapy techniques in stage III non-small cell lung cancer. *Int J Radiat Oncol Biol Phys*. 2014 Mar 15; 88(4):872-84. doi: 10.1016/j.ijrobp.2013.12.010. Epub 2014 Feb 1. PMID: 24495591.

Hayes. Health Technology Assessment. Accelerated Partial Breast Irradiation for Breast Cancer Using Conformal and Intensity-Modulated Radiation Therapy. Dallas, TX: Hayes; 2016 Oct 20. Annual Review 2021 Mar 3.

Intensity Modulated Radiation Therapy, Outpatient

* Plan refers to Boston Medical Center Health Plan, Inc. and its affiliates and subsidiaries offering health coverage plans to enrolled members. The Plan operates in Massachusetts under the trade name Boston Medical Center HealthNet Plan and in other states under the trade name WellSense New Hampshire Health Plan.

Ho AY, Ballangrud A, Li G, Gupta GP, McCormick B, Gewanter R, Gelblum D, Zinovoy M, Mueller B, Mychalczak B, Dutta P, Borofsky K, Parhar P, Reyngold M, Braunstein LZ, Chawla M, Krause K, Freeman N, Siu CT, Cost Z, Arnold BB, Zhang Z, Powell SN. Long-Term Pulmonary Outcomes of a Feasibility Study of Inverse-Planned, Multibeam Intensity Modulated Radiation Therapy in Node-Positive Breast Cancer Patients Receiving Regional Nodal Irradiation. *Int J Radiat Oncol Biol Phys*. 2019 Apr 1; 103(5):1100-8. doi: 10.1016/j.ijrobp.2018.11.045. PMID: 30508620.

Huang CM, Huang MY, Tsai HL, Huang CW, Ma CJ, Lin CH, Huang CJ, Wang JY. A retrospective comparison of outcome and toxicity of preoperative image-guided intensity-modulated radiotherapy versus conventional pelvic radiotherapy for locally advanced rectal carcinoma. *J Radiat Res*. 2017 Mar 1; 58(2):247-59. doi: 10.1093/jrr/rrw098. PMID: 27738080.

Hymel R, Jones GC, Simone CB 2nd. Whole pelvic intensity-modulated radiotherapy for gynecological malignancies: A review of the literature. *Crit Rev Oncol Hematol*. 2015 Jun; 94(3):371-9. doi: 10.1016/j.critrevonc.2014.12.015. Epub 2015 Jan 3. PMID: 25600840.

Jiang ZQ, Yang K, Komaki R, Wei X, Tucker SL, Zhuang Y, Martel MK, Vedam S, Balter P, Zhu G, Gomez D, Lu C, Mohan R, Cox JD, Liao Z. Long-term clinical outcome of intensity-modulated radiotherapy for inoperable non-small cell lung cancer: the MD Anderson experience. *Int J Radiat Oncol Biol Phys*. 2012 May 1; 83(1):332-9. doi: 10.1016/j.ijrobp.2011.06.1963. Epub 2011 Nov 11. PMID: 22079735.

Jolnerovski M, Salleron J, Beckendorf V, Peiffert D, Baumann AS, Bernier V, Huger S, Marchesi V, Chira C. Intensity-modulated radiation therapy from 70Gy to 80Gy in prostate cancer: six-year outcomes and predictors of late toxicity. *Radiat Oncol*. 2017 Jun 16; 12(1):99. doi: 10.1186/s13014-017-0839-3. PMID: 28622770.

Kwak YK, Lee SW, Kay CS, Park HH. Intensity-modulated radiotherapy reduces gastrointestinal toxicity in pelvic radiation therapy with moderate dose. *PLoS One*. 2017 Aug 28; 12(8):e0183339. doi: 10.1371/journal.pone.0183339. eCollection 2017. PMID: 28846718.

