# American College of Radiology
# ACR Appropriateness Criteria®

## Brain Tumors

**Variant 1: Adult. Primary brain tumor screening. Genetic risk factors.**

| Procedure | Appropriateness Category | SOE | Adults RRL | Peds RRL | Rating | Median | Final Tabulations 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MRI head without and with IV contrast | Usually appropriate | Limited | O 0 mSv | O 0 mSv [ped] | 9 | 9 | 0 | 0 | 1 | 0 | 0 | 1 | 3 | 2 | 10 |
| References | | | | Study Quality | | | | | | | | | | | |
| 24 (28620005) | | | | 4 | | | | | | | | | | | |
| 25 (34633580) | | | | 4 | | | | | | | | | | | |
| MRI head without IV contrast | May be appropriate | Limited | O 0 mSv | O 0 mSv [ped] | 5 | 5 | 0 | 1 | 0 | 1 | 9 | 5 | 0 | 0 | 0 |
| References | | | | Study Quality | | | | | | | | | | | |
| 25 (34633580) | | | | 4 | | | | | | | | | | | |
| 26 (28572266) | | | | 4 | | | | | | | | | | | |
| MRI complete spine without and with IV contrast | May be appropriate | Limited | O 0 mSv | O 0 mSv [ped] | 5 | 5 | 1 | 1 | 2 | 3 | 8 | 1 | 0 | 0 | 0 |
| References | | | | Study Quality | | | | | | | | | | | |
| 21 (34806136) | | | | 4 | | | | | | | | | | | |
| 24 (28620005) | | | | 4 | | | | | | | | | | | |
| CT head with IV contrast | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | ☢☢☢ 0.3-3 mSv [ped] | 1 | 1 | 13 | 1 | 0 | 1 | 0 | 0 | 2 | 0 | 0 |
| CT head without IV contrast | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | ☢☢☢ 0.3-3 mSv [ped] | 1 | 1 | 14 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CT head without and with IV contrast | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | ☢☢☢☢ 3-10 mSv [ped] | 1 | 1 | 13 | 2 | 0 | 0 | 0 | 0 | 2 | 0 | 0 |
| MRI functional (fMRI) head without IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 15 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| MRI head perfusion with IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 15 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| MR spectroscopy head without IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 15 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| MRI complete spine without IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 13 | 1 | 0 | 2 | 0 | 0 | 0 | 1 | 0 |
| FDG-PET/CT brain | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | ☢☢☢☢ 3-10 mSv [ped] | 1 | 1 | 15 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| MRI head without IV contrast with DTI | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 13 | 1 | 0 | 2 | 0 | 1 | 0 | 0 | 0 |
| MRI complete spine with IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 13 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 |
| MRI head with IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 12 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| MRI head perfusion without IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 15 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| Fluciclovine PET/CT brain | Usually not appropriate | Expert Consensus | ☢☢☢☢ 10-30 mSv | | 1 | 1 | 15 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| DOTATATE PET/CT brain | Usually not appropriate | Limited | ☢☢☢ 1-10 mSv | | 1 | 1 | 11 | 1 | 1 | 2 | 0 | 0 | 1 | 1 | 0 |

| References | Study Quality |
|---|---|
| 22 (35961372) | 4 |
| 23 (30777201) | 2 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FDG-PET/MRI brain | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | | 1 | 1 | 15 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fluciclovine PET/MRI brain | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | | 1 | 1 | 15 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| DOTATATE PET/MRI brain | Usually not appropriate | Limited | ☢☢☢ 1-10 mSv | | 1 | 1 | 11 | 1 | 1 | 2 | 0 | 0 | 1 | 1 | 0 |

| References | Study Quality |
|---|---|
| 22 (35961372) | 4 |
| 23 (30777201) | 2 |

