

Policy #: 277

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### Title

## Stereotactic Radiosurgery & Stereotactic Body Radiation Therapy

### When services are covered

We cover **stereotactic radiosurgery** using a gamma-ray (gamma knife), linear-accelerator (linac), proton beam unit or image guided device (Cyberknife®) for the following:<sup>12,13</sup> (For diagnoses that are considered medically necessary, see footnote 13)

- Non-resectable, residual or recurrent meningiomas<sup>12,13</sup>
- Choroidal Melanomas<sup>1</sup>
- Acoustic Neuromas (vestibular schwannomas)<sup>4, 8,12,13</sup>
- Pituitary tumors (including adenomas)<sup>1,12,13</sup>
- Primary malignancies of the CNS, including but not limited to high-grade gliomas (initial treatment or treatment of recurrence)<sup>12,13</sup>
- Brain Metastases: solitary or multiple, initial or recurrent brain metastases in patients with good performance status (Karnofsky equal or greater than 70) and no active systemic disease (defined as extracranial disease that is stable or in remission)<sup>5,7, 8,12,13</sup>
- Cranial nerve neuropathy<sup>9</sup> (**covered only for Medicare HMO Blue, Medicare PPO Blue and Blue Medicare PFFS PlusRx members in accordance with local Medicare guidelines**).
- Epilepsy<sup>9</sup> (**covered only for Medicare HMO Blue, Medicare PPO Blue and Blue Medicare PFFS PlusRx members in accordance with local Medicare guidelines**).

We cover **stereotactic radiosurgery** using a gamma-ray, linear-accelerator, proton beam unit or image guided device (Cyberknife®) for **arteriovenous malformations (AVMs)**<sup>12,13</sup> (For diagnoses that are considered medically necessary, see footnote 13)

We cover **stereotactic radiosurgery** using a gamma-ray, linear-accelerator, proton beam unit or image guided device (Cyberknife®) for **trigeminal neuralgia refractory to medical management**.<sup>8,10,12,13</sup> (For diagnoses that are considered medically necessary, see footnote 13)

We cover **stereotactic body radiation therapy** for commercial products and for Medicare HMO Blue, Medicare PPO Blue and Blue Medicare PFFS Plus for the following indications:<sup>13</sup> **effective 9/1/09**:

- Patients with stage 1 non-small cell lung cancer showing no nodal or distant disease and who are not candidates for surgical resection **or**
- Spinal or vertebral body tumors (metastatic or primary) in patients who have received prior radiation therapy

(For diagnoses that are considered medically necessary, see footnote 14)

### When services are not covered

We do not cover **stereotactic radiosurgery for the treatment of seizures, epilepsy, functional disorders, chronic pain, or indications other than those listed above**<sup>8,12,13</sup> because it is considered investigational as it does not meet our Medical Technology Assessment Guidelines, #350.

We do not cover **stereotactic body radiation therapy in the treatment of extracranial sites**<sup>13</sup>, except for cases of spinal tumors after prior radiation therapy and stage 1 non-small lung cancer, because it is considered investigational as it does not meet our Medical Technology Assessment Guidelines, #350.

### Individual consideration

All our medical policies are written for the majority of people with a given condition. Each medical policy is based on scientific evidence. However, for all our medical policies, individual exceptions are sometimes made based on unique clinical circumstances. There is insufficient literature regarding cavernous angiomas; bleeding inoperable cavernous angiomas may warrant consideration of stereotactic radiosurgery. For consideration of an individual patient, physicians may send clinical information to:

#### For services already billed

Blue Cross Blue Shield of Massachusetts  
 Provider Appeals  
 P. O. Box 986065  
 Boston, MA 02298

#### Prior to performance of service

Blue Cross Blue Shield of Massachusetts  
 Case Creation/Medical Policy  
 One Enterprise Drive  
 Quincy, MA 02171  
 Tel: 1-800-327-6716  
 Fax: 1-888-641-5330

### Managed care guidelines

- Any specialist visit requires a referral for Medicare HMO Blue.
- For all other Managed Care plans, any specialist visit requires a referral, except for visits performed by OB/GYN specialists.
- Authorizations are required.-

### Indemnity and PPO guidelines

All authorization requirements are determined by the individual's subscriber certificate, however:

- Authorizations are required for all inpatient services.
- Authorizations are not required for most outpatient services as determined by the individual's subscriber certificate.
- Referrals to a specialist are not required.

### Coding information

*Procedure codes are from current CPT, HCPCS Level II, Revenue Code, and/or ICD-9-CM manuals, as recommended by the American Medical Association, Centers for Medicare and Medicaid Services and American Hospital Associations. Blue Cross Blue Shield Association national codes may be developed when appropriate.*

*The following codes are included below for informational purposes. Inclusion or exclusion of a code does not constitute or imply member coverage or provider reimbursement. Please refer to the member's contract benefits in effect at the time of service to determine coverage or non-coverage as it applies to an individual member.*

#### Stereotactic Radiosurgery:

- CPT code 61793, stereotactic radiosurgery (particle beam, gamma ray or linear accelerator), one or more sessions (**Deleted CPT code, effective 1/1/09**)
- CPT code 61796, stereotactic radiosurgery (particle beam, gamma ray, or linear accelerator); 1 simple cranial lesion (**New CPT code, effective 1/1/09**)
- CPT code 61797, stereotactic radiosurgery (particle beam, gamma ray, or linear accelerator); each additional cranial lesion, simple (List separately in addition to code for primary procedure) (**New CPT code, effective 1/1/09**)

