Brain tumours (primary) and brain metastases in adults

NICE guideline

Draft for consultation, January 2018

This guideline covers diagnosing, monitoring and managing any type of primary brain tumour or brain metastases in people aged 18 or over. It aims to improve diagnosis and care, including standardising the care people have, how information and support are provided, and palliative care.

Who is it for?

- People using services for the diagnosis, management and care of a primary brain tumour or brain metastases.
- Professionals or practitioners involved in the multidisciplinary care of people with primary brain tumours or brain metastases.
- Commissioners of brain tumour services (including clinical commissioning groups and NHS England specialised commissioning).

This version of the guideline contains:

- the draft recommendations
- rationale and impact sections that explain why the committee made the recommendations and how they might affect practice
- the guideline context
- recommendations for research.

Information about how the guideline was developed is on the guideline's page on the NICE website. This includes the evidence reviews, the scope, and details of the committee and any declarations of interest.

Contents

Recommendations

People have the right to be involved in discussions and make informed decisions about their care, as described in your care.

Making decisions using NICE guidelines explains how we use words to show the strength (or certainty) of our recommendations, and has information about prescribing medicines (including off-label use), professional guidelines, standards and laws (including on consent and mental capacity), and safeguarding.

1 Investigation, management and follow-up of glioma

1.1 Investigation of suspected glioma

Imaging for suspected glioma

1.1.1 Offer standard structural MRI (defined as T2 weighted, FLAIR, DWI series and T1 pre- and post-contrast volume) as the initial diagnostic test for suspected glioma, unless MRI is contraindicated.

1.1.2 Consider advanced MRI techniques such as MR perfusion and MR spectroscopy to assess for the potential of a high-grade transformation in a tumour appearing to be low-grade on standard structural MRI.

To find out why the committee made the recommendations on imaging for suspected glioma and how they might affect practice, see rationale and impact.

Use of molecular markers to determine prognosis or guide treatment for glioma

1.1.3 Report all glioma specimens according to the latest version of the WHO classification. As well as histopathological assessment, include molecular markers such as:

- IDH1 and IDH2 mutations

- ATRX mutations to identify IDH mutant astrocytomas and glioblastomas
- 1p/19q codeletion to identify oligodendrogliomas
- histone H3.3 K27M mutations in midline gliomas
- BRAF fusion gene to identify pilocytic astrocytoma.

1.1.4 Consider testing all high-grade glioma specimens for MGMT promoter methylation to inform prognosis and guide treatment.

1.1.5 Consider testing for TERT promoter mutation in IDH wildtype gliomas to provide information about prognosis.

To find out why the committee made the recommendations on use of molecular markers to determine prognosis or guide treatment for glioma and how they might affect practice, see rationale and impact.

1.2 Management of glioma

Initial surgery for suspected low-grade glioma

1.2.1 Refer people with a suspected low-grade glioma to a specialist multidisciplinary team at first radiological diagnosis for management of their tumour. The surgical expertise should include:

- access to awake craniotomy with language and other appropriate functional monitoring, and
- expertise in intraoperative neurophysiological monitoring, and
- access to neuroradiological support.

1.2.2 Consider maximal safe resection at first radiological diagnosis to:

- obtain a histological and molecular diagnosis, and
- remove as much of the tumour as is safely possible.

1.2.3 If maximal safe resection is not possible, consider a biopsy to obtain a pathological and molecular diagnosis.

1.2.4 Consider active monitoring, without biopsy or maximal safe resection, for lesions with radiological features typical of very low-grade tumours, for example DNET and optic pathway glioma.

1.2.5 If people being actively monitored show radiological or clinical disease progression, discuss this at a multidisciplinary team meeting and consider:

- maximal safe resection, or
- a biopsy, but only if maximal safe resection is not an option.

To find out why the committee made the recommendations on initial surgery for suspected low-grade glioma and how they might affect practice, see rationale and impact.

Further management of newly diagnosed low-grade glioma

1.2.6 Following surgery, offer radiotherapy followed by PCV chemotherapy (procarbazine, CCNU (lomustine) and vincristine) for people who:

- have a 1p/19q codeleted, IDH-mutated low-grade glioma (oligodendroglioma), and
- are aged around 40 or over, or have residual tumour on postoperative MRI.

