

# Stereotactic Radiosurgery and Stereotactic Body Radiation Therapy



INDEPENDENT CARE HEALTH PLAN

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## Medicare Advantage Medical Coverage Policy

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#### Disclaimer

The Coverage Summaries are reviewed by the iCare Medicare Utilization Management Committee. Policies in this document may be modified by a member's coverage document. Clinical policy is not intended to preempt the judgment of the reviewing medical director or dictate to health care providers how to practice medicine. Health care providers are expected to exercise their medical judgment in rendering appropriate care. Identification of selected brand names of devices, tests and procedures in a medical coverage policy is for reference only and is not an endorsement of any one device, test, or procedure over another. Clinical technology is constantly evolving, and we reserve the right to review and update this policy periodically. References to CPT® codes or other sources are for definitional purposes only and do not imply any right to reimbursement or guarantee of claims payment. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any shape or form or by any means, electronic, mechanical, photocopying or otherwise, without permission from iCare.

## Related Medicare Advantage Medical/Pharmacy Coverage Policies

None

## Related Documents

Please refer to [CMS website](#) for the most current applicable National Coverage Determination (NCD)/Local Coverage Determination (LCD)/Local Coverage Article (LCA)/CMS Online Manual System/Transmittals.

Type	Title	ID Number	Jurisdiction Medicare Administrative Contractors (MACs)	Applicable States/Territories
LCD LCA	Stereotactic Radiation Therapy: Stereotactic Radiosurgery (SRS) and Stereotactic Body Radiation Therapy (SBRT)	<a href="#">L35076</a> <a href="#">A56874</a>	J6 - National Government Services, Inc. (Part A/B MAC)  JK - National Government Services, Inc. (Part A/B MAC)	IL, MN, WI  CT, NY, ME, MA, NH, RI, VT
LCD LCA	Prostate Rectal Spacers	<a href="#">L37485</a> <a href="#">A56539</a>	J6 - National Government Services, Inc. (Part A/B MAC)  JK - National Government Services, Inc. (Part A/B MAC)	IL, MN, WI  CT, NY, ME, MA, NH, RI, VT

## Description

Stereotactic radiosurgery (SRS) is a form of radiation therapy in which three-dimensional (3D) images are utilized to specifically direct focused radiation to obliterate abnormal tissues in the head and neck (facilitated by a rigid head frame), while sparing surrounding healthy tissue. This technique differs from conventional radiation therapy, which involves exposing large areas of tissue to relatively broad fields of radiation. SRS can be utilized for, but may not be limited to, the treatment of arteriovenous malformations (AVMs), aneurysms, benign or malignant brain tumors and acoustic neuromas (vestibular schwannoma).

Stereotactic body radiation therapy (SBRT) is similar in technique to intracranial SRS except the target areas are in the body (utilizing a body frame) and do not include the head or neck (extracranial). SBRT involves a single high-dose radiation delivery, or a series of fractionated radiation deliveries given over several days, with the intention of decreasing the short and long-term side effects of radiation therapy, while permitting a higher total radiation dosage in some situations.

Delivery systems for SRS and SBRT include, but may not be limited to:

- **CyberKnife** is a radiation delivery system that consists of a lightweight linear accelerator device (LINAC) that is mounted to a multijointed robotic arm. This device utilizes a proprietary real-time image-guidance system to deliver SRS or radiotherapy. It was designed to access hard to reach or complex shaped tumors that may not be accessible by surgery and other radiosurgical technologies.

- **Gamma Knife (eg, Akesis Galaxy and Akesis Galaxy RTi, Elekta Esprit, Gamma Knife Icon Leksell, Perfexion SRS system,)** is a radiosurgery technology, which is designed to treat brain tumors. The device utilizes ionizing radiation (gamma rays) produced by 201 radioactive cobalt-60 sources to ablate intracranial targets via a fixed stereotactic frame.
- **GammaPod** is a stereotactic radiotherapy system that is designed to deliver SBRT by purportedly using thousands of individual focused beams from 36 rotating radioactive Cobalt-60 sources. It is intended for use in the noninvasive stereotactic delivery of radiation to a portion of the breast in conjunction with breast conserving treatment. The individual lies prone on a table with the breast immobilized in a vacuum-assisted cup, which reportedly provides increased accuracy in the delivery of the radiation.<sup>163</sup>

The placement of a **transperineal biodegradable spacer** also known as **prostate rectal spacers (eg, Barrigel, SpaceOAR, SpaceOAR Vue)** positions the anterior (frontal) section of the rectal wall away from the prostate during external beam radiotherapy treatments for prostate cancer with the goal of limiting the radiation exposure to the anterior rectum. Because this material is biodegradable, it is absorbed over time by the individual's body. SpaceOAR is comprised of a synthetic, absorbable polyethylene glycol-based hydrogel. SpaceOAR Vue contains PEGylated iodine, which is designed to enhance visibility via CT scan. Barrigel injectable gel is similar to the SpaceOAR product; however, it is made of stabilized hyaluronic acid.