- CPT code 61798, stereotactic radiosurgery (particle beam, gamma ray, or linear accelerator); 1 complex cranial lesion (*New CPT code, effective 1/1/09*)
- CPT code 61799, stereotactic radiosurgery (particle beam, gamma ray, or linear accelerator); each additional cranial lesion, complex (List separately in addition to code for primary procedure) (*New CPT code, effective 1/1/09*)
- CPT code 61800, application of stereotactic headframe for stereotactic radiosurgery (List separately in addition to code for primary procedure) (*New CPT code, effective 1/1/09*)
- CPT code 63620, stereotactic radiosurgery (particle beam, gamma ray, or linear accelerator); 1 spinal lesion (*New CPT code, effective 1/1/09*)
- CPT code 63621, stereotactic radiosurgery (particle beam, gamma ray, or linear accelerator); each additional spinal lesion (List separately in addition to code for primary procedure) (*New CPT code, effective 1/1/09*)
- CPT code 77371, radiation treatment delivery, stereotactic radiosurgery (SRS), complete course of treatment of cerebral lesion(s) consisting of 1 session; multi-source Cobalt 60 based (*2007 CPT code*)
- CPT code 77372, radiation treatment delivery, stereotactic radiosurgery (SRS), complete course of treatment of cerebral lesion(s) consisting of 1 session; linear accelerator based (*2007 CPT code*)
- CPT code 77432, stereotactic radiation treatment management of cerebral lesion(s) (complete course of treatment consisting of one session)
- HCPCS Level II code G0173, linear accelerator based stereotactic radiosurgery, complete course of therapy in one session
- HCPCS level II code G0243, multi-source photon stereotactic radiosurgery, delivery, including collimator changes and custom plugging, complete course of treatment, all lesions (*Deleted 2007 HCPCS Level II code*)
- HCPCS Level II code G0339, image-guided robotic linear accelerator-based stereotactic radiosurgery, complete course of therapy in one session or first session of fractionated treatment
- HCPCS Level II code G0340, image-guided robotic linear accelerator-based stereotactic radiosurgery, delivery including collimator changes and custom plugging, fractionated treatment, all lesions, per session, second through fifth sessions, maximum five sessions per course of treatment

Stereotactic radiosurgery billed with CPT codes 61793, 61796, 61797, 61798, 61799, 61800, 63620, 63621, 77371, 77372 and 77432 and/or HCPCS Level II codes G0173, G0242, G0243, G0339 and G0340 will deny, leaving no patient balance if submitted with a diagnosis other than the listed covered indications. See footnote 13 for medically necessary diagnoses.

**Stereotactic Body Radiation Therapy:**

- CPT code 77373, stereotactic body radiation therapy, treatment delivery, per fraction to 1 or more lesions, including image guidance, entire course not to exceed 5 fractions
- CPT code 77435, stereotactic body radiation therapy, treatment management, per treatment course, to one or more lesions, including image guidance, entire course not to exceed 5 fractions

**NOTE:** CPT codes 77373 and 77435 will deny, leaving no patient balance if submitted with a diagnosis other than the covered listed conditions for commercial products and for Medicare HMO Blue, Medicare PPO Blue and Blue Medicare PFFS PlusRx.

**NOTE:** See footnote 14 for medically necessary diagnoses for commercial products and for Medicare HMO Blue, Medicare PPO Blue and Blue Medicare PFFS PlusRx.

**Inpatient Hospital Coding:**

- ICD-9-CM procedure code 92.30, stereotactic radiosurgery, not otherwise specified
- ICD-9 procedure code 92.31, single source photon radiosurgery (high energy x-rays, linear accelerator (LINAC))

- ICD-9 CM procedure code 92.32, multi-source photon radiosurgery (Cobalt 60 radiation, gamma irradiation)
- ICD-9 CM procedure code 92.33, particulate radiosurgery (particle beam radiation (cyclotron), proton accelerator)
- ICD-9 CM procedure code 92.39, stereotactic radiosurgery, not elsewhere classified

#### **Outpatient Hospital Coding:**

- Submit the appropriate revenue code with the appropriate CPT and/or HCPCS Level II code that reports the service provided.

#### **Other information**

- For our Medical Technology Assessment Guidelines, see document [#350](#).

#### **Policy update history**

Policy reviewed 3/92. Revised 10/95 to include the following 1995 TEC evaluations. Updated 4/97 after a literature review. No changes were made to coverage. Updated 1/98 to include coverage for trigeminal neuralgia. Reviewed 1/99; no changes in coverage were made. Updated 1/00 to include individual consideration for bleeding inoperable cavernous angiomas, and to change AVM's size from 3.7 cm to 4 cm, based on recommendations by the Massachusetts Neurologic Association. Updated 4/00 to include coverage for cranial nerve neuropathies and certain epileptic disorders for Blue Care 65 (Medicare HMO Blue) members only. Updated 1/01 to exclude coverage for fractionated stereotactic radiotherapy. Updated 1/02 to include individual consideration guidelines for recurrent or residual inoperable intrinsic brain tumors, including benign or malignant glioma, ependymoma, primitive neuroectodermal tumor such as medulloblastoma, neuroblastoma, and pineoblastoma; pineocytoma, neurocytoma, hemangioblastoma and choroid plexus carcinoma; extraaxial inoperable tumors, including cranial nerve schwannomas other than vestibular; and skull base malignancies, including chordoma and metastatic carcinoma. Also, to change pituitary adenomas to pituitary tumors as recommended by the Medical Policy Group. Reviewed 1/03 MPG Neurology, no changes in coverage were made. Updated 12/03 to add new HCPCS Level II codes effective 1/1/04. Reviewed 1/04 MPG neurology, no changes were made. Reviewed 1/05 MPG neurology, no changes were made. Reviewed 2/05 BCBSA National Policy issued 4/04 to clarify coverage and non coverage indications for stereotactic radiosurgery. Reviewed 7/05 BCBSA National Policy issued 4/05 without change in policy statement specific to stereotactic radiosurgery. Updated 8/05 to clarify our coverage guideline on SRS for brain metastases as follows: solitary or multiple, initial or recurrent brain metastases in patients with good performance status (Karnofsky equal or greater than 70). The guideline referring to "and no active systemic disease defined as extracranial disease that is stable or in remission was removed. Effective 8/05. Reviewed 1/06 MPG-Neurology, no changes in coverage were made. Reviewed 10/06 based on BCBSA national policy 6.01.10 issued 7/06; clarification of coverage exclusion of stereotactic radiosurgery of extracranial sites, clarification of coverage of image guided stereotactic radiosurgery and additional references added under footnote 13. Reviewed 1/07 MPG Neurology, no changes in coverage were made. Updated 4/07 with new and deleted codes effective 1/1/07. Updated 4/07 with medically necessary ICD-9 diagnoses supporting coverage of HCPCS Level II codes G0339 and G0340 along with clarification of medically necessary ICD-9 CM diagnoses under footnote 13. Updated 5/07 coding information section. Updated 12/07 after review of BCBSA policy 6.01.10 Stereotactic Radiosurgery and Stereotactic Radiotherapy without change in policy statements; rationale and additional references 19-25 added under footnote 13. Reviewed 1/08 MPG-Neurology, no changes in coverage were made. Updated 12/08 with new and deleted CPT and HCPCS Level II codes effective 1/1/09; clarified procedure to diagnosis editing on stereotactic radiosurgery noted under footnote 13. Reviewed 1/09 MPG – Neurology and Neurosurgery, no changes in coverage were made. Updated 8/09 to clarify non coverage statements specific to stereotactic radiosurgery with BCBSA national policy issued 12/08; removed exclusion language specific to fractionated stereotactic radiotherapy, as it is now references as stereotactic body radiation therapy; clarified coverage exclusion of stereotactic body radiation therapy in the treatment of extracranial sites, except for cases of spinal tumors after prior radiation therapy and stage 1 non-small cell lung cancer. Updated 8/09 to add coverage of stereotactic body radiation therapy for patients with stage 1 small cell lung cancer and for spinal or vertebral