**Variant 2: Adult. Secondary or metastatic brain tumor screening. Extracranial malignancy.**

| Procedure | Appropriateness Category | SOE | Adults RRL | Peds RRL | Rating | Median | Final Tabulations | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| MRI head without and with IV contrast | Usually appropriate | Limited | O 0 mSv | O 0 mSv [ped] | 9 | 9 | 1 | 0 | 0 | 1 | 0 | 0 | 2 | 2 | 11 |

| References | Study Quality |
|---|---|
| 32 (32065345) | 4 |
| 29 (-3197191) | 4 |
| 30 (37245883) | 4 |
| 31 (29799956) | 2 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MRI head without IV contrast | May be appropriate | Limited | O 0 mSv | O 0 mSv [ped] | 5 | 5 | 0 | 1 | 1 | 2 | 11 | 1 | 0 | 0 | 0 |

| References | Study Quality |
|---|---|
| 29 (-3197191) | 4 |
| 30 (37245883) | 4 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MRI complete spine without and with IV contrast | May be appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 5 | 5 | 0 | 2 | 0 | 2 | 5 | 7 | 0 | 0 | 0 |
| CT head with IV contrast | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | ☢☢☢ 0.3-3 mSv [ped] | 1 | 1 | 12 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CT head without IV contrast | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | ☢☢☢ 0.3-3 mSv [ped] | 1 | 1 | 12 | 2 | 1 | 2 | 0 | 0 | 0 | 0 | 0 |
| CT head without and with IV contrast | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | ☢☢☢☢ 3-10 mSv [ped] | 1 | 1 | 11 | 3 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| MRI functional (fMRI) head without IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 13 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| MRI head perfusion with IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 13 | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| MR spectroscopy head without IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 13 | 1 | 0 | 2 | 1 | 0 | 0 | 0 | 0 |
| MRI complete spine without IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 13 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| FDG-PET/CT brain | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | ☢☢☢☢ 3-10 mSv [ped] | 1 | 1 | 13 | 1 | 0 | 0 | 2 | 0 | 1 | 0 | 0 |
| MRI head without IV contrast with DTI | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 12 | 2 | 0 | 0 | 2 | 1 | 0 | 0 | 0 |
| MRI complete spine with IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 13 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 |
| MRI head with IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 12 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| MRI head perfusion without IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 13 | 1 | 1 | 0 | 2 | 0 | 0 | 0 | 0 |
| Fluciclovine PET/CT brain | Usually not appropriate | Expert Consensus | ☢☢☢☢ 10-30 mSv | | 1 | 1 | 14 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| DOTATATE PET/CT brain | Usually not appropriate | Limited | ☢☢☢ 1-10 mSv | | 1 | 1 | 11 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |

| References | Study Quality |
|---|---|
| 11 (35854930) | 4 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FDG-PET/MRI brain | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | | 1 | 1 | 13 | 1 | 0 | 0 | 2 | 0 | 1 | 0 | 0 |
| Fluciclovine PET/MRI brain | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | | 1 | 1 | 14 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 |
| DOTATATE PET/MRI brain | Usually not appropriate | Limited | ☢☢☢ 1-10 mSv | | 1 | 1 | 11 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |

| References | Study Quality |
|---|---|
| 11 (35854930) | 4 |

**Variant 3: Adult. Suspected intra-axial brain tumor based on prior imaging. Pretreatment evaluation.**

| Procedure | Appropriateness Category | SOE | Adults RRL | Peds RRL | Rating | Median | Final Tabulations | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| MRI head without and with IV contrast | Usually appropriate | Limited | O 0 mSv | O 0 mSv [ped] | 9 | 9 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 12 |

| References | Study Quality |
|---|---|
| 33 (28486641) | 4 |
| 52 (36381650) | 4 |
| 53 (33802292) | 4 |
| 54 (26250565) | 4 |
| 55 (36334295) | 1 |
| 56 (32048719) | 4 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MRI head perfusion with IV contrast | Usually appropriate | Strong | O 0 mSv | O 0 mSv [ped] | 7 | 7 | 0 | 0 | 0 | 0 | 5 | 3 | 6 | 2 | 0 |

| References | Study Quality |
|---|---|
| 44 (30777220) | 2 |
| 45 (31371360) | 2 |
| 46 (37010573) | 2 |
| 47 (29098571) | 1 |
| 48 (32678438) | 2 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MRI functional (fMRI) head without IV contrast | May be appropriate | Strong | O 0 mSv | O 0 mSv [ped] | 6 | 6 | 0 | 0 | 0 | 2 | 6 | 3 | 2 | 2 | 1 |

| References | Study Quality |
|---|---|
| 49 (37246748) | 2 |
| 50 (36549990) | 2 |
| 51 (37105676) | 2 |
| 4 (34060940) | Good |
| 42 (32653026) | 2 |
| 43 (28980887) | Good |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MRI head without IV contrast | May be appropriate | Strong | O 0 mSv | O 0 mSv [ped] | 6 | 6 | 1 | 0 | 0 | 2 | 4 | 5 | 2 | 2 | 0 |