## Coverage Determination Criteria

*iCare follows the CMS requirements that only allows coverage and payment for services that are reasonable and necessary for the diagnosis and treatment of illness or injury or to improve the functioning of a malformed body member except as specifically allowed by Medicare.*

*In interpreting or supplementing the criteria above and in order to determine medical necessity consistently, iCare may consider the criteria contained in the following:*

**SRS** will be considered medically reasonable and necessary when the following requirements are met:

- Arteriovenous malformations (AVMs)<sup>53,49,56,97</sup>
  - Individual is a poor surgical risk; **OR**
  - Surgically inaccessible AVM; **OR**
- Brain malignancies (primary or metastatic)<sup>29,33</sup>
  - Lesions less than 5cm; **AND**
  - No active systemic disease (defined as extracranial disease that is stable or in remission); **OR**
- Intracranial tumors which includes, but may not be limited to, acoustic neuromas, other schwannomas, pituitary adenomas, pineocytomas, craniopharyngiomas, glomus tumors, hemangioblastoma:<sup>9,33</sup>

- Not amenable to surgical interventions; **OR**
- Not completely resectable or unresectable; **OR**
- Ocular melanomas
- Pituitary adenomas
- Severe essential tremor<sup>9,36</sup>
  - Not amenable for alternative procedures (eg, deep brain stimulation); **AND**
  - Symptoms refractory to medical therapy; **OR**
- Spinal cord metastases<sup>52,77</sup>
  - No clinically significant spinal instability; **AND**
  - No evidence of spinal cord compression; **AND**
  - Not amenable for additional conventional irradiation or surgery; **AND**
  - Well-circumscribed lesion (easily outline for treatment planning); **OR**
- Trigeminal neuralgia<sup>40</sup>
  - Not amenable to surgical excision; **OR**
  - Symptoms refractory to medical therapy

**SBRT** will be considered medically reasonable and necessary for the treatment of recurrence in or near previously irradiated regions when a high level of precision and accuracy or a high dose per fraction is indicated to minimize the risk of injury to surrounding normal tissues and treatment with conventional methods is not appropriate or safe for the particular individual.<sup>30</sup>

**SBRT** will be considered medically reasonable and necessary when the following requirements are met:

- Adrenal metastases<sup>52,82</sup>; **OR**
- Cholangiocarcinoma, unresectable;<sup>52,75</sup> **OR**
- Hepatocellular carcinoma/liver metastases<sup>52,91</sup>
  - Additional treatment needed (eg, limited disease, symptom palliation); **AND**
  - Not amenable to surgical excision; **AND**
  - Sufficient amount of uninvolved liver to tolerate treatment course; **OR**
- Lung metastases<sup>20,30,52,86</sup>

- 1 – 3 metastases present; **AND**
- Additional treatment needed (eg, curative intent, palliation of symptoms); **AND**
- Medically inoperable or refuses surgery; **AND**
- Stable extrathoracic disease as evidenced by imaging studies (eg, CT scan, PET-CT) prior to beginning treatment; **OR**
- Non-small cell lung cancer (NSCLC)<sup>3,20,86</sup>
  - Inoperable stage 1 or 2 node negative peripheral lesions that are less than 5 cm in maximal dimension; **AND**
  - Need for additional treatment (curative intent); **AND**
  - Medically inoperable or refuses surgery; **AND**
  - No lymph node metastases; **OR**
- Pancreatic cancer, locally advanced for the following indications:<sup>52,88</sup>
  - First-line therapy, either alone or combined with chemotherapy; **OR**
  - Use as palliative therapy; **OR**
- Prostate cancer<sup>26,52,89</sup>
  - Low-risk disease
    - [Gleason grade](#) less than or equal to 6; **AND**
    - Life expectancy of 10 years or greater; **AND**
    - Prostate-specific antigen (PSA) less than 10; **AND**
    - [Stage T1-T2](#) (organ-confined) prostate cancer; **OR**
  - Intermediate-risk disease or high-risk
    - [Gleason grade](#) 7 – 10; **AND**
    - Prostate-specific antigen (PSA) 10 or greater; **AND**
    - [Stage T2b/T2c](#) or [T3a](#) prostate cancer; **OR**
- Spinal Metastases<sup>52,77</sup>
  - In tumors that are considered resistant to conventional external beam radiation therapy (EBRT) (eg, sarcoma, melanoma, renal cell carcinoma, NSCLC, colon carcinoma); **AND**
  - Need for additional treatment (eg, symptom palliation); **AND**
  - No cord compression; **AND**

- No spinal fracture or instability; **OR**
- Spinal Tumors<sup>77</sup>
  - Not amenable to surgical excision

**Transperineal biodegradable spacer** also known as **prostate rectal spacers** (eg, Barrigel, SpaceOar, SpaceOAR Vue) will be considered medically reasonable and necessary for use during prostate cancer radiation therapy.

*The use of the criteria in this Medicare Advantage Medical Coverage Policy provides clinical benefits highly likely to outweigh any clinical harms. Services that do not meet the criteria above are not medically necessary and thus do not provide a clinical benefit. Medically unnecessary services carry risks of adverse outcomes and may interfere with the pursuit of other treatments which have demonstrated efficacy.*

## Coverage Limitations

[US Government Publishing Office. Electronic code of federal regulations: part 411 – 42 CFR § 411.15 - Particular services excluded from coverage](#)

**SRS/SBRT** will not be considered medically reasonable and necessary when the following requirements are met:

- Treatment is unlikely to result in clinical cancer control and/or functional impairment;<sup>30</sup> **AND**
- Tumor burden cannot be completely targeted with acceptable risk to critical normal structures;<sup>30</sup> **AND**
- Poor performance status ([Karnofsky Performance Status less than 40](#) or [Eastern Oncology Group \(ECOG\) status of 3 or worse](#));<sup>30</sup> **AND**
- Recurrent (other than pelvis and head and neck tumors) or metastatic disease could be treated by conventional methods (record must describe why other radiation therapy measures are not appropriate or safe for the individual);<sup>30</sup> **AND**
- Course of radiation treatment extending beyond 5 fractions as the goal of SBRT is to maximize the potency of radiotherapy by completing an entire course of treatment within an extremely accelerated time frame. Extending beyond 5 fractions is not considered SBRT and not to be used as a boost following a conventionally fractionated course of treatment;<sup>30</sup> **AND**

**SRS/SBRT** will not be considered medically reasonable and necessary for the following diagnoses:

- Breast cancer; **OR**

- Thyroid cancer; **OR**
- GammaPod

A review of the current medical literature shows that there is no evidence to determine that this service is standard medical treatment. There is an absence of randomized, blinded clinical studies examining benefit and long-term clinical outcomes establishing the value of this service in clinical management.