body tumors (metastatic or primary) in patients who have received prior radiation therapy, effective 9/1/09; added rationale and references under footnote 13. Updated 8/09 to implement editing to support coverage of stereotactic body radiation therapy when billed with CPT codes 77373 and 77435 for commercial and Medicare Advantage products; editing is effective 9/1/09 and noted under footnote 14.

#### **Scientific background, Rationale and References**

<sup>1</sup> 1992 Blue Cross Blue Shield of Massachusetts Interspecialty Medical Advisory Committee; Blue Cross Blue Shield Association national policy 6.01.10, issued 10/15/00; and Local Medicare policy, issued 5/00. See also their website at [http://www.cms.hhs.gov/mcd/viewlcd.asp?lcd\\_id=16065&lcd\\_version=2&show=all](http://www.cms.hhs.gov/mcd/viewlcd.asp?lcd_id=16065&lcd_version=2&show=all) This Local Medicare Review policy was retired 5/31/04. Pituitary adenoma was changed to pituitary tumors based on the recommendation of the Medical Policy Group – Neurology in 1/02.

<sup>2</sup> Based on a 1995 TEC (Technology Evaluation Center) assessment of medical literature from 1991-4/95 evaluating SRS for primary treatment and for post-op recurrence of meningioma. Local tumor control served as an outcomes measure, as this correlates with stable or improved neurologic status. Of five studies considered, three used gamma beam, two used linear accelerators. For patients with resectable tumor, those who undergo complete resection may have control rates over 90% even at ten years. While the four-year control rate for SRS in one study was 92%, it is unclear whether this would be maintained over ten years. SRS compared favorably to standard EBRT (actuarial data) for patients with residual post-op tumors. For patients with non-resectable tumors, control rates were probably no worse than that expected for EBRT, and complication rates were similar in one study. Radiosurgery in patients with lesions over 4 cm is associated with increased complications and lower probability of reaching effective radiation doses.

<sup>5</sup> Based on a 1995 TEC (Technology Evaluation Center) assessment of medical literature from 1991-4/95 and the 1993 and 1994 ASTRO meetings, evaluating SRS for initial treatment in conjunction with or follow-up after whole brain irradiation (WBRT), in patients with solitary or multiple brain mets. Local tumor control served as outcomes measure, as this had been shown to correlate with better palliation. As initial treatment along with WBRT in patients with two or more brain mets, SRS + WBRT improved local control over WBRT alone. For recurrent single or multiple brain mets previously treated with WBRT, SRS alone achieved better health outcomes than no salvage treatment.

<sup>6</sup> Based on a 1992 TEC (Technology Evaluation Center) assessment of medical literature assessing radiosurgery for treatment of AVMs. Evidence suggested that for inoperable AVMs under 3.7 cm, obliteration (which has been correlated with lowered risk for hemorrhage) was 75-94%. The main drawback is the time until obliteration, which may be 1-3 years after treatment in large lesions. There were insufficient data to permit assessment of radiosurgery in radiographically occult AVMs.

<sup>7</sup> For recent clinical reviews, see *Current treatment of cerebral metastasis* in Current Opinions in Neurology 1996 Dec;9(6):414-8 by Kin and Bernstein. This review explores surgery, whole brain XRT, radiosurgery, brachytherapy, chemo, as well as experimental approaches such as hyperthermia, hormonal tx, and biologicals. Also see *Radiosurgery: its role in brain metastasis management* by Flickinger et al. (Pittsburgh) in Neurosurg Clin N Am 1996 Jul;7(3):497-504. this article discusses radiotherapy's effectiveness, side effects, and cost considerations. *Surgical management of cerebral metastases* by Lang and Sawy (MD Anderson) in Neurosurg Clin N Am 1996 Jul;7(3):459-84 emphasizes surgical approaches, and the "adjunctive" role of whole brain XRT and radiosurgery. A practical algorithm is suggested. Also see *Clinical decision making in brain metastases* by Arbit and Wronski, in Neurosurg Clin N Am 1996 Jul;7(3):447-57, noting success of surgery, especially for patients with breast, renal cell, and lung ca; therapeutic guidelines are suggested.

<sup>8</sup> Based on the 10/97 TEC (Technology Evaluation Center) assessment on stereotactic radiosurgery (SRS) for functional disorders. Published literature on SRS for functional disorders, including trigeminal neuralgia, epilepsy, and chronic pain were reviewed. For trigeminal neuralgia, 145 patients at 5 centers, using roughly similar dosing and targets reported very similar results. 82-94% of patients had initial success. This compares

favorably to the 83-92% initial success rate for alternative treatments. As well, the pain recurrence rate with SRS (3-14%) was superior to that of other treatments (15-54%). There were few complications with SRS, consisting largely of facial paresthesia in up to 6% of patients. However, alternative treatments carried various complications such as: microvascular decompression: 1% mortality, 10% peri-op morbidity; balloon compression: 66% trigeminal motor dysfunction, 19% major + minor dysesthesia, and 72% facial numbness; radiofrequency rhizotomy: 11% major + minor dysesthesia, and 98% facial numbness. These studies all used the Gamma Knife.

For epilepsy, there were only 2 studies (n=20 total), which differed in their use of SRS. There is insufficient evidence to permit conclusions about health outcomes for epilepsy. For chronic pain, there were also only 2 studies (n=49 total, quite heterogenous regarding origin of pain). Previous pain treatment was not fully disclosed. There is insufficient evidence to permit conclusions about health outcomes for chronic pain.

<sup>8</sup> Based on the Blue Cross Blue Shield Association national policy 6.01.10.