Lee KJ, Yoon HI, Chung MJ, Park JY, Bang S, Park SW, Seong JS, Song SY. A Comparison of Gastrointestinal Toxicities between Intensity-Modulated Radiotherapy and Three-Dimensional Conformal Radiotherapy for Pancreatic Cancer. *Gut Liver*. 2016 Mar; 10(2):303-9. doi: 10.5009/gnl15186. PMID: 26470767.

Ling DC, Hess CB, Chen AM, Daly ME. Comparison of Toxicity Between Intensity-Modulated Radiotherapy and 3-Dimensional Conformal Radiotherapy for Locally Advanced Non-small-cell Lung Cancer. *Clin Lung Cancer*. 2016 Jan; 17(1):18-23. doi: 10.1016/j.clc.2015.07.006. Epub 2015 Aug 3. PMID: 26303127.

Intensity Modulated Radiation Therapy, Outpatient

* Plan refers to Boston Medical Center Health Plan, Inc. and its affiliates and subsidiaries offering health coverage plans to enrolled members. The Plan operates in Massachusetts under the trade name Boston Medical Center HealthNet Plan and in other states under the trade name WellSense New Hampshire Health Plan.

Lin Y, Wang B. Dosimetric absorption of intensity-modulated radiotherapy compared with conventional radiotherapy in breast-conserving surgery. *Oncol Lett*. 2015 Jan; 9(1):9-14. Epub 2014 Nov 12. doi: 10.3892/ol.2014.2704. PMID: 25435927.

Lockney NA, Friedman DN, Wexler LH, Sklar CA, Casey DL, Wolden SL. Late Toxicities of Intensity-Modulated Radiation Therapy for Head and Neck Rhabdomyosarcoma. *Pediatr Blood Cancer*. 2016 Sep; 63(9):1608-14. doi: 10.1002/pbc.26061. Epub 2016 May 16. PMID: 27195454.

MacDonald SM, Ahmad S, Kachris S, Vogds BJ, DeRouen M, Gittleman AE, DeWyngaert K, Vlachaki MT. Intensity modulated radiation therapy versus three-dimensional conformal radiation therapy for the treatment of high grade glioma: a dosimetric comparison. *J Appl Clin Med Phys*. 2007 Apr 19; 8(2):47-60. PMID: 17592465.

Mackley HB, Reddy CA, Lee SY, Harnisch GA, Mayberg MR, Hamrahian AH, Suh JH. Intensity-modulated radiotherapy for pituitary adenomas: the preliminary report of the Cleveland Clinic experience. *Int J Radiat Oncol Biol Phys*. 2007 Jan 1; 67(1):232-9. Epub 2006 Nov 2. PMID: 17084541.

Marta GN, Silva V, de Andrade Carvalho H, de Arruda FF, Hanna SA, Gadia R, da Silva JL, Correa SF, Vita Abreu CE, Riera R. Intensity-modulated radiation therapy for head and neck cancer: systematic review and meta-analysis. *Radiother Oncol*. 2014 Jan; 110(1):9-15. doi: 10.1016/j.radonc.2013.11.010. Epub 2013 Dec 13. PMID: 24332675.

Merino T, San Francisco IF, Rojas PA, Bettoli P, Zúñiga A, Besa P. Intensity-modulated radiotherapy versus radical prostatectomy in patients with localized prostate cancer: long-term follow-up. *BMC Cancer*. 2013 Nov 8; 13:530. doi: 10.1186/1471-2407-13-530. PMID: 24209381.

Milker-Zabel S, Zabel-du Bois A, Huber P, Schlegel W, Debus J. Intensity-modulated radiotherapy for complex-shaped meningioma of the skull base: long-term experience of a single institution. *Int J Radiat Oncol Biol Phys*. 2007 Jul 1; 68(3):858-63. Epub 2007 Mar 26. PMID: 17379447.