- Bone metastasis excluding spine; **OR**
- Colon/rectal cancer; **OR**
- Epilepsy; **OR**
- Gynecologic cancer (eg, cervical, endometrial, ovarian, uterine, vulvar) **OR**;
- Kidney/renal cancer; **OR**
- Pancreatic cancer; **OR**

A review of the current medical literature shows that the evidence is insufficient to determine that this service is standard medical treatment. There remains an absence of randomized, blinded clinical studies examining benefit and long-term clinical outcomes establishing the value of this service in clinical management.

### **Summary of Evidence**

#### ***Bone metastases***

Advanced radiation techniques (eg, SBRT) as primary treatment for painful bone metastases should be considered in the setting of a clinical trial since there is currently insufficient data to routinely support this treatment.<sup>10</sup>

#### ***Colon/rectal cancer***

SBRT for the treatment of extrahepatic disease can be considered in select cases, or as part of a clinical trial. Ablative SBRT should only be used in the setting of a clinical trial or in the setting of oligometastases (eg, lung, liver).<sup>90</sup>

#### ***Epilepsy***

Due to the lack of data, it is not possible to compare efficacy and safety profiles of different radiosurgery methods for the treatment of epilepsy.<sup>42</sup>

#### ***Gynecological cancers***

SBRT is not considered an appropriate alternative to brachytherapy.<sup>78</sup>

#### ***Kidney/renal cancer***

SBRT in the management of localized renal masses at present remains investigational.<sup>28</sup> Further randomized trials comparing SBRT to standard treatment approaches, such as surgical resection and other ablative techniques, are necessary prior to integrating this technique into clinical practice.<sup>123</sup>

#### ***Pancreatic cancer***

There are limited data to support specific radiation therapy dosing for SBRT; therefore, it should preferably be utilized as part of a clinical trial or at an experienced, high-volume center.<sup>88</sup> Until randomized trials comparing this approach with conventional systemic and other radiation therapies the place of SBRT as a treatment option for locally advanced pancreatic cancer will remain uncertain and cannot be recommended as a standard approach.<sup>104</sup>

### Coding Information

Any codes listed on this policy are for informational purposes only. Do not rely on the accuracy and inclusion of specific codes. Inclusion of a code does not guarantee coverage and/or reimbursement for a service or procedure.

CPT® Code(s)	Description	Comments
32701	Thoracic target(s) delineation for stereotactic body radiation therapy (SRS/SBRT), (photon or particle beam), entire course of treatment	
55874	Transperineal placement of biodegradable material, peri-prostatic, single or multiple injection(s), including image guidance, when performed	
61796	Stereotactic radiosurgery (particle beam, gamma ray, or linear accelerator); 1 simple cranial lesion	
61797	Stereotactic radiosurgery (particle beam, gamma ray, or linear accelerator); each additional cranial lesion, simple (List separately in addition to code for primary procedure)	
61798	Stereotactic radiosurgery (particle beam, gamma ray, or linear accelerator); 1 complex cranial lesion	
61799	Stereotactic radiosurgery (particle beam, gamma ray, or linear accelerator); each additional cranial lesion, complex (List separately in addition to code for primary procedure)	
61800	Application of stereotactic headframe for stereotactic radiosurgery (List separately in addition to code for primary procedure)	
63620	Stereotactic radiosurgery (particle beam, gamma ray, or linear accelerator); 1 spinal lesion	
63621	Stereotactic radiosurgery (particle beam, gamma ray, or linear accelerator); each additional spinal lesion (List separately in addition to code for primary procedure)	
77371	Radiation treatment delivery, stereotactic radiosurgery (SRS), complete course of treatment of cranial lesion(s) consisting of 1 session; multi-source Cobalt 60 based	



77372	Radiation treatment delivery, stereotactic radiosurgery (SRS), complete course of treatment of cranial lesion(s) consisting of 1 session; linear accelerator based	
77373	Stereotactic body radiation therapy, treatment delivery, per fraction to 1 or more lesions, including image guidance, entire course not to exceed 5 fractions	
77432	Stereotactic radiation treatment management of cranial lesion(s) (complete course of treatment consisting of 1 session)	
77435	Stereotactic body radiation therapy, treatment management, per treatment course, to 1 or more lesions, including image guidance, entire course not to exceed 5 fractions	
<b>CPT® Category III Code(s)</b>	<b>Description</b>	<b>Comments</b>
No code(s) identified		
<b>HCPCS Code(s)</b>	<b>Description</b>	<b>Comments</b>
C1889	Implantable/insertable device, not otherwise classified	
G0339	Image guided robotic linear accelerator-based stereotactic radiosurgery, complete course of therapy in one session or first session of fractionated treatment	
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	

## References

1. Agency for Healthcare Research and Quality (AHRQ). Comparative Effectiveness Review. Radiation therapy for brain metastases. <https://www.ahrq.gov>. Published June 2021. Accessed August 11, 2023.
2. American Association for the Study of Liver Diseases (AASLD). AASLD practice guidance on prevention, diagnosis and treatment of hepatocellular carcinoma. <https://www.aasld.org>. Published May 22, 2023. Accessed August 15, 2023.
3. American College of Chest Physicians (ACCP). Treatment of stage I and II non-small cell lung cancer. Diagnosis and management of lung cancer, 3<sup>rd</sup> ed: American College of Chest Physicians evidence-based clinical practice guidelines. <https://www.chestnet.org>. Published May 2013. Accessed August 16, 2023.
4. American College of Radiology (ACR). ACR Appropriateness Criteria. Radiologic management of liver cancer. <https://www.acr.org>. Published 2022. Accessed August 16, 2023.