The policy states that the choice of energy source (gamma knife, Linac, or charged-particle beam) may depend on local availability. While Linac devices are common, there are fewer than 36 gamma knife units in the US. The policy notes that for small lesions (under 5 cm<sup>3</sup>), dose distributions from a gamma knife are essentially the same as those achievable with a Linac unit. Larger (5-25 cm<sup>3</sup>) or irregular masses may benefit from Linac units, due to their ability to treat larger lesions with multiple isocenters, and ability to use collimated fields. The policy states that for larger volume lesions (over 25 cm<sup>3</sup>), charged particle units with a fixed number of beams have superior ability to shape dose distribution.

Regarding **fractional stereotactic radiotherapy** (multiple sessions), the policy notes that the published literature comprises case series from a single institution. While in theory, fractionate therapy might, for example, preserve the facial and trigeminal nerves while treating an acoustic neuroma, comparative studies have not been published. Regarding use of fractionated therapy to treat malignancies, the policy points out that there are inadequate data to determine whether the cumulative higher radiation dose results in improved patient outcomes such as median survival or quality of life.

<sup>9</sup> In accordance with CMS (Center for Medicare and Medicaid Services) guidelines. See Medicare's policy on stereotactic radiosurgery at the following web address:

[http://www.cms.hhs.gov/mcd/viewlcd.asp?lcd\\_id=16065&lcd\\_version=2&show=all](http://www.cms.hhs.gov/mcd/viewlcd.asp?lcd_id=16065&lcd_version=2&show=all) This policy was retired 5/31/2004.

Medicare policy is developed separately from BCBSMA policy. While BCBSMA policy is based upon scientific evidence, Medicare policy incorporates scientific evidence with local expert opinion, and governmental regulations from CMS (Centers for Medicare and Medicaid Services) and the US Congress. While BCBSMA and Medicare policies may differ, our Blue Care 65 (Medicare HMO Blue) patients must be offered the same services as Medicare offers. In many instances, BCBSMA policies offer more benefits than does Medicare policy.

<sup>10</sup> See Kondzioka et al. *Gamma knife radiosurgery for trigeminal neuralgia. Arch Neurol 1998 Dec;55:1524-9.*

This study reported on (n=121) patients with trigeminal neuralgia (tic douloureux). Mean duration of pain was 11 months; all failed to respond to medication; 78% had previous unsuccessful surgery. 18 months after radiosurgery, 64 patients reported no pain; 18 patients had less than 50% pain relief. Result: (n=82; 77%) of patients were considered to have good to excellent result.

<sup>12</sup> Based on BCBSA National Policy 6.01.10 issued 4/16/04 without a change in policy statement:

A literature search based on the MEDLINE database for the period of 2002 to February 2004 identified numerous published studies of stereotactic radiosurgery. However, the majority of these studies consist of

single institution case series focusing on specific conditions, i.e., either benign lesions in the brain, primary malignancies, or specific types of metastases. Although extensive, this literature would not prompt a change in the policy statement. The review also focused on those indications considered investigational according to this policy, i.e., functional disorders such as pain, epilepsy, or movement disorders, but limited literature was identified. Two small case series examined the role of gamma knife radiosurgery in the treatment of refractory movement disorders. However, at the present time radiofrequency ablation or deep brain stimulation would be considered the gold standard therapies for this indication and no comparative data are available. (13, 14)

#### References:

- 1) 1994 TEC Assessments Tab 38
- 2) 1995 TEC Assessments Tab 5
- 3) 1995 TEC Assessments Tab 6
- 4) 1995 TEC Assessments Tab 7
- 5) 1997 TEC Assessments Tab 24
- 6) 1998 TEC Assessments Tab 28
- 7) Kondziolka D, Patel A, Lunsford LD et al. Stereotactic radiosurgery plus whole brain radiotherapy versus radiotherapy alone for patients with multiple brain metastases. *Int J Radiat Oncol Biol Phys* 1999; 45(2):427-34.
- 8) Weltman E, Salvajoli JV, Brandt RA et al. Radiosurgery for brain metastases: a score index for predicting prognosis. *Int J Radiat Oncol Biol Phys* 2000; 46(5):1155-61.
- 9) Yu C, Chen JC, Apuzzo ML et al. Metastatic melanoma to the brain: prognostic factors after gamma knife radiosurgery. *Int J Radiat Oncol Biol Phys* 2002; 52(5):1277-87.
- 10) Regis J, Bartolomei F, Rey M et al. Gamma knife surgery for mesial temporal lobe epilepsy. *J Neurosurg* 2000; 93(suppl 3):141-6.
- 11) Schrottner O, Eder HG, Unger F et al. Radiosurgery in lesional epilepsy: brain tumors. *Stereotact Funct Neurosurg* 1998; 70(suppl 1):50-6.
- 12) Whang CJ, Kwon Y. Long-term follow-up of stereotactic Gamma Knife radiosurgery in epilepsy. *Stereotact Funct Neurosurg* 1996; 66 (suppl 1): 349-56.
- 13) Ohye C, Shibazaki T, Zhang J et al. Thalamic lesions produced by gamma thalamotomy for movement disorders. *J Neurosurg* 2002; 97 (5 suppl):600-6.
- 14) Keep MF, Mastofrancesco L, Erdman D et al. Gamma knife subthalamotomy for Parkinson disease: the subthalamic nucleus as a new radiosurgical target. Case report. *J Neurosurg* 2002; 97 (5 suppl):592-9.

<sup>13</sup> Based on BCBSA National Policy 6.01.10 issued 4/05. Updated policy after revised literature search. Additional discussion in rationale section and in policy guideline section regarding fractionated stereotactic radiotherapy with no change in policy statement. A literature search based on the MEDLINE database for the period of 2002 to January 2005 identified numerous published studies of stereotactic radiosurgery. However, the majority of these studies consist of single institution case series focusing on specific conditions, i.e., either benign lesions in the brain, primary malignancies, or specific types of metastases. Although extensive, this literature would not prompt a change in the policy statement. The review also focused on those indications considered investigational according to this policy, i.e., functional disorders such as pain, epilepsy, or movement disorders, but limited literature was identified. Two small case series examined the role of gamma knife radiosurgery in the treatment of refractory movement disorders. However, at the present time radiofrequency ablation or deep brain stimulation would be considered the gold standard therapies for this indication and no comparative data are available. (13,14)

The literature was also searched with a focus on stereotactic radiotherapy, in which multiple fractions are given over a course of several days. One research focus has been on the treatment of acoustic neuromas, where the most significant side effect is functional preservation of the facial and auditory nerve. For example, in a single institution study, Meijer and colleagues reported on the outcomes of single fraction vs. fractionated LINAC-based stereotactic radiosurgery in 129 patients with acoustic neuromas. (15) Among these patients, 49 were edentate and thus could not be fitted with a relocatable head frame that relies on dental impressions. This group was treated with a single fraction, while the remaining 80 patients were treated with a fractionated schedule.