Naik A, Gurjar OP, Gupta KL, Singh K, Nag P, Bhandari V. Comparison of dosimetric parameters and acute toxicity of intensity-modulated and three-dimensional radiotherapy in patients with cervix carcinoma: A randomized prospective study. *Cancer Radiother*. 2016 Jul; 20(5):370-6. doi: 10.1016/j.canrad.2016.05.011. Epub 2016 Jun 28. PMID: 27368915.

Narayana A, Yamada J, Berry S, Shah P, Hunt M, Gutin PH, Leibel SA. Intensity-modulated radiotherapy in high-grade gliomas: clinical and dosimetric results. *Int J Radiat Oncol Biol Phys*. 2006 Mar 1; 64(3):892-7. PMID: 16458777.

Intensity Modulated Radiation Therapy, Outpatient

* Plan refers to Boston Medical Center Health Plan, Inc. and its affiliates and subsidiaries offering health coverage plans to enrolled members. The Plan operates in Massachusetts under the trade name Boston Medical Center HealthNet Plan and in other states under the trade name WellSense New Hampshire Health Plan.

National Cancer Institute (NCI). Childhood Laryngeal Cancer Tumors Treatment (PDQ®) - Health Professional Version.

National Cancer Institute (NCI). Childhood Nasopharyngeal Cancer Treatment (PDQ®) - Health Professional Version.

National Cancer Institute (NCI). Laryngeal Cancer Treatment (Adult) (PDQ®) - Health Professional Version.

National Cancer Institute (NCI). Merkel Cell Carcinoma Treatment (PDQ®) - Health Professional Version.

National Cancer Institute (NCI). Nasopharyngeal Cancer Treatment (Adult) (PDQ®) - Health Professional Version.

National Cancer Institute (NCI). Non-Small Cell Lung Cancer Treatment (PDQ®) - Health Professional Version.

National Cancer Institute (NCI). Oral Complications of Chemotherapy and Head/Neck Radiation (PDQ®) - Health Professional Version.

National Cancer Institute (NCI). Radiation Therapy to Treat Cancer.

National Comprehensive Cancer Network (NCCN). NCCN Guidelines®. NCCN Guidelines for Treatment of Cancer by Site.

New Hampshire Department of Health and Human Services. Billing Manuals.

New Hampshire Department of Health and Human Services. Provider Notices.

Nutting CM, Morden JP, Harrington KJ, Urbano TG, Bhide SA, Clark C, Miles EA, Miah AB, Newbold K, Tanay MA, Adab F, Jefferies SJ, Scrase C, Yap BK, A'Hern RP, Sydenham MA, Emson M, Hall E; PARSPORT trial management group. Parotid-sparing intensity modulated versus conventional radiotherapy in head and neck cancer (PARSPORT): a phase 3 multicentre randomized controlled trial. *Lancet Oncol.* 2011 Feb; 12(2):127-36. doi: 10.1016/S1470-2045(10)70290-4. Epub 2011 Jan 12. PMID: 21236730.

Pan HY, Jiang J, Hoffman KE, Tang C, Choi SL, Nguyen QN, Frank SJ, Anscher MS, Shih YT, Smith BD. Comparative Toxicities and Cost of Intensity-Modulated Radiotherapy, Proton Radiation, and Stereotactic Body Radiotherapy Among Younger Men With Prostate Cancer. *J Clin Oncol.* 2018 Jun 20; 36(18):1823-1830. doi: 10.1200/JCO.2017.75.5371. Epub 2018 Mar 21. PMID: 29561693.

Intensity Modulated Radiation Therapy, Outpatient

* Plan refers to Boston Medical Center Health Plan, Inc. and its affiliates and subsidiaries offering health coverage plans to enrolled members. The Plan operates in Massachusetts under the trade name Boston Medical Center HealthNet Plan and in other states under the trade name WellSense New Hampshire Health Plan.

Pan XB, Huang ST, Chen KH, Jiang YM, Ma JL, Qu S, Li L, Chen L, Zhu XD. Intensity-modulated radiotherapy provides better quality of life than two-dimensional conventional radiotherapy for patients with stage II nasopharyngeal carcinoma. *Oncotarget*. 2017 Jul 11; 8(28):46211-8. doi: 10.18632/oncotarget.17582. PMID: 28515352.