1.2.7 Following surgery, consider radiotherapy followed by PCV chemotherapy for people who:

- have a 1p/19q non-codeleted, IDH-mutated low-grade glioma (astrocytoma), and
- are aged around 40 or over, or have residual tumour on postoperative MRI.

1.2.8 Consider active monitoring for people who are aged around 40 and under with IDH-mutated low-grade glioma and have no residual tumour on postoperative MRI.

1.2.9 Consider radiotherapy followed by PCV chemotherapy for people with IDH-mutated low-grade glioma who have not had radiotherapy before if they have:

- progressive disease on radiological follow-up, or
- intractable seizures.

1.2.10 Do not deliver radiotherapy with a treatment dose of more than 54Gy at 1.8Gy per fraction for people with IDH-mutated low-grade glioma.

1.2.11 Be aware that people with histologically confirmed IDH wildtype grade II glioma may have a prognosis similar to glioblastoma if there are other molecular features consistent with glioblastoma. Take this into account when thinking about management options.

To find out why the committee made the recommendations on further management of newly diagnosed low-grade glioma and how they might affect practice, see rationale and impact.

Management of newly diagnosed grade III glioma following surgery or if surgery is not possible

1.2.12 For advice on using temozolomide for treating newly diagnosed grade III glioma, see the NICE technology appraisal on carmustine implants and temozolomide for the treatment of newly diagnosed high-grade glioma.

1.2.13 Following surgery, offer sequential radiotherapy and PCV chemotherapy to all people who have:

- Karnofsky performance status 70 or more, and
- a newly diagnosed grade III glioma with 1p/19q codeletion (anaplastic oligodendroglioma).

1.2.14 Discuss with people the order of PCV and radiotherapy, and the potential benefits and risks of each option (see Table 1). Make the decision after discussing these factors.

Table 1 - Factors to consider when deciding between PCV or radiotherapy first in the management of anaplastic oligodendroglioma

	PCV first	**Radiotherapy first**
Overall survival	No clinically important difference	No clinically important difference
Progression-free survival	No clinically important difference	No clinically important difference
Fertility preservation.	Trying to preserve fertility may cause a delay in the start of treatment.	Allows additional time for fertility preservation without delaying treatment.
Planning treatment around important life events.	Initially much less contact with the health system, but potentially more fatigue. Harder to give a precise date for when radiotherapy will start, as people's tolerance of chemotherapy is less predictable.	Initially much more contact with the health system: daily visits to radiotherapy department lasting several weeks. Timing of start of chemotherapy much more predictable.

1.2.15 Following surgery, offer radiotherapy followed by up to 12 cycles of adjuvant temozolomide to all people who have:

- Karnofsky performance status of 70 or more, and
- a newly diagnosed IDH wildtype or mutated grade III glioma without 1p/19q codeletion (anaplastic astrocytoma).

1.2.16 Do not offer nitrosoureas (for example CCNU (lomustine)) concurrently with radiotherapy for people with newly diagnosed grade III glioma.

1.2.17 Advise people who have an initial diagnosis of grade III glioma (and their relatives and carers, as appropriate) that the available evidence does not support the use of:

- metformin
- statins
- ketogenic diets
- cannabis oil
- valgancyclovir

- immunotherapy.

To find out why the committee made the recommendations on management of newly diagnosed grade III glioma following surgery or if surgery is not possible and how they might affect practice, see rationale and impact.

Management of newly diagnosed grade IV glioma (glioblastoma) following surgery or if surgery is not possible

1.2.18 For advice on using temozolomide for treating newly diagnosed grade IV glioma (glioblastoma), see the NICE technology appraisal on carmustine implants and temozolomide for the treatment of newly diagnosed high-grade glioma.

1.2.19 Offer radiotherapy using 60Gy in 30 fractions with concomitant temozolomide followed by up to 6 cycles of adjuvant temozolomide for people aged around 70 and under who:

- have a Karnofsky performance status greater than or equal to 70,, and
- have had maximal safe resection for a newly diagnosed grade IV glioma (glioblastoma).

1.2.20 Offer radiotherapy using 40Gy in 15 fractions with concomitant and adjuvant temozolomide for people aged around 70 and over who:

- have a Karnofsky performance status greater than or equal to 70, and
- have a newly diagnosed grade IV glioma (glioblastoma) with MGMT methylation.