| References | Study Quality |
|---|---|
| 33 (28486641) | 4 |
| 57 (35198981) | Good |
| 58 (28751449) | 2 |
| 59 (37468750) | 1 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MRI head without IV contrast with DTI | May be appropriate | Strong | O 0 mSv | O 0 mSv [ped] | 6 | 6 | 0 | 0 | 0 | 0 | 4 | 7 | 3 | 0 | 2 |

| References | Study Quality |
|---|---|
| 2 (31494311) | 2 |
| 3 (31192130) | 4 |
| 60 (35626069) | 4 |
| 61 (30277427) | 2 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MRI head perfusion without IV contrast | May be appropriate | Strong | O 0 mSv | O 0 mSv [ped] | 6 | 6 | 0 | 0 | 0 | 0 | 7 | 4 | 5 | 0 | 0 |

| References | Study Quality |
|---|---|
| 44 (30777220) | 2 |
| 45 (31371360) | 2 |
| 46 (37010573) | 2 |
| 47 (29098571) | 1 |
| 48 (32678438) | 2 |

| | |
|---|---|
| 49 (37246748) | 2 |
| 50 (36549990) | 2 |
| 51 (37105676) | 2 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MR spectroscopy head without IV contrast | May be appropriate | Strong | O 0 mSv | O 0 mSv [ped] | 5 | 5 | 1 | 0 | 0 | 4 | 6 | 2 | 2 | 1 | 0 |

| References | Study Quality |
|---|---|
| 38 (35655732) | 4 |
| 39 (29459844) | 4 |
| 40 (26471274) | Good |
| 41 (33811494) | Good |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MRI complete spine without and with IV contrast | May be appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 5 | 5 | 0 | 1 | 0 | 1 | 12 | 2 | 0 | 0 | 0 |
| Fluciclovine PET/CT brain | May be appropriate | Strong | ☢☢☢☢ 10-30 mSv | | 5 | 5 | 0 | 1 | 0 | 5 | 8 | 2 | 0 | 0 | 0 |

| References | Study Quality |
|---|---|
| 8 (36549916) | 2 |
| 9 (37341842) | 1 |
| 35 (30519867) | 4 |
| 37 (29730279) | 2 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fluciclovine PET/MRI brain | May be appropriate | Strong | ☢☢☢ 1-10 mSv | | 5 | 5 | 0 | 1 | 0 | 4 | 9 | 2 | 0 | 0 | 0 |

| References | Study Quality |
|---|---|
| 8 (36549916) | 2 |
| 9 (37341842) | 1 |
| 35 (30519867) | 4 |
| 37 (29730279) | 2 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FDG-PET/MRI brain | Usually not appropriate | Limited | ☢☢☢ 1-10 mSv | | 2 | 2 | 7 | 3 | 4 | 1 | 1 | 0 | 0 | 0 | 0 |

| References | Study Quality |
|---|---|
| 35 (30519867) | 4 |
| 36 (31426864) | 2 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DOTATATE PET/MRI brain | Usually not appropriate | Limited | ☢☢☢ 1-10 mSv | | 2 | 2 | 8 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| References | | | | Study Quality | | | | | | | | | | | |
| 34 (35695763) | | | | 4 | | | | | | | | | | | |
| CT head with IV contrast | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | ☢☢☢ 0.3-3 mSv [ped] | 1 | 1 | 12 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| CT head without IV contrast | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | ☢☢☢ 0.3-3 mSv [ped] | 1 | 1 | 12 | 1 | 2 | 2 | 0 | 0 | 0 | 0 | 0 |
| CT head without and with IV contrast | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | ☢☢☢☢ 3-10 mSv [ped] | 1 | 1 | 12 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| MRI complete spine without IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 10 | 1 | 3 | 0 | 1 | 0 | 1 | 0 | 0 |
| FDG-PET/CT brain | Usually not appropriate | Limited | ☢☢☢ 1-10 mSv | ☢☢☢☢ 3-10 mSv [ped] | 1 | 1 | 9 | 3 | 3 | 1 | 0 | 0 | 0 | 0 | 0 |
| References | | | | Study Quality | | | | | | | | | | | |
| 35 (30519867) | | | | 4 | | | | | | | | | | | |
| 36 (31426864) | | | | 2 | | | | | | | | | | | |
| MRI complete spine with IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 12 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 |
| MRI head with IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 11 | 2 | 2 | 0 | 0 | 1 | 0 | 0 | 0 |
| DOTATATE PET/CT brain | Usually not appropriate | Limited | ☢☢☢ 1-10 mSv | | 1 | 1 | 9 | 4 | 3 | 0 | 0 | 0 | 0 | 0 | 0 |
| References | | | | Study Quality | | | | | | | | | | | |
| 34 (35695763) | | | | 4 | | | | | | | | | | | |