Paulino AC, Mazloom A, Terashima K, Su J, Adesina AM, Okcu MF, Teh BS, Chintagumpata M. Intensity-modulated radiotherapy (IMRT) in pediatric low-grade glioma. *Cancer*. 2013 Jul 15; 119(14):2654-9. doi: 10.1002/cncr.28118. Epub 2013 Apr 30. PMID: 23633429.

Paulsson AK, McMullen KP, Peiffer AM, Hinson WH, Kearns WT, Johnson AJ, Lesser GJ, Ellis TL, Tatter SB, Debinski W, Shaw EG, Chan MD. Limited margins using modern radiotherapy techniques does not increase marginal failure rate of glioblastoma. *Am J Clin Oncol*. 2014 Apr; 37(2):177-81. doi: 10.1097/COC.0b013e318271ae03. PMID: 23211224.

Peng G, Wang T, Yang KY, Zhang S, Zhang T, Li Q, Han J, Wu G. A prospective, randomized study comparing outcomes and toxicities of intensity-modulated radiotherapy vs. conventional two-dimensional radiotherapy for the treatment of nasopharyngeal carcinoma. *Radiother Oncol*. 2012 Sep; 104(3):286-93. doi: 10.1016/j.radonc.2012.08.013. Epub 2012 Sep 17. PMID: 22995588.

Pignol JP, Truong P, Rakovitch E, Sattler MG, Whelan TJ, Olivetto IA. Ten years results of the Canadian breast intensity modulated radiation therapy (IMRT) randomized controlled trial. *Radiother Oncol*. 2016 Dec; 121(3):414-9. doi: 10.1016/j.radonc.2016.08.021. Epub 2016 Sep 13. PMID: 27637858.

Pinnaduwege DS, Descovich M, Lometti MW, Varad B, Roach M 3rd, Gottschalk AR. An Evaluation of Robotic and Conventional IMRT for Prostate Cancer: Potential for Dose Escalation. *Technol Cancer Res Treat*. 2017 Jun; 16(3):267-75. doi: 10.1177/1533034616639729. Epub 2016 Mar 31. PMID: 27037301.

Prasad S, Cambridge L, Huguet F, Chou JF, Zhang Z, Wu AJ, O'Reilly EM, Allen PJ, Goodman KA. Intensity modulated radiation therapy reduces gastrointestinal toxicity in locally advanced pancreas cancer. *Pract Radiat Oncol*. 2016 Mar-Apr; 6(2):78-85. doi: 10.1016/j.prro.2015.09.006. Epub 2015 Sep 25. PMID: 26577010.

Rastogi K, Sharma S, Gupta S, Agarwal N, Bhaskar S, Jain S. Dosimetric comparison of IMRT versus 3DCRT for post-mastectomy chest wall irradiation. *Radiat Oncol J*. 2018 Mar; 36(1):71-8. doi: 10.3857/roj.2017.00381. Epub 2018 Mar 30. PMID: 29621872.

Rattan R, Kapoor R, Bahl A, Gupta R, Oinam AS, Kaur S. Comparison of bone marrow sparing intensity modulated radiotherapy (IMRT) and three-dimensional conformal radiotherapy (3DCRT) in carcinoma of anal canal: a prospective study. *Ann Transl Med*. 2016 Feb; 4(4):70. doi: 10.3978/j.issn.2305-5839.2016.01.37. PMID: 27004217.

Intensity Modulated Radiation Therapy, Outpatient

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Sajja R, Barnett GH, Lee SY, Harnisch G, Stevens GH, Lee J, Suh JH. Intensity-modulated radiation therapy (IMRT) for newly diagnosed and recurrent intracranial meningiomas: preliminary results. *Technol Cancer Res Treat*. 2005 Dec; 4(6):675-82. PMID: 16292888.