5. American College of Radiology (ACR). ACR-ARS practice parameter for the performance of brain stereotactic radiosurgery. <https://www.acr.org>. Published 2021. Accessed August 16, 2023.
6. American College of Radiology (ACR). ACR-ASTRO practice parameter for radiation oncology. <https://www.acr.org>. Published 2014. Updated 2018. Accessed August 16, 2023.
7. American College of Radiology (ACR). ACR-ASTRO practice parameter for the performance of stereotactic body radiation therapy. <https://www.acr.org>. Published 2014. Updated 2019. Accessed August 16, 2023.
8. American Society for Radiation Oncology (ASTRO). Model Policy. Stereotactic body radiation therapy (SBRT). <https://www.astro.org>. Published 2014. Updated June 2020. Accessed August 15, 2023.
9. American Society for Radiation Oncology (ASTRO). Model Policy. Stereotactic radiosurgery (SRS). <https://www.astro.org>. Published 2014. Accessed August 15, 2023.
10. American Society for Radiation Oncology (ASTRO). Palliative radiation therapy for bone metastases: an update of an ASTRO evidence-based guideline. <https://www.astro.org>. Published January 1, 2017. Accessed August 15, 2023.
11. American Society for Radiation Oncology (ASTRO). Radiation therapy for brain metastases: an ASTRO clinical practice guideline. <https://www.astro.org>. Published August 2022. Accessed August 15, 2023.
12. American Society for Radiation Oncology (ASTRO). Radiation therapy for glioblastoma: an ASTRO evidence-based clinical practice guideline. <https://www.astro.org>. Published July 2016. Accessed August 15, 2023.
13. American Society for Radiation Oncology (ASTRO). Radiation therapy for pancreatic cancer: an ASTRO clinical practice guideline. <https://www.astro.org>. Published 2019. Accessed August 15, 2023.
14. American Society for Radiation Oncology (ASTRO). Radiation therapy for small cell lung cancer: an ASTRO clinical practice guideline. <https://www.astro.org>. Published 2020. Accessed August 15, 2023.
15. American Society for Radiation Oncology (ASTRO). Treatment of oligometastatic non-small cell lung cancer: an ASTRO/ESTRO clinical practice guideline. <https://www.astro.org>. Published April 25, 2023. Accessed August 15, 2023.
16. American Society of Clinical Oncology (ASCO). Locally advanced, unresectable pancreatic cancer: American Society of Clinical Oncology clinical practice guideline. <https://www.asco.org>. Published August 1, 2016. Accessed August 15, 2023.
17. American Society of Clinical Oncology (ASCO). Management of advanced human epidermal growth factor receptor 2-positive breast cancer and brain metastases: ASCO guideline update. <https://www.asco.org>. Published May 31, 2022. Accessed August 15, 2023.

18. American Society of Clinical Oncology (ASCO). Radiation therapy for brain metastases: ASCO guideline endorsement of ASTRO guideline. <https://www.asco.org>. Published May 13, 2022. Accessed August 15, 2023.
19. American Society of Clinical Oncology (ASCO). Radiation therapy for glioblastoma: American Society of Clinical Oncology clinical practice guideline endorsement of the American Society for Radiation Oncology guideline. <https://www.asco.org>. Published January 20, 2017. Accessed August 15, 2023.
20. American Society of Clinical Oncology (ASCO). Radiation therapy for small-cell lung cancer: ASCO guideline endorsement of an ASTRO guideline. <https://www.asco.org>. Published January 27, 2021. Accessed August 15, 2023.
21. American Society of Clinical Oncology (ASCO). Stereotactic body radiotherapy for early-stage non-small cell lung cancer: American Society of Clinical Oncology endorsement of the American Society for Radiation Oncology evidence-based guideline. <https://www.asco.org>. Published March 1, 2018. Accessed August 15, 2023.
22. American Society of Clinical Oncology (ASCO). Treatment for brain metastases: ASCO-SNO-ASTRO guideline. <https://www.asco.org>. Published December 21, 2021. Accessed August 15, 2023.
23. American Society of Clinical Oncology (ASCO). Treatment of metastatic colorectal cancer: ASCO guideline. <https://www.asco.org>. Published October 17, 2022. Accessed August 15, 2023.
24. American Thyroid Association (ATA). 2015 American Thyroid Association management guidelines for adult patients with thyroid nodules and differentiated thyroid cancer. <https://www.thyroid.org>. Published January 2016. Accessed August 15, 2023.
25. American Thyroid Association (ATA). 2015 American Thyroid Association management guidelines for management of patients with anaplastic thyroid cancer. <https://www.thyroid.org>. Published March 2021. Accessed August 15, 2023.
26. American Urological Association (AUA). Clinically localized prostate cancer: AUA/ASTRO guideline 2022. <https://www.auanet.org>. Published 2022. Accessed August 16, 2023.
27. American Urological Association (AUA). Hypofractionated radiation therapy for localized prostate cancer: an ASTRO, ASCO and AUA evidence-based guideline. <https://www.auanet.org>. Published 2018. Accessed August 16, 2023.
28. American Urological Association (AUA). Renal mass and localized renal cancer: evaluation, management and follow-up – AUA guideline. <https://www.auanet.org>. Published April 2021. Accessed August 16, 2023.
29. Centers for Medicare & Medicaid Services (CMS). Local Coverage Article (LCD). Prostate rectal spacers (L37485). <https://www.cms.gov>. Published July 2, 2018. Updated August 1, 2020. Accessed September 20, 2023.