**Variant 4: Adult. Suspected extra-axial brain tumor on prior imaging. Pretreatment evaluation.**

| Procedure | Appropriateness Category | SOE | Adults RRL | Peds RRL | Rating | Median | Final Tabulations | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| MRI head without and with IV contrast | Usually appropriate | Limited | O 0 mSv | O 0 mSv [ped] | 9 | 9 | 0 | 0 | 1 | 0 | 0 | 0 | 2 | 1 | 12 |

| References | Study Quality |
|---|---|
| 62 (33459822) | 4 |
| 63 (27432671) | 4 |

| DOTATATE PET/CT brain | May be appropriate | Strong | ☢☢☢ 1-10 mSv | | 6 | 6 | 0 | 0 | 1 | 1 | 4 | 6 | 3 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| References | Study Quality |
|---|---|
| 68 (28450556) | 2 |
| 65 (35275019) | 2 |
| 66 (35885570) | 4 |
| 67 (37287577) | 4 |
| 69 (32442855) | 4 |

| DOTATATE PET/MRI brain | May be appropriate | Strong | ☢☢☢ 1-10 mSv | | 6 | 6 | 0 | 0 | 1 | 1 | 5 | 5 | 3 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| References | Study Quality |
|---|---|
| 68 (28450556) | 2 |
| 65 (35275019) | 2 |
| 66 (35885570) | 4 |
| 67 (37287577) | 4 |
| 69 (32442855) | 4 |

| MRI head without IV contrast | May be appropriate | Limited | O 0 mSv | O 0 mSv [ped] | 5 | 5 | 0 | 1 | 0 | 1 | 14 | 0 | 0 | 0 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| References | Study Quality |
|---|---|
| 32 (32065345) | 4 |
| 62 (33459822) | 4 |
| 63 (27432671) | 4 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MRI complete spine without and with IV contrast | May be appropriate | Limited | O 0 mSv | O 0 mSv [ped] | 5 | 5 | 0 | 1 | 1 | 1 | 7 | 6 | 0 | 0 | 0 |
| | References | | | Study Quality | | | | | | | | | | | |
| | 64 (37535461) | | | 4 | | | | | | | | | | | |
| MRI functional (fMRI) head without IV contrast | May be appropriate | Limited | O 0 mSv | O 0 mSv [ped] | 4 | 4 | 3 | 1 | 2 | 4 | 4 | 1 | 0 | 1 | 0 |
| | References | | | Study Quality | | | | | | | | | | | |
| | 70 (25957723) | | | 2 | | | | | | | | | | | |
| CT head without IV contrast | Usually not appropriate | Limited | ☢☢☢ 1-10 mSv | ☢☢☢ 0.3-3 mSv [ped] | 3 | 3 | 5 | 3 | 4 | 3 | 1 | 0 | 0 | 0 | 0 |
| | References | | | Study Quality | | | | | | | | | | | |
| | 62 (33459822) | | | 4 | | | | | | | | | | | |
| | 63 (27432671) | | | 4 | | | | | | | | | | | |
| MRI head perfusion with IV contrast | Usually not appropriate | Limited | O 0 mSv | O 0 mSv [ped] | 3 | 3 | 5 | 1 | 3 | 1 | 6 | 0 | 0 | 0 | 0 |
| | References | | | Study Quality | | | | | | | | | | | |
| | 71 (33504729) | | | 4 | | | | | | | | | | | |
| | 72 (35155210) | | | 2 | | | | | | | | | | | |
| MRI head without IV contrast with DTI | Usually not appropriate | Limited | O 0 mSv | O 0 mSv [ped] | 3 | 3 | 5 | 1 | 3 | 0 | 6 | 1 | 0 | 0 | 0 |
| | References | | | Study Quality | | | | | | | | | | | |
| | 70 (25957723) | | | 2 | | | | | | | | | | | |
| MRI head perfusion without IV contrast | Usually not appropriate | Limited | O 0 mSv | O 0 mSv [ped] | 3 | 3 | 5 | 1 | 4 | 3 | 3 | 0 | 0 | 0 | 0 |
| | References | | | Study Quality | | | | | | | | | | | |
| | 71 (33504729) | | | 4 | | | | | | | | | | | |
| | 72 (35155210) | | | 2 | | | | | | | | | | | |
| CT head with IV contrast | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | ☢☢☢ 0.3-3 mSv [ped] | 1 | 1 | 12 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CT head without and with IV contrast | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | ☢☢☢☢ 3-10 mSv [ped] | 1 | 1 | 12 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| MR spectroscopy head without IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 12 | 1 | 1 | 0 | 2 | 0 | 0 | 0 | 0 |
| MRI complete spine without IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 12 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 0 |
| FDG-PET/CT brain | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | ☢☢☢☢ 3-10 mSv [ped] | 1 | 1 | 10 | 3 | 1 | 0 | 0 | 2 | 0 | 0 | 0 |
| MRI complete spine with IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 11 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 |
| MRI head with IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 14 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Fluciclovine PET/CT brain | Usually not appropriate | Expert Consensus | ☢☢☢☢ 10-30 mSv | | 1 | 1 | 11 | 2 | 2 | 0 | 0 | 1 | 0 | 0 | 0 |
| FDG-PET/MRI brain | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | | 1 | 1 | 11 | 2 | 1 | 0 | 0 | 2 | 0 | 0 | 0 |
| Fluciclovine PET/MRI brain | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | | 1 | 1 | 11 | 2 | 2 | 0 | 0 | 1 | 0 | 0 | 0 |