Samuelian JM, Callister MD, Ashman JB, Young-Fadok TM, Borad MJ, Gunderson LL. Reduced acute bowel toxicity in patients treated with intensity-modulated radiotherapy for rectal cancer. *Int J Radiat Oncol Biol Phys*. 2012 Apr 1; 82(5):1981-7. doi: 10.1016/j.ijrobp.2011.01.051. Epub 2011 Apr 7. PMID: 21477938.

Sciacero P, Cante D, Piva C, Casanova Borca V, Petrucci E, Gastaldi L, La Porta MR, Franco P. The role of radiation therapy in vulvar cancer: review of the current literature. *Tumori*. 2017 Sep 18; 103(5):422-9. doi: 10.5301/tj.5000529. Epub 2016 Jul 21. PMID: 27443892.

Shih KK, Hajj C, Kollmeier M, Frey MK, Sonoda Y, Abu-Rustum NR, Alektiar KM. Impact of postoperative intensity-modulated radiation therapy (IMRT) on the rate of bowel obstruction in gynecologic malignancy. *Gynecol Oncol*. 2016 Oct; 143(1):18-21. doi: 10.1016/j.ygyno.2016.07.116. Epub 2016 Jul 30. PMID: 27486131.

Shinohara E. Radiation Therapy: Which type is right for me? *OncoLink Penn Medicine*. 2020 Mar 3.

Sujenthiran A, Nossiter J, Charman SC, Parry M, Dasgupta P, van der Meulen J, Cathcart PJ, Clarke NW, Payne H, Aggarwal A. National Population-Based Study Comparing Treatment-Related Toxicity in Men Who Received Intensity Modulated Versus 3-Dimensional Conformal Radical Radiation Therapy for Prostate Cancer. *Int J Radiat Oncol Biol Phys*. 2017 Dec 1; 99(5):1253-1260. doi: 10.1016/j.ijrobp.2017.07.040. Epub 2017 Sep 1. PMID: 28974414.

Tai P, Nghiem PT, Park SY. Pathogenesis, clinical features, and diagnosis of Merkel cell (neuroendocrine) carcinoma. *UpToDate*. 2021 Apr 2.

U.S. Food and Drug Administration (FDA). 510K Premarket Notification. Calypso 4D Localization System.

Van der Veen J, Nuyts S. Can Intensity-Modulated-Radiotherapy Reduce Toxicity in Head and Neck Squamous Cell Carcinoma? *Cancers (Basel)*. 2017 Oct 6; 9(10). pii: E135. doi: 10.3390/cancers9100135. PMID: 28984841.

Vandecasteele K, Tummers P, Makar A, van Eijkeren M, Delrue L, Denys H, Lambert B, Beerens AS, Van den Broecke R, Lambein K, Fonteyne V, De Meerleer G. Postoperative intensity-modulated arc therapy for cervical and endometrial cancer: a prospective report on toxicity. *Int J Radiat Oncol Biol Phys*. 2012 Oct 1; 84(2):408-14. doi: 10.1016/j.ijrobp.2011.12.020. Epub 2012 Feb 28. PMID: 22377596.

Intensity Modulated Radiation Therapy, Outpatient

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Viani GA, Viana BS, Martin JE, Rossi BT, Zuliani G, Stefano E. Intensity-modulated radiotherapy reduces toxicity with similar biochemical control compared with 3-dimensional conformal radiotherapy for prostate cancer: A randomized clinical trial. *Cancer*. 2016 Jul 1;122(13):2004-11. doi: 10.1002/cncr.29983. Epub 2016 Mar 29. PMID: 27028170.

Wee CW, Kang HC, Wu HG, Chie EK, Choi N, Park JM, Kim JI, Huang CM, Wang JY, Ng SY, Goodman KA. Intensity-modulated radiotherapy versus three-dimensional conformal radiotherapy in rectal cancer treated with neoadjuvant concurrent chemoradiation: a meta-analysis and pooled-analysis of acute toxicity. *Jpn J Clin Oncol*. 2018 May 1; 48(5):458-66. doi: 10.1093/jjco/hyy029. PMID: 29554287.