1.2.21 Consider radiotherapy using 40Gy in 15 fractions with concomitant and adjuvant temozolomide for people aged around 70 and over who:

- have a Karnofsky performance status greater than or equal to 70, and
- have a newly diagnosed grade IV glioma (glioblastoma) without MGMT methylation or for which methylation status is unavailable.

1.2.22 Consider best supportive care alone for people aged around 70 and over who:

- have a grade IV glioma (glioblastoma) , and
- have a Karnofsky performance status of less than 70.

1.2.23 For people with initial diagnosis of grade IV glioma (glioblastoma) not covered in recommendations 1.2.19 - 1.2.22 consider:

- radiotherapy using 60Gy in 30 fractions with concurrent and adjuvant temozolomide
- radiotherapy alone using 60Gy in 30 fractions
- hypo-fractionated radiotherapy
- temozolomide alone if the tumour has MGMT methylation and the person is aged around 70 and over
- best supportive care alone.

1.2.24 Assess the person's performance status throughout the postoperative period and review treatment options for grade IV glioma (glioblastoma) if their performance status changes.

1.2.25 Do not offer bevacizumab as part of management of a newly diagnosed grade IV glioma (glioblastoma).

1.2.26 Do not offer tumour-treating fields (TTF) as part of management of a newly diagnosed grade IV glioma (glioblastoma).

1.2.27 Advise people who have an initial diagnosis of grade III glioma (and their relatives and carers, as appropriate) that the available evidence does not support the use of:

- metformin
- statins
- ketogenic diets
- cannabis oil
- valgancyclovir
- immunotherapy.

To find out why the committee made the recommendations on management of newly diagnosed grade IV glioma (glioblastoma) following surgery or if surgery is not possible and how they might affect practice, see rationale and impact.

Management of recurrent grade III and grade IV glioma (recurrent high-grade glioma)

1.2.28 When deciding on treatment options for people with recurrent high-grade glioma, take into account:

- the person's preferences.
- Karnofsky performance status
- time from last treatment
- what their last treatment was
- tumour molecular markers.

1.2.29 Consider PCV or single agent CCNU (lomustine) as an alternative to temozolomide for people with recurrent high-grade glioma.

1.2.30 For advice on using temozolomide as an option for treating recurrent high-grade glioma, see the NICE technology appraisal on guidance on the use of temozolomide for the treatment of recurrent malignant glioma (brain cancer).

1.2.31 Consider best supportive care alone to manage high-grade glioma if other treatments are not likely to be of benefit, or if the person would prefer this. If so refer, to the NICE guidance on end of life care.

1.2.32 For people with focal recurrent enhancing disease, the multidisciplinary team should consider the treatment options of:

- further surgery with or without carmustine wafers
- further radiotherapy.

1.2.33 Do not offer bevacizumab, erlotinib, or cediranib, either alone or in combination with chemotherapy, as part of management of a recurrent high-grade glioma.

1.2.34 Do not offer tumour treating fields (TTF) as part of management of a recurrent high-grade glioma.

1.2.35 Advise people who have a recurrent high-grade glioma (and their relatives and carers, as appropriate) that the available evidence does not support the use of:

- metformin
- statins
- ketogenic diet
- cannabis oil
- valgancyclovir
- immunotherapy.

To find out why the committee made the recommendations on management of recurrent grade III and grade IV glioma (recurrent high-grade glioma) and how they might affect practice, see rationale and impact.

Techniques for resection of glioma

1.2.36 If a person has a radiologically-suspected enhancing high-grade glioma, and the multidisciplinary team believes maximal surgical resection is possible, offer 5-amino-levulinic acid (5-ALA)-guided resection as an adjunct to maximise resection at initial surgery

1.2.37 Consider awake craniotomy for people with low- and high-grade glioma to preserve neurological function while achieving maximal safe resection.

1.2.38 Discuss awake craniotomy and its potential benefits and risks with the person and their relatives and carers (as appropriate) before making the choice to have awake craniotomy. Only consider the procedure if the person is likely not to be significantly distressed by it.

1.2.39 Involve appropriate other specialists, such as neuropsychologists and speech and language therapists, before, during and after the awake craniotomy.

1.2.40 Consider intraoperative MRI to help preserve neurological function while achieving maximal safe resection in both low- and high-grade glioma, unless MRI is contraindicated.