**Variant 5: Adult. Known history of brain tumor. Posttreatment surveillance.**

| Procedure | Appropriateness Category | SOE | Adults RRL | Peds RRL | Rating | Median | Final Tabulations | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| MRI head without and with IV contrast | Usually appropriate | Limited | O 0 mSv | O 0 mSv [ped] | 9 | 9 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 13 |

| References | Study Quality |
|---|---|
| 33 (28486641) | 4 |
| 53 (33802292) | 4 |
| 54 (26250565) | 4 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MRI head perfusion with IV contrast | Usually appropriate | Strong | O 0 mSv | O 0 mSv [ped] | 7 | 7 | 0 | 0 | 0 | 0 | 4 | 4 | 4 | 3 | 1 |

| References | Study Quality |
|---|---|
| 76 (27502247) | Good |
| 48 (32678438) | 2 |
| 54 (26250565) | 4 |
| 56 (32048719) | 4 |
| 71 (33504729) | 4 |
| 72 (35155210) | 2 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MRI head perfusion without IV contrast | May be appropriate | Strong | O 0 mSv | O 0 mSv [ped] | 6 | 6 | 0 | 0 | 0 | 0 | 7 | 4 | 1 | 4 | 0 |

| References | Study Quality |
|---|---|
| 76 (27502247) | Good |
| 48 (32678438) | 2 |
| 54 (26250565) | 4 |
| 56 (32048719) | 4 |
| 71 (33504729) | 4 |
| 72 (35155210) | 2 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MRI head without IV contrast | May be appropriate (Disagreement) | Expert Opinion | O 0 mSv | O 0 mSv [ped] | 5 | 5 | 2 | 1 | 0 | 2 | 3 | 7 | 0 | 1 | 0 |