Wegner RE, Abel S, White RJ, Horne ZD, Hasan S, Kirichenko AV. Trends in intensity-modulated radiation therapy use for rectal cancer in the neoadjuvant setting: a National Cancer Database analysis. *Radiat Oncol J*. 2018 Dec; 36(4):276-84. doi: 10.3857/roj.2018.00465. Epub 2018 Dec 31. PMID: 30630266.

Yeung AR, Pugh SL, Klopp AH, Gil KM, Wenzel L, Westin SN, Gaffney DK, Small W Jr, Thompson S, Doncals DE, Cantuaria GHC, Yaremko BP, Chang A, Kundapur V, Mohan DS, Haas ML, Kim YB, Ferguson CL, Deshmukh S, Bruner DW, Kachnic LA. Improvement in Patient-Reported Outcomes With Intensity-Modulated Radiotherapy (RT) Compared With Standard RT: A Report From the NRG Oncology RTOG 1203 Study. *J Clin Oncol*. 2020 May 20; 38(15):1685-1692. doi: 10.1200/JCO.19.02381. Epub 2020 Feb 19. PMID: 32073955.

Youssef FF, Parikh PJ, DeWees TA, Mutch MG, Tan BR Jr, Grigsby PW, Myerson RJ, Olsen JR. Efficacy and toxicity of rectal cancer reirradiation using IMRT for patients who have received prior pelvic radiation therapy. *Adv Radiat Oncol*. 2016 Feb 22; 1(2):94-100. doi: 10.1016/j.adro.2016.02.002. eCollection 2016 Apr-Jun. PMID: 2870875.

Yu T, Zhang Q, Zheng T, Shi H, Liu Y, Feng S, Hao M, Ye L, Wu X, Yang C. The Effectiveness of Intensity Modulated Radiation Therapy versus Three-Dimensional Radiation Therapy in Prostate Cancer: A Meta-Analysis of the Literatures. *PLoS One*. 2016 May 12; 11(5):e0154499. doi: 10.1371/journal.pone.0154499. eCollection 2016. PMID: 27171271.

Zhou L, Liu J, Xue J, Xu Y, Gong Y, Deng L, Wang S, Zhong R, Ding Z, Lu Y. Whole brain radiotherapy plus simultaneous in-field boost with image guided intensity-modulated radiotherapy for brain metastases of non-small cell lung cancer. *Radiat Oncol*. 2014 May 21; 9:117. doi: 10.1186/1748-717X-9-117. PMID: 24884773.

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Policy History

Original Approval Date*	Original Effective* Date and Version Number	Policy Owner	Original Policy Approved by
Regulatory Approval: N/A Internal Approval: 02/19/08: Medical Policy, Criteria, and Technology Assessment Committee (MPCTAC) 02/26/08: Utilization Management Committee (UMC) 03/12/08: Quality Improvement Committee (QIC)	06/01/08 Version 1	Medical Policy Manager as Chair of MPCTAC	MPCTAC, QIC, and UMC

*Effective Date for the BMC HealthNet Plan Commercial Product: 01/01/12

*Effective Date for the WellSense New Hampshire Medicaid Product 01/01/13

*Effective Date for the Senior Care Options Product: 01/01/16

*Effective Date for the WellSense Medicare Advantage HMO Product: 01/01/22

This policy replaced the *Stereoscopic X-Ray Guidance for Radiation Therapy* policy.