1.2.41 Consider intraoperative ultrasound to help achieve maximal safe resection in both low- and high-grade glioma.

1.2.42 Consider diffusion tensor imaging (DTI) overlays in addition to standard neuronavigation techniques to minimise damage to functionally important fibre tracts in both low- and high-grade glioma.

To find out why the committee made the recommendations on techniques for resection of glioma and how they might affect practice, see rationale and impact.

1.3 Follow-up for glioma

1.3.1 Offer regular clinical review for people with glioma to assess changes in physical, psychological and cognitive wellbeing.

1.3.2 Base decisions on when to arrange regular clinical reviews and follow-up imaging for people with glioma on:

- tumour subtype
- life expectancy
- the person's preferences (see Table 2)
- treatment used before
- treatment options available
- any residual tumour.

Table 2 - Factors when deciding between more frequent in comparison to less frequent follow-up for people with glioma

Possible advantages of more frequent follow-up	Possible disadvantages of more frequent follow-up
May identify recurrent disease earlier which may increase treatment options or enable treatment before people become symptomatic.	There is no definitive evidence that identifying recurrent disease early improves outcomes.
May help provide information about the course of the illness and prognosis.	May increase anxiety if changes of uncertain significance are detected on imaging.
Some people can find more frequent imaging and hospital contact reassuring. Provides an opportunity to identify patient or carer needs (psychosocial support and late side effects of treatment).	Some people can find more frequent imaging and hospital contact burdensome and disruptive - they feel their life revolves around their latest scan There may be a financial cost from taking time off work and travelling to appointments.
	More imaging and follow-up is resource intensive for the NHS.

1.3.3 Consider standard structural MRI (defined as T2 weighted, FLAIR, DWI series and T1 pre- and post-contrast volume) as part of regular clinical review to monitor people with glioma for progression or recurrence unless MRI is contraindicated.

1.3.4 Consider advanced MRI techniques, such as MR perfusion, DTI and MR spectroscopy to help with image interpretation for people with possible recurrence after treatment for glioma when:

- early identification of recurrence is thought likely to be important, and
- findings on standard imaging are equivocal for recurrence.

1.3.5 Be aware that having routine imaging and waiting for the results may cause anxiety for people with glioma, and their relatives and carers. Explain that imaging can be difficult to interpret and results can be of uncertain significance.

1.3.6 Consider a baseline MRI within 72 hours of surgical resection for all types of glioma.

1.3.7 Consider a baseline MRI 3 months after the completion of radiotherapy for all types of glioma.

1.3.8 Arrange an urgent clinical review, including appropriate imaging, for people with glioma who develop new or changing neurological symptoms or signs at any time.

An example of a possible follow-up schedule is given in Table 3.

Table 3 - Possible regular clinical review schedule for glioma depending on grade of tumour

	Years after end of treatment:					
	0–1	**1–2**	**2–3**	**3–4**	**5–10**	**>10 (for the rest of life)**
Grade I	Scan at 12 months, then: • consider discharge if no tumour visible on imaging • consider if ongoing imaging is needed at a rate of once every 1-3 years for the rest of the person's life if the tumour is visible on imaging					
Grade II and Grade III 1p/19q codeleted, IDH-mutated (oligodendroglioma)	Scan at 3 months, then every 6 months		Annually		Every 1–2 years	Consider if ongoing imaging is needed at a rate of once every 1-2 years
Grade III 1p/19q non-codeleted, IDH-mutated (astrocytoma) and Grade IV (glioblastoma)	Every 3-6 months		Every 6-12 months		Annually	Consider if ongoing imaging is needed at a rate of once every 1-2 years

To find out why the committee made the recommendations on follow-up for glioma and how they might affect practice, see rationale and impact.

2 Investigation, management and follow-up of meningioma

2.1 Investigation of suspected meningioma

2.1.1 Offer standard structural MRI (defined as T2 weighted, FLAIR, DWI series and T1 pre- and post-contrast volume) as the initial diagnostic test for suspected meningioma, unless MRI is contraindicated.

2.1.2 Consider CT imaging for meningioma (if not already performed) to assess bone involvement.

> To find out why the committee made the recommendations on investigation of suspected meningioma and how they might affect practice, see rationale and impact.