30. Centers for Medicare & Medicaid Services (CMS). Local Coverage Article (LCD). Stereotactic Radiation Therapy: Stereotactic Radiosurgery (SRS) and Stereotactic Body Radiation Therapy (SBRT) (L35076). <https://www.cms.gov>. Published October 1, 2015. Updated April 1, 2020. Accessed August 30, 2023.
31. ClinicalKey. Clinical Overview. Brain metastases. <https://www.clinicalkey.com>. Updated January 1, 2023. Accessed August 11, 2023.
32. ClinicalKey. Clinical Overview. Lung cancer (non-small cell). <https://www.clinicalkey.com>. Updated May 5, 2023. Accessed August 11, 2023.
33. ClinicalKey. Clinical Overview. Vestibular schwannoma. <https://www.clinicalkey.com>. Updated June 22, 2022. Accessed August 11, 2023.
34. Congress of Neurological Surgeons (CNS). Congress of Neurological Surgeons systematic review and evidence-based guideline on the use of stereotactic radiosurgery in the treatment of adults with metastatic brain tumors. <https://www.cns.org>. Published March 2019. Accessed August 15, 2023.
35. ECRI Institute. Clinical Evidence Assessment. Barrigel hyaluronic spacer (Palette Life Sciences) for reducing exposure during prostate cancer therapy. <https://www.ecri.org>. Published September 7, 2022. Accessed August 10, 2023.
36. ECRI Institute. Clinical Evidence Assessment. Stereotactic radiosurgery for treating essential tremor. <https://www.ecri.org>. Published January 1, 2023. Accessed August 9, 2023.
37. ECRI Institute. Clinical Evidence Assessment. Zap-X radiosurgery system (Zap Surgical Systems, Inc.) for intracranial tumor radiation therapy. <https://www.ecri.org>. Published April 11, 2022. Accessed August 9, 2023.
38. Hayes, Inc. Health Technology Assessment. Absorbable perirectal spacer (SpaceOAR systems, Boston Scientific) during radiation therapy for prostate cancer. <https://evidence.hayesinc.com>. Published September 27, 2021. Updated November 4, 2022. Accessed August 9, 2023.
39. Hayes, Inc. Health Technology Assessment. Stereotactic radiosurgery for movement disorders. <https://evidence.hayesinc.com>. Published September 18, 2019. Updated October 7, 2022. Accessed August 9, 2023.
40. Hayes, Inc. Health Technology Assessment. Stereotactic radiosurgery for trigeminal neuralgia. <https://evidence.hayesinc.com>. Published September 26, 2019. Updated October 20, 2022. Accessed August 9, 2023.
41. Hayes, Inc. Medical Technology Directory (ARCHIVED). Stereotactic radiosurgery for arteriovenous malformations and intracranial tumors. <https://evidence.hayesinc.com>. Published January 8, 2009. Updated February 19, 2013. Accessed August 9, 2023.

42. International Stereotactic Radiosurgery Society (ISRS). Radiosurgery for epilepsy: systematic review and International Stereotactic Radiosurgery Society (ISRS) practice guideline. <https://www.isrsy.org>. Published September 20, 2017. Accessed August 16, 2023.
43. International Stereotactic Radiosurgery Society (ISRS). Stereotactic body radiotherapy for lung oligo-metastases: systematic review and International Stereotactic Radiosurgery Society practice guideline. <https://www.isrsy.org>. Published June 25, 2023. Accessed August 16, 2023.
44. International Stereotactic Radiosurgery Society (ISRS). Stereotactic body radiotherapy for ultra-central lung tumors: a systematic review and meta-analysis and International Stereotactic Radiosurgery Society practice guideline. <https://www.isrsy.org>. Published June 21, 2023. Accessed August 16, 2023.
45. International Stereotactic Radiosurgery Society (ISRS). Stereotactic radiosurgery for benign (World Health Organization grade I) cavernous sinus meningiomas – International Stereotactic Radiosurgery Society (ISRS) practice guideline a systematic review. <https://www.isrsy.org>. Published January 14, 2018. Accessed August 16, 2023.
46. International Stereotactic Radiosurgery Society (ISRS). Stereotactic radiosurgery for intracranial noncavernous sinus benign meningioma: International Stereotactic Radiosurgery Society systematic review, meta-analysis and practice guideline. <https://www.isrsy.org>. Published March 12, 2020. Accessed August 16, 2023.
47. International Stereotactic Radiosurgery Society (ISRS). Stereotactic radiosurgery for non-functioning pituitary adenoma: meta-analysis and International Stereotactic Radiosurgery Society practice opinion. <https://www.isrsy.org>. Published March 5, 2020. Accessed August 16, 2023.
48. International Stereotactic Radiosurgery Society (ISRS). Stereotactic radiosurgery for postoperative metastatic surgical cavities: a critical review and International Stereotactic Radiosurgery Society (ISRS) practice guideline. <https://www.isrsy.org>. Published March 14, 2021. Accessed August 16, 2023.
49. International Stereotactic Radiosurgery Society (ISRS). Stereotactic radiosurgery for Spetzler-Martin grade I and II arteriovenous malformations: International Stereotactic Radiosurgery Society (ISRS) practice guideline. <https://www.isrsy.org>. Published 2020. Accessed August 16, 2023.
50. International Stereotactic Radiosurgery Society (ISRS). Stereotactic radiosurgery for vestibular schwannomas: International Stereotactic Radiosurgery Society (ISRS) practice guideline. <https://www.isrsy.org>. Published February 2, 2017. Accessed August 16, 2023.
51. International Stereotactic Radiosurgery Society (ISRS). Stereotactic radiosurgery in the management of limited (1-4) brain metastases: systematic review and International Stereotactic Radiosurgery Society (ISRS) practice guideline. <https://www.isrsy.org>. Published 2017. Accessed August 16, 2023.
52. MCG Health. Stereotactic body radiotherapy. 27<sup>th</sup> edition. <https://www.mcg.com>. Accessed June 28, 2023.
53. MCG Health. Stereotactic radiosurgery. 27<sup>th</sup> edition. <https://www.mcg.com>. Accessed June 28, 2023.