Policy Revisions History

Review Date	Summary of Revisions	Revision Effective Date and Version Number	Approved by
01/27/09	Updated references.	Version 2	01/27/09: MPCTAC 01/27/09: UMC
03/24/09	Updated clinical criteria and coding, removed authorization requirement for prostate, brain, head and neck cancers, added authorization requirement for all other diagnoses. Effective date of these changes is 07/01/09.	07/01/09 Version 3	03/24/09: MPCTAC 03/24/09: UMC 04/17/09: QIC
05/01/10	Updated references.	Version 4	06/30/10: MPCTAC 07/28/10: QIC
06/01/11	Added information for IMRT, updated clinical background information, coding and references.	Version 5	06/29/11: MPCTAC 07/27/11: QIC
06/01/12	Updated CPT code definitions and added applicable code, updated references, and revised the introductory paragraph in	Version 6	06/20/12: MPCTAC 07/25/12: QIC

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Policy Revisions History

	Applicable Coding section. Updated policy to include IMRT with and without stereoscopic x-ray guidance; formerly the policy specified IMRT with stereoscopic x-ray guidance.		
08/01/12	Off cycle review for WellSense New Hampshire Product. Revised title to specify IMRT in the outpatient setting. Revised Summary section and Limitations section. Reformatted Medical Policy Statement section and move criteria from Clinical Background Information section to Medical Policy Statement section.	Version 7	08/17/12: MPCTAC 09/06/12: QIC
08/14/13 and 08/15/13	Off cycle review for WellSense New Hampshire Product and merged policy format. Incorporate policy revisions dated 08/01/12 (as specified above) for the WellSense New Hampshire Product using the merged policy format.	Version 8	08/14/13: MPCTAC (electronic vote) 08/15/13: QIC
07/17/13 and 08/21/13	Review for effective date 12/01/13. Revised title to specify the outpatient setting. Moved medical criteria from the Clinical Background Information section to the Medical Policy Statement section. Updated and added references. Revised applicable code list.	12/01/13 Version 9	07/17/13: MPCTAC 08/21/13: MPCTAC 09/19/13: QIC
06/01/14 and 06/30/14	Review for effective date 10/01/14. Revised text in the Policy Summary, Description of Item or Service, Medical Policy Statement, and Limitations sections without changing criteria. Added code-specific notes in the Applicable Coding section. Deleted CPT code 77421 because stereoscopic x-ray guidance also used with other services not included in this policy. Revised title for ICD9 code range 192.0-192.9 and removed ICD9 codes 192.1, 192.2, and 192.3 (since these codes are included in the code range 192.0-192.9). Updated references.	10/01/14 Version 10	06/30/14: MPCTAC (electronic vote) 07/09/14: QIC
12/01/14	Review for 2015 code changes effective 03/01/15. Updated applicable code list.	03/01/15 Version 11	12/02/14: MPCTAC (electronic vote) 12/10/14: QIC
06/01/15	Review for effective date 10/01/15. Removed Commonwealth Care, Commonwealth Choice, and Employer Choice	10/01/15 Version 12	06/17/15: MPCTAC 07/08/15: QIC

Intensity Modulated Radiation Therapy, Outpatient

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Policy Revisions History

	from the list of applicable products because the products are no longer available. Updated language in the Applicable Coding section and updated applicable code list. Revised criteria in the Medical Policy Statement and Limitations sections. Updated Summary, Definitions, and References sections.		
11/25/15	Review for effective date 01/01/16. Updated template with list of applicable products and notes. Revised language in the Applicable Coding section.	01/01/16 Version 13	11/18/15: MPCTAC 11/25/15: MPCTAC (electronic vote) 12/09/15: QIC
06/01/16	Review for effective date 10/01/16. Revised Definitions, Clinical Background Information, References, and Reference to Applicable Laws and Regulations sections. Removed ICD-9 diagnosis codes and added Plan notes to applicable CPT codes. Revised criteria in the Medical Policy Statement section.	10/01/16 Version 14	06/15/16: MPCTAC 07/13/16: QIC
12/01/16	Review for effective date 04/01/17. Industry-wide new 2017 applicable ICD-10 diagnosis codes added, Plan notes added to Applicable Coding section, and additional applicable diagnosis codes included. Updated criteria in the Medical Policy Statement and Limitations sections. Revised Summary, Definitions, and References sections.	04/01/17 Version 15	12/21/16: MPCTAC 01/11/17: QIC
06/01/17	Review for effective date 09/01/17. Updated Summary, Definitions, and References sections. Revised criteria in the Limitations section. Revised the list of diagnosis codes that do not require prior authorization.	09/01/17 Version 16	06/21/17: MPCTAC
06/01/18	Review for effective date 07/01/18. Administrative changes made to the Applicable Coding, Other Applicable Policies, and Reference to Applicable Laws and Regulations sections.	07/01/18 Version 17	06/20/18: MPCTAC
07/10/18	Review for effective 10/01/18. Industry-wide updates to codes included in the Applicable Coding section.	10/01/18 Version 18	Not applicable because industry-wide code changes.
06/01/19	Review for effective date 09/01/19. Administrative changes made to the Definitions, Clinical Background Information,	09/01/19 Version 19	06/19/19: MPCTAC