2.2 Management of confirmed meningioma following surgery or if surgery is not possible

2.2.1 Base management of inoperable or incompletely excised or recurrent meningioma on the type and grade of meningioma (see Table 4).

Table 4- Treatment choices for different kinds of meningioma

		Type				
		Completely excised (Simpson 1–2)	**Incompletely excised (Simpson 3–5)**	**Inoperable (biopsy available)**	**Inoperable (biopsy not available)**	**Recurrent**
Grade	I	Offer active monitoring	Consider further surgery (if possible), radiotherapy, or active monitoring	Consider active monitoring or radiotherapy	Clinically assess location, growth and likelihood to cause significant symptoms during life expectancy. Consider active monitoring or radiotherapy accordingly.	Consider either further surgery or radiotherapy (if not previously used)
	II	Offer a choice between active monitoring or radiotherapy	Consider further surgery (if possible). Offer adjuvant radiotherapy if surgery is not possible or if the tumour is still incompletely excised after further surgery	Offer radiotherapy		Consider further surgery and offer radiotherapy (if not previously used)
	III	Offer radiotherapy	Consider further surgery (if possible) and offer adjuvant radiotherapy	Offer radiotherapy		Consider further surgery and offer radiotherapy (if not previously used)

2.2.2 Before deciding on radiotherapy for meningioma, take into account:

- the person's preferences (see Table 5)
- size and location of tumour
- neurological function
- oedema
- comorbidities

- performance status
- life expectancy
- surgical and radiotherapy morbidity
- treatments used before
- rate of tumour progression.

Table 5 - Factors to consider when deciding between radiotherapy or no radiotherapy as treatment for a surgically-treated meningioma

	Radiotherapy	**No radiotherapy**
Control of tumour	There is evidence that radiotherapy is effective in the local control of a tumour.	Receiving no radiotherapy means the tumour may continue to grow.
Risk of developing subsequent symptoms	Controlling the tumour will reduce the risk of developing symptoms from the tumour in the future.	If the tumour grows it can cause irreversible symptoms such as loss of vision.
Risk of re-treatment	Less risk of needing second surgery compared to no radiotherapy.	Higher risk of needing second surgery compared to radiotherapy. If the tumour has progressed then the surgery might be more complex. If the tumour has progressed then not all radiotherapy techniques may be possible.
Early side effects of treatment	Early side effects from radiotherapy can include: • fatigue • hair loss • headache • nausea • seizures • skin irritation.	No side effects from treatment.
Late side effects of treatment	Late side effects from radiotherapy can include: • effect on cognition • risk of stroke • risk of radionecrosis • risk of second tumours • cranial nerve effects • hypopituitarism • cataracts.	No side effects from treatment.
Management of side effects	Increased use of steroids to manage side effects.	No side effects from treatment.

2.2.3 When deciding on the radiotherapy technique for people with meningioma, take into account:

- tumour grade
- size
- location (proximity to optic nerves, optic chiasm and brainstem)
- the preferences of the person with the meningioma (for example to minimise the number of appointments or travel distance).

From the suitable radiotherapy techniques, choose the one which minimises the dose to normal brain tissue.

2.2.4 If the multidisciplinary team thinks that radiotherapy may be appropriate for a person, offer them the opportunity to discuss potential benefits and risks of radiotherapy with an oncologist.

To find out why the committee made the recommendations on management of confirmed meningioma following surgery or if surgery is not possible and how they might affect practice, see rationale and impact.

2.3 Follow-up for meningioma

2.3.1 Offer regular clinical review for people with meningioma to assess changes in physical, psychological and cognitive wellbeing.

2.3.2 Base decisions on when to arrange regular clinical reviews and follow-up imaging for people with meningioma on:

- tumour grade
- life expectancy
- the person's preferences (see Table 6)
- treatment used before
- treatment options available
- any residual tumour.

Table 6 - Factors when deciding between more frequent in comparison to less frequent follow-up for people with meningioma

Possible advantages of more frequent follow-up	Possible disadvantages of more frequent follow-up
May identify recurrent disease earlier which may increase treatment options or enable treatment before people become symptomatic.	There is no definitive evidence that identifying recurrent disease early improves outcomes.
May help provide information about the course of the illness and prognosis.	May increase anxiety if changes of uncertain significance are detected on imaging.
Some people can find more frequent imaging and hospital contact reassuring. Provides an opportunity to identify patient or carer needs (psychosocial support and late side effects of treatment).	Some people can find more frequent imaging and hospital contact burdensome and disruptive - they feel their life revolves around their latest scan. There may be a financial cost from taking time off work and travelling to appointments.
	More imaging and follow up is resource intensive for the NHS.