54. Merck Manual: Professional Version. Overview of intracranial tumors. <https://www.merckmanuals.com>. Updated May 2023. Accessed August 11, 2023.
55. Merck Manual: Professional Version. Radiation therapy for cancer. <https://www.merckmanuals.com>. Updated September 2020. Accessed August 3, 2022.
56. Merck Manual: Professional Version. Spinal cord arteriovenous malformations (AVMs). <https://www.merckmanuals.com>. Updated February 2023. Accessed August 11, 2023.
57. Müller AC, Mischinger J, Mischinger J, et al. Interdisciplinary consensus statement on indication and application of a hydrogel spacer for prostate radiotherapy based on experience in more than 250 patients. *Radiol Oncol*. 2016;50:329-336.
58. National Cancer Institute (NCI). Adult central nervous system tumors treatment (PDQ) – health professional version. <https://www.cancer.gov>. Updated January 20, 2023. Accessed August 15, 2023.
59. National Cancer Institute (NCI). Cancer staging. <https://www.cancer.gov>. Updated October 14, 2022. Accessed August 17, 2023.
60. National Cancer Institute (NCI). Childhood astrocytomas treatment (PDQ) – health professional version. <https://www.cancer.gov>. Updated April 19, 2022. Accessed August 15, 2023.
61. National Cancer Institute (NCI). Childhood craniopharyngioma treatment (PDQ) – health professional version. <https://www.cancer.gov>. Updated June 7, 2023. Accessed August 15, 2023.
62. National Cancer Institute (NCI). Childhood ependymoma treatment (PDQ) – health professional version. <https://www.cancer.gov>. Updated June 7, 2023. Accessed August 15, 2023.
63. National Cancer Institute (NCI). Childhood esthesioneuroblastoma treatment (PDQ) – health professional version. <https://www.cancer.gov>. Updated December 9, 2022. Accessed August 15, 2023.
64. National Cancer Institute (NCI). Childhood liver cancer treatment (PDQ) – health professional version. <https://www.cancer.gov>. Updated April 7, 2023. Accessed August 15, 2023.
65. National Cancer Institute (NCI). Childhood medulloblastoma and other central nervous system embryonal tumors treatment (PDQ) – health professional version. <https://www.cancer.gov>. Updated April 12, 2023. Accessed August 15, 2023.
66. National Cancer Institute (NCI). Childhood rhabdomyosarcoma treatment (PDQ) – health professional version. <https://www.cancer.gov>. Updated January 10, 2023. Accessed August 15, 2023.
67. National Cancer Institute (NCI). Childhood soft tissue sarcoma treatment (PDQ) – health professional version. <https://www.cancer.gov>. Updated January 10, 2023. Accessed August 15, 2023.



68. National Cancer Institute (NCI). Ewing sarcoma treatment and undifferentiated small round cell sarcomas of the bone and soft tissue treatment (PDQ) – health professional version. <https://www.cancer.gov>. Updated June 14, 2023. Accessed August 15, 2023.
69. National Cancer Institute (NCI). Intraocular (uveal) melanoma treatment (PDQ) – health professional version. <https://www.cancer.gov>. Updated May 12, 2023. Accessed August 15, 2023.
70. National Cancer Institute (NCI). Nasopharyngeal cancer treatment (adults) (PDQ) – health professional version. <https://www.cancer.gov>. Updated July 13, 2022. Accessed August 15, 2023.
71. National Cancer Institute (NCI). Non-small cell lung cancer treatment (PDQ) – health professional version. <https://www.cancer.gov>. Updated February 17, 2023. Accessed August 15, 2023.
72. National Cancer Institute (NCI). Oropharyngeal cancer treatment (adults) (PDQ) – health professional version. <https://www.cancer.gov>. Updated June 30, 2023. Accessed August 15, 2023.
73. National Cancer Institute (NCI). Osteosarcoma and undifferentiated pleomorphic sarcoma of bone treatment (PDQ) – health professional version. <https://www.cancer.gov>. Updated April 5, 2023. Accessed August 15, 2023.
74. National Cancer Institute (NCI). Pituitary tumors treatment (PDQ) – health professional version. <https://www.cancer.gov>. Updated November 4, 2022. Accessed August 15, 2023.
75. National Comprehensive Cancer Network (NCCN). NCCN Clinical Practice Guidelines in Oncology. Biliary tract cancers. <https://www.nccn.org>. Updated May 10, 2023. Accessed August 15, 2023.
76. National Comprehensive Cancer Network (NCCN). NCCN Clinical Practice Guidelines in Oncology. Bone cancer. <https://www.nccn.org>. Updated August 7, 2023. Accessed August 15, 2023.
77. National Comprehensive Cancer Network (NCCN). NCCN Clinical Practice Guidelines in Oncology. Central nervous system cancers. <https://www.nccn.org>. Updated March 24, 2023. Accessed August 15, 2023.
78. National Comprehensive Cancer Network (NCCN). NCCN Clinical Practice Guidelines in Oncology. Cervical cancer. <https://www.nccn.org>. Updated April 28, 2023. Accessed August 15, 2023.
79. National Comprehensive Cancer Network (NCCN). NCCN Clinical Practice Guidelines in Oncology. Colon cancer. <https://www.nccn.org>. Updated April 25, 2023. Accessed August 15, 2023.
80. National Comprehensive Cancer Network (NCCN). NCCN Clinical Practice Guidelines in Oncology. Head and neck cancer. <https://www.nccn.org>. Updated May 15, 2023. Accessed August 15, 2023.
81. National Comprehensive Cancer Network (NCCN). NCCN Clinical Practice Guidelines in Oncology. Hepatobiliary cancers. <https://www.nccn.org>. Updated March 10, 2023. Accessed August 15, 2023.