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Policy Revisions History

	References, and Reference to Applicable Laws and Regulations sections. Criteria revised in the Medical Policy Statement and Limitations sections. Coding and Plan notes updated in the Applicable Coding section.		
09/01/19	Review for effective date 10/01/19. Revised Plan notes in the Applicable Coding section.	10/01/19 Version 20	09/18/19: MPCTAC
06/01/20	Review for effective date 07/01/20. Administrative changes made to the References and Reference to Applicable Laws and Regulations sections.	07/01/20 Version 21	06/17/20: MPCTAC
06/01/21	Review for effective date 09/01/21. Administrative changes made to the References section. Criterion revised in the Limitations section.	09/01/21 Version 22 Not implemented - replaced with Version 23	06/16/21: MPCTAC
08/0/21	Review for effective date 09/01/21. Revisions approved in version 22 implemented. Administrative changes made to the Medical Policy Statement and Applicable Coding sections to clarify existing Plan guidelines for the prior authorization waiver.	09/01/21 Version 23	08/13/21: MPCTAC (electronic vote)
11/01/21	Review for effective date 12/01/21. Adopted new medical policy template; removed administrative sections, Medical Policy Statement section renamed Clinical Criteria section, and Limitations section renamed Limitation and Exclusions section. Added WellSense Medicare Advantage HMO as an applicable product effective 01/01/22. Administrative changes made to the Policy Summary, Clinical Criteria, Limitations, Applicable Coding, and References sections.	12/01/21 Version 24	11/17/21: MPCTAC

Next Review Date

06/01/22

Authorizing Entity

MPCTAC

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Disclaimer Information: *

Medical Policies are the Plan's guidelines for determining the medical necessity of certain services or supplies for purposes of determining coverage. These Policies may also describe when a service or supply is considered experimental or investigational, or cosmetic. In making coverage decisions, the Plan uses these guidelines and other Plan Policies, as well as the Member's benefit document, and when appropriate, coordinates with the Member's health care Providers to consider the individual Member's health care needs.

Plan Policies are developed in accordance with applicable state and federal laws and regulations, and accrediting organization standards (including NCQA). Medical Policies are also developed, as appropriate, with consideration of the medical necessity definitions in various Plan products, review of current literature, consultation with practicing Providers in the Plan's service area who are medical experts in the particular field, and adherence to FDA and other government agency policies. Applicable state or federal mandates, as well as the Member's benefit document, take precedence over these guidelines. Policies are reviewed and updated on an annual basis, or more frequently as needed. Treating providers are solely responsible for the medical advice and treatment of Members.

The use of this Policy is neither a guarantee of payment nor a final prediction of how a specific claim(s) will be adjudicated. Reimbursement is based on many factors, including member eligibility and benefits on the date of service; medical necessity; utilization management guidelines (when applicable); coordination of benefits; adherence with applicable Plan policies and procedures; clinical coding criteria; claim editing logic; and the applicable Plan – Provider agreement.

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