With an average follow-up of 33 months, there was no difference in outcome in terms of local tumor control, facial nerve preservation, and hearing preservation. Chung and colleagues reported on the results of a single institution case series of 72 patients with acoustic neuromas, 45 who received single fraction therapy and 27 who received fractionated therapy. (16) Patients receiving single fraction treatment were functionally deaf, while those receiving fractionated therapy had useful hearing in the affected ear. After a median follow-up of 26 months, there was no tumor recurrence in either group. Three separate single-institution case series reported on 87 patients with metastatic disease, 143 patients with astrocytomas, and 36 patients with cerebral AVMs who were treated with fractionated stereotactic radiotherapy. (17-19) While all reported promising outcomes, the lack of a control group receiving stereotactic radiosurgery severely limits interpretation.

### References:

12. Meijer OW, Vandertop WP, Baayen JC et al. Single-fraction vs. fractionated LINAC-based stereotactic radiosurgery for vestibular schwannoma: a single institution study. *Int J Radiat Oncol Biol Phys* 2003; 56(5):1390-6.
13. Chung HT, Ma R, Toyota B et al. Audiologic and treatment outcomes after linear accelerator-based stereotactic irradiation for acoustic neuroma. *Int J Radiat Oncol Biol Phys* 2004; 59(4):1116-21.
14. Aoyama H, Shirato H, Onimaru R et al. Hypofractionated stereotactic radiotherapy alone without whole brain irradiation for patients with solitary and oligo brain metastasis using noninvasive fixation of the skull. *Int J Radiat Oncol Biol Phys* 2003; 56(3):793-800.
15. Plathow C, Schulz-Ertner D, Thilman C et al. Fractionated stereotactic radiotherapy in low-grade astrocytomas: Long-term outcome and prognostic factors. *Int J Radiat Oncol Biol Phys* 2003; 57(4):996-1003.
16. Lindvall P, Bergstrom P, Lofroth PO et al. Hypofractionated conformal stereotactic radiotherapy for arteriovenous malformation. *Neurosurgery* 2003; 53(5):1036-43.

**2006 Update:** Based on review of BCBSA National Policy 6.01.10 Stereotactic Radiosurgery and Stereotactic Radiotherapy issued 7/06. BCBSA policy was updated and revised with a literature search. The policy was renamed to Stereotactic Radiosurgery and Stereotactic Radiotherapy. Policy statement revised to indicate that stereotactic radiosurgery of extracranial sites is investigational. Additional information provided on Cyberknife device in Description and Rationale sections. General discussion added regarding challenges of evidence-based approach to evaluating rapidly emerging technologies. Reference numbers 9-11 and 13 added; other references deleted. Comments and references (17 and 18) added to SRS with or without whole-brain radiation therapy for brain metastases.

### Challenges to an Evidence-Based Approach to Rapidly Evolving Technologies in Radiation Oncology

This policy groups together several different techniques for delivering stereotactic radiosurgery, i.e., the Gamma Knife, LINAC devices, proton beam radiotherapy and the CyberKnife device, i.e., an example of image-guided radiotherapy. However, from an evidence-based approach, it is extremely difficult to compare these different devices to determine if one device is superior to another for a particular indication. A literature search in May 2006 failed to identify any controlled trials directly comparing different devices in homogeneous groups of patients. In addition, the field of radiation oncology is rapidly evolving, with a current intense interest in emerging image-guided technology. A limited number of stereotactic radiosurgery options may be available in individual markets, and thus the choice among devices may be dictated primarily by geography. The following summarizes different variables related to stereotactic radiosurgery and radiotherapy.

#### Size of lesion

In terms of stereotactic radiosurgery, the superiority of one energy source over another depends primarily on the dose distribution capabilities, which in turn depend on the target's volume, location, and shape. For small lesions (i.e., <5 cm<sup>3</sup>), the dose distributions produced by the Gamma Knife are essentially identical to those achievable with LINAC units. When the target lesion is nonspherical or of intermediate size (e.g., between 5 and 25 cm<sup>3</sup>), LINAC units may have an advantage over Gamma Knife units, due to their ability to treat larger lesions without requiring multiple isocenters (which makes treatment planning difficult), and the ability to shape the dose using collimated fields. However, when targeting large volumes (i.e., >25 cm<sup>3</sup>), charged

particle units that use a small fixed number of beams have the best ability to shape dose distributions and thus offer some advantages over both LINAC and Gamma Knife units.

### **Dose Fractionation**

Standard radiobiologic principles suggest that fractionating radiation therapy (i.e., delivery in multiple sessions) will reduce both early and late toxicities to surrounding normal tissues. Radiosurgery (one treatment) or hypofractionation (limited number of treatments) may be considered when patient movement limits the use of conventional radiation therapy, or may be offered as a convenience to patients, particularly those that require rapid pain relief. These two clinical indications are also associated with different outcomes that must be considered as part of an evidence-based analysis. A more basic scientific issue is an underlying understanding of the radiosensitivity of surrounding normal tissues.

### **Dose Escalation**

Novel forms of radiation therapy, for example, the CyberKnife, other techniques of delivering IMRT and proton beam therapy have been proposed as ways to provide dose escalation. In this setting, clinical questions include whether or not dose escalation provides improved tumor control, which depends on the dose response rate of individual tumor types, and whether an increased dose is associated with increased toxicity to surrounding tissues.

### **Decreased toxicity**

A variety of novel treatment planning and delivery approaches are designed to reduce toxicity. The ability of the CyberKnife to accommodate patient movement is a unique feature and a variety of applications have been suggested, including treatment of lung, prostate, and pancreas cancer. In these settings, respiratory motion can limit the ability to deliver IMRT, and thus in this setting the CyberKnife may be considered an alternative to multileaf collimators, tomotherapy, or the “step and shoot” technique. Evidence of reduced toxicity would require directly comparative studies. Many of the potential benefits of the CyberKnife and other treatment delivery systems have been based on modeling studies, or studies with phantoms, with more limited clinical experience.