82. National Comprehensive Cancer Network (NCCN). NCCN Clinical Practice Guidelines in Oncology. Kidney cancer. <https://www.nccn.org>. Updated June 21, 2023. Accessed August 15, 2023.
83. National Comprehensive Cancer Network (NCCN). NCCN Clinical Practice Guidelines in Oncology. Melanoma: cutaneous. <https://www.nccn.org>. Updated March 10, 2023. Accessed August 15, 2023.
84. National Comprehensive Cancer Network (NCCN). NCCN Clinical Practice Guidelines in Oncology. Melanoma: uveal. <https://www.nccn.org>. Updated May 4, 2023. Accessed August 15, 2023.
85. National Comprehensive Cancer Network (NCCN). NCCN Clinical Practice Guidelines in Oncology. Neuroendocrine and adrenal tumors. <https://www.nccn.org>. Updated August 2, 2023. Accessed August 15, 2023.
86. National Comprehensive Cancer Network (NCCN). NCCN Clinical Practice Guidelines in Oncology. Non-small cell lung cancer. <https://www.nccn.org>. Updated April 13, 2023. Accessed August 15, 2023.
87. National Comprehensive Cancer Network (NCCN). NCCN Clinical Practice Guidelines in Oncology. Occult primary (cancer of unknown primary). <https://www.nccn.org>. Updated December 21, 2022. Accessed August 15, 2023.
88. National Comprehensive Cancer Network (NCCN). NCCN Clinical Practice Guidelines in Oncology. Pancreatic adenocarcinoma. <https://www.nccn.org>. Updated June 19, 2023. Accessed August 15, 2023.
89. National Comprehensive Cancer Network (NCCN). NCCN Clinical Practice Guidelines in Oncology. Prostate cancer. <https://www.nccn.org>. Updated August 7, 2023. Accessed August 15, 2023.
90. National Comprehensive Cancer Network (NCCN). NCCN Clinical Practice Guidelines in Oncology. Rectal cancer. <https://www.nccn.org>. Updated July 25, 2023. Accessed August 16, 2023.
91. National Comprehensive Cancer Network (NCCN). NCCN Clinical Practice Guidelines in Oncology. Small cell lung cancer. <https://www.nccn.org>. Updated December 21, 2022. Accessed August 16, 2023.
92. National Comprehensive Cancer Network (NCCN). NCCN Clinical Practice Guidelines in Oncology. Soft tissue sarcoma. <https://www.nccn.org>. Updated April 25, 2023. Accessed August 16, 2023.
93. National Comprehensive Cancer Network (NCCN). NCCN Clinical Practice Guidelines in Oncology. Thymomas and thymic carcinomas. <https://www.nccn.org>. Updated December 15, 2022. Accessed August 16, 2023.
94. National Comprehensive Cancer Network (NCCN). NCCN Clinical Practice Guidelines in Oncology. Thyroid carcinoma. <https://www.nccn.org>. Updated August 16, 2023. Accessed August 16, 2023.
95. National Comprehensive Cancer Network (NCCN). NCCN Clinical Practice Guidelines in Oncology. Uterine neoplasms. <https://www.nccn.org>. Updated April 28, 2023. Accessed August 16, 2023.



96. Society of Thoracic Surgeons (STS). Expert consensus document on pulmonary metastasectomy. <https://www.sts.org>. Published 2019. Accessed August 16, 2023.
97. UpToDate, Inc. Brain arteriovenous malformations. <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.
98. UpToDate, Inc. Brain metastases in non-small cell lung cancer. <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.
99. UpToDate, Inc. Craniopharyngioma. <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.
100. UpToDate, Inc. Differentiated thyroid cancer: external beam radiotherapy. <https://www.uptodate.com>. Updated July 2023. Accessed August 11, 2023.
101. UpToDate, Inc. Evaluation and management of lung cancer in patients with interstitial lung disease. <https://www.uptodate.com>. Updated July 2023. Accessed August 11, 2023.
102. UpToDate, Inc. External beam radiation therapy for localized prostate cancer. <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.
103. UpToDate, Inc. General principles of radiation therapy for head and neck cancer. <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.
104. UpToDate, Inc. Initial chemotherapy and radiation for nonmetastatic, locally advanced, unresectable and borderline resectable, exocrine pancreatic cancer. <https://www.uptodate.com>. Updated July 6, 2023. Accessed August 18, 2023.
105. UpToDate, Inc. Liver transplantation for hepatocellular carcinoma. <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.
106. UpToDate, Inc. Localized hepatocellular carcinoma: liver-directed therapies for nonsurgical candidates not eligible for local ablation. <https://www.uptodate.com>. Updated July 2023. Accessed August 11, 2023.
107. UpToDate, Inc. Localized hepatocellular carcinoma: liver-directed therapies for nonsurgical candidates not eligible for local thermal ablation. <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.
108. UpToDate, Inc. Management of brain metastases in melanoma. <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.
109. UpToDate, Inc. Management of known or presumed benign (WHO grade 1) meningioma. <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.

110. UpToDate, Inc. Management of stage I and stage II non-small cell lung cancer. <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.
111. UpToDate, Inc. Multiple primary lung cancer. <https://www.uptodate.com>. Updated July 2023. Accessed August 11, 2023.
112. UpToDate, Inc. Nonsurgical local treatment strategies for colorectal cancer liver metastases. <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.
113. UpToDate, Inc. Oligometastatic non-small cell lung cancer. <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.
114. UpToDate, Inc. Overview of therapeutic approaches for adult patients with bone metastasis from solid tumors. <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.
115. UpToDate, Inc. Overview of the treatment of brain metastases. <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.
116. UpToDate, Inc. Paragangliomas: treatment of locoregional disease. <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.
117. UpToDate, Inc. Pineal gland mass. <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.
118. UpToDate, Inc. Primary therapy of Cushing's disease: transsphenoidal surgery and pituitary irradiation. <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.
119. UpToDate, Inc. Radiation therapy for the management of painful bone metastases. <https://www.uptodate.com>. Updated July 6, 2023. Accessed August 10, 2023.
120. UpToDate, Inc. Radiation therapy in the management of melanoma. <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.
121. UpToDate, Inc. Radiation therapy of pituitary adenomas. <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.
122. UpToDate, Inc. Radiation therapy techniques in cancer treatment. <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.
123. UpToDate, Inc. Radiofrequency ablation, cryoablation and other ablative techniques for renal cell carcinoma. <https://www.uptodate.com>. Updated July 2023. Accessed August 11, 2023.
124. UpToDate, Inc. Stereotactic body radiation therapy for lung tumors. <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.