2.3.3 Consider standard structural MRI (defined as T2 weighted, FLAIR, DWI series and T1 pre- and post-contrast volume) as part of regular clinical review to monitor people with meningioma for progression or recurrence unless MRI is contraindicated.

2.3.4 Be aware that having routine imaging and waiting for the results may cause anxiety for people with meningioma and their relatives and carers.

2.3.5 Arrange an urgent clinical review, including appropriate imaging, for people with meningioma (including incidental meningioma) who develop new or changing neurological symptoms or signs at any time.

An example of a possible follow-up schedule is given in Table 7.

Table 7 - Possible regular clinical review schedule for meningioma depending on grade of tumour

	Years after end of treatment:								
	0-1	**1-2**	**2-3**	**3-4**	**4-5**	**5-6**	**6-7**	**7-8**	**8-9**	**>9 (for the rest of life)**
Grade I: no residual tumour*	Scan at 3 months	Annually		Once every 2 years						Consider discharge
Grade I: residual tumour*	Scan at 3 months	Annually				Once every 2 years				Consider discharge
Grade I: after radiotherapy	Scan 6 months after radiotherapy	Annually		Once every 2 years						Consider discharge
Grade II	Scan at 3 months, then 6-12 months later	Annually				Once every 2 years				Consider discharge
Grade III	Every 3-6 months		Every 6-12 months			Annually				
Asymptomatic incidental meningioma	Scan at 12 months. If no change consider discharge or scan at 5 years									
**The presence of any residual tumour can only be established after the first scan at 3 months*										

To find out why the committee made the recommendations on follow-up for meningioma and how they might affect practice, see rationale and impact.

3 Investigation, management and follow-up of brain metastases

3.1 Investigation of suspected brain metastases

3.1.1 Offer standard structural MRI (defined as T2 weighted, FLAIR, DWI series and T1 pre- and post-contrast volume) as the initial diagnostic test for suspected brain metastases, unless MRI is contraindicated.

3.1.2 To help establish current disease status, offer extracranial imaging appropriate to the tumour type for people with any radiologically-suspected brain metastases that may be suitable for focal treatment.

3.1.3 Perform all intracranial and extracranial diagnostic imaging before referral to neuro-oncology multidisciplinary team meetings.

To find out why the committee made the recommendations on investigation of suspected brain metastases and how they might affect practice, see rationale and impact.

3.2 Management of confirmed brain metastases

3.2.1 When choosing management options for brain metastases, take into account:

- the person's preference (see Table 8 and Table 9)
- the person's age
- performance status
- extracranial disease
- the number and volume of metastases
- the primary tumour site and molecular profile
- leptomeningeal disease

3.2.2 location of metastases.Consider maximal local therapy with either surgery or stereotactic radiosurgery for people with a single brain metastasis.

3.2.3 Base the choice of treatment for people with a single brain metastasis on:

- tumour size
- location of metastasis
- extent of oedema
- the person's preference (see Table 8)
- comorbidities.

Table 8- Factors to consider when deciding between surgery or stereotactic radiotherapy as treatment for a single brain metastasis

	Surgery	**Stereotactic radiosurgery**
Overall survival	No clinically important difference	No clinically important difference
Risk of needing additional treatment	Risk that stereotactic radiotherapy may be needed in any case.	Risk that surgery may be needed in any case. However, has higher local control rate than surgery (meaning surgery is less likely after radiotherapy than the other way around).
Key benefit of treatment	Has more rapid control of symptoms. Additionally, surgery allows for obtaining an up-to-date pathological diagnosis which may guide future treatment, making it more effective.	Has a higher local control rate than surgery, meaning more treatment is less likely to be needed. Additionally, is an outpatient treatment and does not need a general anaesthetic.
Key risks of treatment	Surgical procedures carry known risks that vary depending on the person and the tumour. These include infection, stroke, a prolonged hospital stay or death. Surgery is more painful than radiotherapy during recovery.	Radiation carries the risk of delayed effects such as radionecrosis, which might need surgical resection. There is an increased risk of seizures with this technique, although this appears to mostly affect people who have pre-existing epilepsy.
Steroid use	Early reduction in steroid dose	Likely to need steroids for longer, and at a higher dose. Steroids have significant side effects when used long-term, such as changes in mood, heart problems and changes in body fat.
Planning treatment around important life events	The wound from the surgery may affect the ability to carry out certain activities in the short term, such as air travel and sport. The cosmetic appearance of the wound from surgery may be important to some people, and should be discussed.	Some people find the techniques used in radiotherapy challenging or upsetting, especially the equipment which immobilises the head. This is especially likely to be true for claustrophobic people.
Other considerations		Radiotherapy can reach some areas of the brain that surgery cannot, and might be the only appropriate technique for certain tumour types.