In summary, the lack of comparative studies of different techniques of radiation planning and delivery in homogeneous groups of patients limits any scientific analysis regarding the relative safety and efficacy of different systems for different clinical situations, i.e., reduction of fractionation, dose escalation, reduced toxicity, or a combination of all three. Therefore the scientific evidence is inadequate to permit scientific conclusions regarding the superiority of one device over another. The following discussion focuses on different general applications of stereotactic radiosurgery and radiotherapy.

### **Treatment of Brain Metastases**

Previous studies suggested that use of radiosurgery for brain metastases should be limited to patients with 3 or fewer lesions. A recent randomized trial compared whole-brain radiation therapy (WBRT) with WBRT plus radiosurgery boost to metastatic foci. (1) It found that the significant advantage of radiosurgery boost over WBRT alone in terms of freedom from local failure did not differ among patients with 2, 3, or 4 metastases. Survival also did not depend on the number of metastases. As the number of metastases rises, so does the total volume of tissue receiving high-dose radiation, thus the morbidity risk of radiation necrosis associated with radiosurgery is likely to increase. For a large number of metastases, and for large volumes of tissue, this risk may be high enough to negate the advantage of radiosurgery plus WBRT over WBRT alone seen in patients with 4 or fewer metastases. Stereotactic radiosurgery centers commonly exclude patients with more than 5 metastases from undergoing radiosurgery. (2,3) It is difficult to identify a specific limit on the number of metastases for which the use of stereotactic radiosurgery is advantageous. A large number of very small metastases may respond to radiosurgery as well as a small number of larger metastases. The previous Policy Update stated that radiosurgery is medically necessary for between 1 and 3 metastases, but recent literature suggests that such a restriction is no longer justified.

### **Treatment of Epilepsy**

The 1998 TEC Assessment (4) cited 2 studies of 11 and 9 patients, in which radiosurgery was used to treat epilepsy. The subsequent literature search revealed 3 small studies on the use of radiosurgery for medically refractory epilepsy. Regis et al (5) selected 25 patients with mesial temporal lobe epilepsy, of which 16 provided minimum 2-year follow-up. Seizure-free status was achieved in 13 patients, 2 patients were improved, and 3 patients had radiosurgery-related visual field defects. Schrottner et al. (6) included 26 patients with tumoral epilepsy, associated mainly with low-grade astrocytomas. Mean follow-up among 24 available patients was 2.25 years. Tumor location varied across patients. Seizures were simple partial in 6 (3 with generalization) and complex partial in 18 (5 with generalization, 1 gelastic). Seizures were eliminated or nearly so in 13 patients. Little improvement was observed in 4 patients and none in 7. Whang and Kwon (7) performed radiosurgery in 31 patients with epilepsy associated with non-progressive lesions. A minimum of 1-year follow-up was available in 23 patients, of whom 12 were seizure-free, 3 had antiseizure medications discontinued, 2 had seizures reduced in frequency, and 9 experienced no change. While the Regis series selected a fairly homogeneous clinical sample, the other 2 studies were heterogeneous. No confirmatory evidence is available on mesial temporal lobe epilepsy. The available evidence from patients with epileptic lesions of various sizes and locations is insufficient to show what factors are associated with favorable outcome. There is inadequate reporting of complications associated with radiosurgery. The studies published to date are preliminary in nature. The 1998 TEC Assessment observed that evidence was insufficient to permit conclusions about the effects of radiosurgery on epilepsy. Conclusions about the health outcome effects of radiosurgery await additional studies.

### **Treatment of Chronic Pain**

The TEC Assessment from 1998 (4) identified 2 papers, with 2 and 47 patients, who underwent radiosurgical thalamotomy for chronic pain. No new studies were found in the search of recent literature. Thus, the conclusions of the 1998 TEC Assessment have not changed.

### **Treatment of Extracranial Sites Including Spinal Cord Lesions**

A variety of applications have been proposed for the CyberKnife device (8). Published data are limited for most extracranial sites and thus this use is considered investigational.

The site most studied involves spinal lesions. In the largest case series, Gerszten and colleagues reported on the outcomes of 115 patients with spinal tumors of varying etiologies, i.e., benign, metastatic, single, or multiple lesions, in a variety of locations, i.e., cervical, thoracic, lumbar, sacral, who were treated with the CyberKnife in a single session. (9) The majority of patients were treated for pain control and also had received prior external beam irradiation. The authors point out that radiation therapy of the spinal cord is limited by its low tolerance, and that if a radiation dose could be targeted more accurately at the lesions, higher doses could be delivered in a single fraction. They further point out that conventional methods of delivering IMRT are limited due to lack of target immobilization. Axial and radicular pain improved in 74 of the 79 symptomatic patients. There was no acute radiation toxicity or new neurologic deficits. Conventional external beam radiation therapy typically is delivered over a course of 10-20 fractions. In contrast, in this study only one CyberKnife treatment session was used. In a 2005 study, Degen and colleagues reported on the outcomes of 51 patients with 72 spinal lesions who were treated with the CyberKnife. (10) Patients underwent a median of 3 treatments. Pain was improved, as measured by declining mean visual analog scale (VAS) score, and quality of life was maintained during the 1-year study period.

While these studies show that this approach was feasible, safe, and was able to provide pain relief with targeted radiation with few treatment sessions, studies comparing this approach to conventional treatments are needed to fully understand the impact of this treatment on pain relief, tumor control, and survival.

### **Stereotactic Radiotherapy**

Stereotactic radiotherapy describes the delivery of multiple fractions over a course of several days. One research focus has been on the treatment of acoustic neuromas, where the most significant side effect is functional preservation of the facial and auditory nerve. For example, in a single institution study, Meijer and

colleagues reported on the outcomes of single fraction versus fractionated LINAC-based stereotactic radiosurgery in 129 patients with acoustic neuromas. (11) Among these patients, 49 were edentate and thus could not be fitted with a relocatable head frame that relies on dental impressions. This group was treated with a single fraction, while the remaining 80 patients were treated with a fractionated schedule. With an average follow-up of 33 months, there was no difference in outcome in terms of local tumor control, facial nerve preservation, and hearing preservation. Chung and colleagues reported on the results of a single institution case series of 72 patients with acoustic neuromas, 45 who received single fraction therapy and 27 who received fractionated therapy. (12) Patients receiving single fraction treatment were functionally deaf, while those receiving fractionated therapy had useful hearing in the affected ear. After a median follow-up of 26 months, there was no tumor recurrence in either group. Chang (13) reported that 74% of 61 patients with acoustic neuromas treated with CyberKnife using staged treatment who had serviceable hearing maintained serviceable hearing during at least 36 months of follow-up. Three separate single-institution case series reported on 87 patients with metastatic disease, 143 patients with astrocytomas, and 36 patients with cerebral AVMs who were treated with fractionated stereotactic radiotherapy. (14-16) While all reported promising outcomes, the lack of a control group receiving stereotactic radiosurgery severely limits interpretation.