125. UpToDate, Inc. Stereotactic cranial radiosurgery. <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.
126. UpToDate, Inc. Surgical treatment of essential tremor. <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.
127. UpToDate, Inc. The role of local therapies in metastatic breast cancer. <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.
128. UpToDate, Inc. Treatment and prognosis of neoplastic epidural spinal cord compression. <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.
129. UpToDate, Inc. Treatment options for locally advanced, unresectable but not metastatic cholangiocarcinoma. <https://www.uptodate.com>. Updated July 2023. Accessed August 17, 2023.
130. UpToDate, Inc. Vestibular schwannoma (acoustic neuroma). <https://www.uptodate.com>. Updated July 2023. Accessed August 10, 2023.
131. US Food & Drug Administration (FDA). 510(k) summary: Akesis Galaxy. <https://www.fda.gov>. Published September 4, 2019. Accessed July 30, 2020.
132. US Food & Drug Administration (FDA). 510(k) summary: Akesis Galaxy RTi. <https://www.fda.gov>. Published March 5, 2021. Accessed August 11, 2021.
133. US Food & Drug Administration (FDA). 510(k) summary: Barrigel injectable gel. <https://www.fda.gov>. Published May 26, 2022. Accessed August 16, 2023.
134. US Food & Drug Administration (FDA). 510(k) summary: ClearPoint array system. <https://www.fda.gov>. Published January 22, 2021. Accessed August 12, 2022.
135. US Food & Drug Administration (FDA). 510(k) summary: CyberKnife robotic radiosurgery system. <https://www.fda.gov>. Published November 17, 2010. Accessed May 17, 2015.
136. US Food & Drug Administration (FDA). 510(k) summary: Elekta Esprit Gamma Knife. <https://www.fda.gov>. Published September 28, 2022. Accessed August 16, 2023.
137. US Food & Drug Administration (FDA). 510(k) summary: GammaPod – Model A. <https://www.fda.gov>. Published April 4, 2018. Accessed August 18, 2019.
138. US Food & Drug Administration (FDA). 510(k) summary: Leksell Gamma Knife Icon. <https://www.fda.gov>. Published August 4, 2015. Accessed May 15, 2016.
139. US Food & Drug Administration (FDA). 510(k) summary: Leksell Gamma Knife Perfexion. <https://www.fda.gov>. Published May 24, 2010. Accessed May 17, 2015.

140. US Food & Drug Administration (FDA). 510(k) summary: ViewRay system. <https://www.fda.gov>.  
Published May 22, 2012. Accessed May 17, 2015.
141. US Food & Drug Administration (FDA). 510(k) summary: Zap-X radiosurgery system.  
<https://www.fda.gov>. Published February 25, 2019. Accessed July 30, 2020.
142. US Food & Drug Administration (FDA). De novo summary: SpaceOAR system. <https://www.fda.gov>.  
Published October 1, 2014. Accessed February 28, 2017.

**Appendix**

**Appendix A**

**Karnofsky Performance Status Criteria**

Able to carry on normal activity and to work; no special care needed.	100	Normal, no complaints; no evidence of disease
	90	Able to carry on normal activity; minor signs or symptoms of disease
	80	Normal activity with effort; some signs or symptoms of disease
Unable to work; able to live at home and care for most personal needs; varying amount of assistance needed.	70	Cares for self; unable to carry on normal activity or to do active work
	60	Requires occasional assistance but is able to care for most of personal needs
	50	Requires considerable assistance and frequent medical care
Unable to care for self; requires equivalent of institutional or hospital care; disease may be progressing rapidly.	40	Disabled; requires special care and assistance
	30	Severely disabled; hospital admission is indicated although death not imminent
	20	Moribund; fatal processes progressing rapidly
	0	Dead

**Appendix B**

**ECOG Performance Status**

Grade	ECOG
0	Fully active, able to carry on all pre-disease performance without restriction
1	Restricted in physically strenuous activity but ambulatory and able to carry out work of a light or sedentary nature, eg, light housework, office work
2	Ambulatory and capable of all selfcare but unable to carry out any work activities. Up and about more than 50% of waking hours
3	Capable of only limited selfcare, confined to bed or chair more than 50% of waking hours

Grade	ECOG
4	Completely disabled. Cannot carry on any selfcare. Totally confined to bed or chair
5	Dead

**Appendix C**

**TNM Staging System<sup>85</sup>**

The T category describes the original (primary) tumor.

TX	Primary tumor cannot be evaluated
T0	No evidence of primary tumor
Tis	Carcinoma in situ (early cancer that has not spread to neighboring tissue)
T1-T4	Size and/or extent of the primary tumor -

The N category describes whether the cancer has reached nearby lymph nodes

NX	Regional lymph nodes cannot be evaluated
N0	No regional lymph node involvement (no cancer found in the lymph nodes)
N1-N3	Involvement of regional lymph nodes (number and/or extent of spread)

The M category tells whether there are distant metastases

M0	No distant metastasis
M1	Distant metastasis

**Appendix C**

**Gleason Grading System**

Grade Group	Gleason Score	Gleason Pattern
1	Less than or equal to 6	Less than or equal to 3+3
2	7	3+4
3	7	4+3
4	8	4+4, 3+5, 5+3
5	9 or 10	4+5, 5+4, 5+5

**Change Summary**

- Click or tap to enter a date. New Policy.

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