| References | Study Quality |
|---|---|
| 54 (26250565) | 4 |
| 56 (32048719) | 4 |
| 62 (33459822) | 4 |
| 63 (27432671) | 4 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MRI complete spine without and with IV contrast | May be appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 5 | 5 | 2 | 0 | 1 | 4 | 7 | 1 | 1 | 0 | 0 |
| DOTATATE PET/MRI brain | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | | 3 | 3 | 7 | 1 | 6 | 1 | 1 | 0 | 0 | 0 | 0 |
| DOTATATE PET/CT brain | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | | 2 | 2 | 7 | 2 | 6 | 1 | 0 | 0 | 0 | 0 | 0 |
| CT head with IV contrast | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | ☢☢☢ 0.3-3 mSv [ped] | 1 | 1 | 14 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| CT head without IV contrast | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | ☢☢☢ 0.3-3 mSv [ped] | 1 | 1 | 12 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 0 |
| CT head without and with IV contrast | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | ☢☢☢☢ 3-10 mSv [ped] | 1 | 1 | 14 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| MRI functional (fMRI) head without IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 11 | 2 | 0 | 1 | 2 | 0 | 0 | 0 | 0 |
| MR spectroscopy head without IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 11 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| MRI complete spine without IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 11 | 4 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| FDG-PET/CT brain | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | ☢☢☢☢ 3-10 mSv [ped] | 1 | 1 | 10 | 4 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| MRI head without IV contrast with DTI | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 12 | 1 | 0 | 0 | 2 | 1 | 0 | 0 | 0 |
| MRI complete spine with IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 10 | 2 | 1 | 1 | 2 | 0 | 0 | 0 | 0 |
| MRI head with IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 12 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Fluciclovine PET/CT brain | Usually not appropriate | Expert Consensus | ☢☢☢☢ 10-30 mSv | | 1 | 1 | 10 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FDG-PET/MRI brain | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | | 1 | 1 | 10 | 4 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Fluciclovine PET/MRI brain | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | | 1 | 1 | 10 | 3 | 3 | 0 | 0 | 0 | 0 | 0 | 0 |

**Variant 6: Adult. Known history of brain tumor. New or enlarging lesion on posttreatment surveillance. Next imaging study.**

| Procedure | Appropriateness Category | SOE | Adults RRL | Peds RRL | Rating | Median | Final Tabulations | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| MRI head without and with IV contrast | Usually appropriate | Limited | O 0 mSv | O 0 mSv [ped] | 9 | 9 | 0 | 0 | 1 | 0 | 0 | 0 | 2 | 2 | 11 |

| References | Study Quality |
|---|---|
| 74 (37774317) | 4 |

| MRI head perfusion with IV contrast | Usually appropriate | Moderate | O 0 mSv | O 0 mSv [ped] | 7 | 7 | 0 | 0 | 0 | 1 | 2 | 0 | 8 | 4 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| References | Study Quality |
|---|---|
| 76 (27502247) | Good |
| 1 (28332014) | 4 |
| 80 (27187209) | 4 |

| MRI head perfusion without IV contrast | Usually appropriate | Moderate | O 0 mSv | O 0 mSv [ped] | 7 | 7 | 0 | 0 | 0 | 1 | 3 | 2 | 7 | 2 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| References | Study Quality |
|---|---|
| 76 (27502247) | Good |
| 1 (28332014) | 4 |
| 80 (27187209) | 4 |