### **Addendum, Brain Metastases**

Aoyama and colleagues recently reported on a randomized trial of SRS plus whole-brain radiation therapy (WBRT) versus SRS alone for treatment of patients with 1 to 4 brain metastases. (17) They found a 12-month intracranial tumor recurrence rate of 46.8% in the SRS plus WBRT group compared to 76.4% in the group that only received SRS. However, median survival times were not different at 7.5 and 8.0 months, respectively. They also found no differences in neurological functional preservation. In an accompanying editorial, Raizer comments that either treatment approach is a reasonable first step, recognizing that those who select SRS alone are more likely to need subsequent salvage radiation treatments. (18) Raizer adds the additional comment that those who have a single brain metastasis from non-small cell lung cancer or recursive partitioning analysis (RPA) class 1 patients should initially receive SRS and WBRT

### **References:**

17. Aoyama H, Shirato H, Tago M et al. Stereotactic radiosurgery plus whole-brain radiation therapy vs stereotactic radiosurgery alone for treatment of brain metastases: a randomized controlled trial. *JAMA* 2006; 295(21):2483-91.
18. Raizer J. Radiosurgery and whole-brain radiation therapy for brain metastases: either or both as the optimal treatment. *JAMA* 2006; 295(21):2535-6.

**2007 Update:** Based upon review of BCBSA policy 6.01.10 Stereotactic Radiosurgery and Stereotactic Radiotherapy, issued 9/07. Policy was updated with literature search in September 2007; no changes to policy statements. Additional references 19-25 were added.

The policy was updated with a literature search using MEDLINE conducted in September 2007.

A number of articles were identified describing studies of stereotactic radiosurgery and radiotherapy of extracranial sites; some studies refer to this approach as stereotactic body radiation therapy (SBRT).

Additional reports on the use of stereotactic radiosurgery for spinal tumors have been published. Gerszten recently published results on a series of 500 cases from a single institution using the CyberKnife system. (19) In this series, the maximum intratumoral dose ranged from 12.5 to 25 Gy with a mean of 20 Gy. Long-term pain improvement occurred in 290 of 336 cases (86%). Long-term radiographic tumor control was demonstrated in 90% of lesions treated with radiosurgery as a primary treatment modality. Twenty-seven of 32 cases (84%) with a progressive neurologic deficit before treatment experienced at least some clinical improvement. While the results show pain improvement, the extent of pain relief and impact of quality of life is not reported. As noted above in the rationale, comparative studies are needed along with more details about relevant outcomes. Chang reported on phase I/II results of SBRT in 74 spinal lesions in 63 patients with cancer. (20) The actuarial 1-year tumor progression-free incidence was 84%. Pattern-of-failure analysis showed 2

primary mechanisms of failure: recurrence in the bone adjacent to the site of previous treatment; and recurrence in the epidural space adjacent to the spinal cord. The authors concluded that analysis of the data obtained in their study supports the safety and effectiveness of SBRT in cases of metastatic spinal tumors. They add that they consider it prudent to routinely treat the pedicles and posterior elements using a wide bone margin posterior to the diseased vertebrae because of the possible direct extension into these structures and for patients without a history of radiotherapy, more liberal spinal cord dose constraints than those used in the study.

A number of studies of SBRT were identified in the treatment of non-small-cell lung cancer (NSCLC). Reported studies generally involved small numbers of patients with limited follow-up and did not have a comparison group. Timmerman concluded that prospective trials using SBRT in North America have been able to identify potent tolerant dose levels and confirm their efficacy, but also noted that sometimes debilitating toxicity has been observed for patients with tumors near the central airways. (21) Hof reported on outcomes (median follow-up 15 months) for 42 patients with stages I and II lung cancer who were not suitable for surgery and who were treated with stereotactic radiotherapy. (22) In this series, at 12 months overall survival was 75% and disease-free survival was 70%. Better local control was noted with higher doses of radiation. Early preliminary results were also noted for this treatment approach with liver, renal, and prostate cancer. (23-25) Given these published results and the lack of comparative outcome data, no changes are made in the policy statements.

#### **Additional references:**

19. Gerszten PC, Burton SA, Ozhasoglu C et al. Radiosurgery for spinal metastases: clinical experience in 500 cases from a single institution. *Spine* 2007; 32(2):193-9.
20. Chang EL, Shiu AS, Mendel E et al. Phase I/II study of stereotactic body radiotherapy for spinal metastasis and its pattern of failure. *J Neurosurg Spine* 2007; 7(2):151-60.
21. Timmerman RD, Park C, Kavanagh BD. The North American experience with stereotactic body radiation therapy in non-small cell lung cancer. *J Thorac Oncol* 2007; 2(7 suppl 3):S101-12.
22. Hof H, Muentner M, Oetzel D et al. Stereotactic single-dose radiotherapy (radiosurgery) of early stage nonsmall-cell lung cancer (NSCLC). *Cancer* 2007; 110(1):148-55.
23. Mendez Romero A, Wunderink W, Hussain SM et al. Stereotactic body radiation therapy for primary and metastatic liver tumors: a single institution phase i-ii study. *Acta Oncol* 2006; 45(7):831-7.
24. Svedman C, Sandstrom P, Pisa P et al. A prospective phase II trial of using extracranial stereotactic radiotherapy in primary and metastatic renal cell carcinoma. *Acta Oncol* 2007; 45(7):870-5.
25. Madsen BL, Hsi RA, Pham HT et al. Stereotactic hypofractionated accurate radiotherapy of the prostate (SHARP), 33.5 Gy in five fractions for localized disease: first clinical trial results. *Int J Radiat Oncol Biol Phys* 2007; 67(4):1099-105.

**2009 Update:** Based upon review of BCBSA policy 6.01.10 Stereotactic Radiosurgery and Stereotactic Body Radiation Therapy, issued 12/08. BCBSA policy was updated with literature search; reference numbers 26-29 were added. Clinical input reviewed. Policy statements changed to indicate SBRT may be considered medically necessary in specific cases of both non-small cell lung cancer and spinal tumors. Policy title modified to include "Stereotactic Body Radiation Therapy." CPT coding updated. Information about charged particle (e.g., proton ion) radiation therapy removed from policy (refer to policy 8.01.10)

Since the last update, a number of additional articles have been published about SBRT, especially for the treatment of lung tumors. However, data on the use of SBRT in other non-central nervous system sites remains limited. One new citation was identified related to treatment planning in prostate cancer. (26) Recent studies on use in liver cancers describe feasibility studies and interim analysis.

In terms of lung tumors, publications are reporting longer-term outcomes with SBRT for patients with early lung cancer who are not surgical candidates. These are patients with clinical stage 1 disease who currently might have been treated with conventional radiation therapy. These studies were summarized in a recent review by Nguyen. (27) This paper cites a number of studies of SBRT for early-stage lung cancer receiving a biologic equivalent dose of 100 Gy or more. Three of the studies cited reported 5-year survival that ranged from 30% to

83%; in the largest series of 257 patients the 5-year survival was 42%. Koto reported on a phase II study of 31 patients with Stage 1 non-small cell lung cancer. (28) Patients received 45 Gy in 3 fractions, but those with tumors close to an organ at risk received 60 Gy in 8 fractions. With a median follow-up of 32 months, the 3-year overall survival was 72%, disease-free survival was 84%. Five patients developed grade 2 or greater pulmonary toxicity. While comparative studies were not identified, older studies have reported 3-year disease-specific survival rates of 49% for those with stage 1 disease. (29) SBRT may not be appropriate for tumors in close proximity to the heart, mediastinum, or spinal cord. In addition, centrally located proximal tumors may be associated with increased toxicity.

#### Physician Specialty Society and Academic Medical Center Input

In response to requests, input was received from 2 physician specialty societies and 4 academic medical centers while this policy was under review for December 2008. While the various physician specialty societies and academic medical centers may collaborate with and make recommendations during this process, through the provision of appropriate reviewers, input received does not represent an endorsement or position statement by the physician specialty societies or academic medical centers, unless otherwise noted. The input uniformly supported use of this technology in the treatment of non-small cell lung cancer and spinal tumors after prior radiation therapy. There was also support for use in some patients with liver (metastatic and primary) cancer and as first-line treatment of spinal tumors. There was little support for its use in cases of prostate cancer.

#### Summary

Based on the information reviewed above, SBRT may be considered medically necessary in patients with stage 1 non-small cell lung cancer (not larger than 5 cm in diameter) showing no nodal or distant disease and who are not candidates for surgical resection because of co-morbid conditions. SBRT has also been shown to improve outcomes (reduce pain) in patients with spinal (vertebral) tumors that recur after prior radiation therapy. Data for other extra-cranial uses of SBRT are limited, these clinical situations are still considered investigational.

#### **References:**

26. Fuller DB, Naitoh J, Lee C et al. Virtual HDR CyberKnife treatment for localized prostatic carcinoma: dosimetry comparison with HDR brachytherapy and preliminary clinical observations. *Int J Radiat Oncol Biol Phys* 2008; 70(5):1588-97.
27. Nguyen NP, Garland L, Welsh J et al. Can stereotactic fractionated radiation therapy become the standard of care for early stage non-small cell lung carcinoma. *Cancer Treat Rev* 2008; 34(8):719-27.
28. Koto M, Takai Y, Ogawa Y et al. A phase II study on stereotactic body radiotherapy for stage I non-small cell lung cancer. *Radiother Oncol* 2007; 85(3):429-34.
29. Kupelian PA, Komaki R, Allen P. Prognostic factors in the treatment of node-negative nonsmall cell lung carcinoma with radiotherapy alone. *Int J Radiat Oncol Biol Phys* 1996; 36(3):607-13.

#### **BCBSMA medically necessary ICD-9 CM diagnoses for coverage of stereotactic radiosurgery for all Products (including Medicare Advantage Products):**

190.6-malignant neoplasm of eye, choroid

191.0-191.9-malignant neoplasm of brain

192.0-192.9-malignant neoplasm of other and unspecified parts of nervous system

194.3-malignant neoplasm of other endocrine glands and related structures, pituitary gland and craniopharyngeal duct

198.3-secondary malignant neoplasm of other specified sites, brain and spinal cord

198.4-secondary malignant neoplasm of other specified sites, other parts of nervous system

225.0-225.9-benign neoplasm of brain and other parts of nervous system

227.3-benign neoplasm of other endocrine glands and related structures, pituitary gland and craniopharyngeal duct (pouch)

237.0-neoplasm of uncertain behavior of endocrine glands and nervous system, pituitary gland and craniopharyngeal duct

237.5-neoplasm of uncertain behavior of endocrine glands and nervous system, brain and spinal cord

237.6-neoplasm of uncertain behavior of endocrine glands and nervous system, meninges

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239.6-neoplasms of unspecified nature, brain  
239.7-neoplasms of unspecified nature, endocrine glands and other parts of nervous system  
350.1-trigeminal neuralgia  
747.81-anomalies of cerebrovascular system (arteriovenous malformation of brain)

**BCBSMA medically necessary ICD-9 CM diagnoses for Medicare Advantage Products only:**

345.00-345.91-epilepsy and recurrent seizures  
352.0-352.9-disorders of other cranial nerves

<sup>14</sup> **BCBSMA medically necessary ICD-9 CM diagnoses for coverage of stereotactic body radiation therapy (CPT codes 77373 and 77435) for commercial products and for Medicare HMO Blue, Medicare PPO Blue, and Blue Medicare PFFS PlusRx, editing is effective 9/1/09:**

- 162.2 Malignant neoplasm of main bronchus
- 162.3 Malignant neoplasm of upper lob, bronchus or lung
- 162.4 Malignant neoplasm of middle lobe, bronchus or lung
- 162.5 Malignant neoplasm of lower lobe, bronchus or lung
- 162.8 Malignant neoplasm of other parts of bronchus or lung
- 162.9 Malignant neoplasm of bronchus and lung, unspecified
- 170.2 Malignant neoplasm of vertebral column, excluding sacrum and coccyx
- 170.6 Malignant neoplasm of pelvic bones, sacrum, and coccyx
- 198.5 Secondary malignant neoplasm of bone and bone marrow

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