| FDG-PET/CT brain | May be appropriate | Strong | ☢☢☢ 1-10 mSv | ☢☢☢☢ 3-10 mSv [ped] | 6 | 6 | 0 | 0 | 0 | 2 | 6 | 3 | 5 | 0 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| References | Study Quality |
|---|---|
| 76 (27502247) | Good |
| 7 (28341716) | 2 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 35 (30519867) | | 4 | | | | | | | | | | | | |
| DOTATATE PET/CT brain | May be appropriate | Strong | ☢☢☢ 1-10 mSv | | 6 | 6 | 0 | 0 | 1 | 1 | 6 | 4 | 3 | 1 | 0 | |
| | | References | | Study Quality | | | | | | | | | | | | |
| | | 15 (35661809) | | 2 | | | | | | | | | | | | |
| | | 11 (35854930) | | 4 | | | | | | | | | | | | |
| | | 66 (35885570) | | 4 | | | | | | | | | | | | |
| | | 69 (32442855) | | 4 | | | | | | | | | | | | |
| | | 77 (31868239) | | 2 | | | | | | | | | | | | |
| | | 78 (31898311) | | 4 | | | | | | | | | | | | |
| FDG-PET/MRI brain | May be appropriate | Strong | ☢☢☢ 1-10 mSv | | 6 | 6 | 0 | 0 | 0 | 2 | 6 | 3 | 5 | 0 | 0 | |
| | | References | | Study Quality | | | | | | | | | | | | |
| | | 76 (27502247) | | Good | | | | | | | | | | | | |
| | | 7 (28341716) | | 2 | | | | | | | | | | | | |
| | | 35 (30519867) | | 4 | | | | | | | | | | | | |
| DOTATATE PET/MRI brain | May be appropriate | Strong | ☢☢☢ 1-10 mSv | | 6 | 6 | 0 | 0 | 1 | 1 | 6 | 4 | 3 | 1 | 0 | |
| | | References | | Study Quality | | | | | | | | | | | | |
| | | 15 (35661809) | | 2 | | | | | | | | | | | | |
| | | 11 (35854930) | | 4 | | | | | | | | | | | | |
| | | 66 (35885570) | | 4 | | | | | | | | | | | | |
| | | 69 (32442855) | | 4 | | | | | | | | | | | | |
| | | 77 (31868239) | | 2 | | | | | | | | | | | | |
| | | 78 (31898311) | | 4 | | | | | | | | | | | | |
| MRI head without IV contrast | May be appropriate | Limited | O 0 mSv | O 0 mSv [ped] | 5 | 5 | 0 | 1 | 0 | 4 | 9 | 2 | 0 | 0 | 0 | |
| | | References | | Study Quality | | | | | | | | | | | | |
| | | 54 (26250565) | | 4 | | | | | | | | | | | | |
| | | 56 (32048719) | | 4 | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MR spectroscopy head without IV contrast | May be appropriate | Limited | O 0 mSv | O 0 mSv [ped] | 5 | 5 | 0 | 0 | 1 | 1 | 7 | 4 | 2 | 1 | 0 |
| References | | | | Study Quality | | | | | | | | | | | |
| 1 (28332014) | | | | 4 | | | | | | | | | | | |
| MRI head without IV contrast with DTI | May be appropriate | Strong | O 0 mSv | O 0 mSv [ped] | 5 | 5 | 1 | 1 | 1 | 5 | 8 | 0 | 0 | 0 | 0 |
| References | | | | Study Quality | | | | | | | | | | | |
| 81 (26450533) | | | | 2 | | | | | | | | | | | |
| 40 (26471274) | | | | Good | | | | | | | | | | | |
| Fluciclovine PET/CT brain | Usually not appropriate | Limited | ☢☢☢☢ 10-30 mSv | | 3 | 3 | 5 | 1 | 3 | 2 | 4 | 1 | 0 | 0 | 0 |
| References | | | | Study Quality | | | | | | | | | | | |
| 10 (37055222) | | | | 4 | | | | | | | | | | | |
| 79 (36577872) | | | | 4 | | | | | | | | | | | |
| Fluciclovine PET/MRI brain | Usually not appropriate | Limited | ☢☢☢ 1-10 mSv | | 3 | 3 | 5 | 1 | 3 | 2 | 4 | 1 | 0 | 0 | 0 |
| References | | | | Study Quality | | | | | | | | | | | |
| 10 (37055222) | | | | 4 | | | | | | | | | | | |
| 79 (36577872) | | | | 4 | | | | | | | | | | | |
| CT head with IV contrast | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | ☢☢☢ 0.3-3 mSv [ped] | 1 | 1 | 14 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| CT head without IV contrast | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | ☢☢☢ 0.3-3 mSv [ped] | 1 | 1 | 12 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 |
| CT head without and with IV contrast | Usually not appropriate | Expert Consensus | ☢☢☢ 1-10 mSv | ☢☢☢☢ 3-10 mSv [ped] | 1 | 1 | 14 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| MRI functional (fMRI) head without IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 12 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 |
| MRI complete spine without IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 13 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MRI complete spine without and with IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 12 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 |
| MRI complete spine with IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 13 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| MRI head with IV contrast | Usually not appropriate | Expert Consensus | O 0 mSv | O 0 mSv [ped] | 1 | 1 | 13 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |

**Appendix Key**

A more complete discussion of the items presented below can be found by accessing the supporting documents at the designated hyperlinks.

**Appropriateness Category**: The panel's recommendation for a procedure based on the assessment of the risks and benefits of performing the procedure for the specified clinical scenario.

**SOE**: Strength of Evidence. The assessment of the amount and quality of evidence found in the peer reviewed medical literature for an appropriateness recommendation.

- **References:** The citation number and PMID for the reference(s) associated with the recommendation.
- **Study Quality**: The assessment of the quality of an individual reference based on the number of study quality elements described in the reference.

**RRL**: Relative Radiation Level. A population based assessment of the amount of radiation a typical patient may be exposed to during the specified procedure.

**Rating**: The final rating (1-9 scale) for the procedure as determined by the panel during rating rounds.

**Median**: The median rating (1-9 scale) for the procedure as determined by the panel during rating rounds.

**Final tabulations:** A histogram showing the number of panel members who rated the procedure as noted in the column heading (ie, 1, 2, 3, etc.).

Additional supporting documents about the AC methodology and processes can be found at **www.acr.org/ac.**