3.2.4 Do not offer adjuvant whole-brain radiotherapy to people with single brain metastasis treated with stereotactic radiotherapy or surgery.

3.2.5 Consider adjuvant stereotactic radiosurgery to the surgical cavities for people with 1 to 3 brain metastases that have been resected.

3.2.6 Consider stereotactic radiosurgery for people with multiple brain metastases who have controlled extracranial disease and good performance status. Take into account the number and total volume of metastases.

3.2.7 Do not offer whole-brain radiotherapy to people with non-small cell lung cancer and brain metastases not suitable for surgery or stereotactic radiotherapy who have a Karnofsky performance status of under 70.

3.2.8 For people with multiple brain metastases who have not had stereotactic radiosurgery or surgery, discuss the potential benefits and risks of whole-brain radiotherapy with them and their relatives and carers (as appropriate) (see Table 9). Based on the discussion and their personal choice, consider:

- whole-brain radiotherapy, or
- no whole-brain radiotherapy.

Table 9 - Potential benefits and harms of whole-brain radiotherapy for multiple metastases

	Whole-brain radiotherapy	**No whole brain radiotherapy**
Overall survival	No clinically important difference	No clinically important difference
Quality of life	Short-term deterioration in quality of life because of treatment.	No impact on quality of life because of treatment but deterioration because of the disease progression.
Potential benefits	Can stabilise or reduce the brain metastases.	Brain metastases may continue to grow.
Side effects	Temporary hair loss and fatigue. Potential for accelerated cognitive loss because of radiotherapy.	Potential for cognitive loss because of disease progression.
Time commitment	Requires 5-10 hospital visits.	No time commitment.
Other considerations	People with non-small cell lung cancer will not benefit from treatment if their overall prognosis is poor.	

3.2.9 Do not offer memantine in addition to whole-brain radiotherapy to people with multiple brain metastases, unless as part of a clinical trial.

3.2.10 Do not offer concurrent systemic therapy to enhance the efficacy of whole-brain radiotherapy to people with multiple brain metastases, unless as part of a clinical trial.

To find out why the committee made the recommendations on management of confirmed brain metastases and how they might affect practice, see rationale and impact.

3.3 Follow-up for brain metastases

3.3.1 Offer regular clinical review for people with brain metastases to assess changes in physical, psychological and cognitive wellbeing.

3.3.2 Base decisions on when to arrange regular clinical reviews and follow-up imaging for people with brain metastases on:

- primary cancer
- extracranial disease status
- life expectancy
- treatment options available
- the person's preferences (see Table 10).

Table 10- Factors when deciding between more frequent in comparison to less frequent follow-up for people with brain metastases

Possible advantages of more frequent follow-up	**Possible disadvantages of more frequent follow-up**
May identify recurrent disease earlier which may increase treatment options or enable treatment before people become symptomatic	There is no definitive evidence that identifying recurrent disease early improves outcomes.
May help provide information about the course of the illness and prognosis.	May increase anxiety if changes of uncertain significance are detected on imaging.
Some people can find more frequent imaging and hospital contact reassuring. Provides an opportunity to identify patient or carer needs (psychosocial support and late side effects of treatment).	Some people can find more frequent imaging and hospital contact burdensome and disruptive - they feel their life revolves around their latest scan. There may be a financial cost from taking time off work and travelling to appointments.
	More imaging and follow up is resource intensive for the NHS.

3.3.3 Consider standard structural MRI (defined as T2 weighted, FLAIR, DWI series and T1 pre- and post-contrast volume) as part of regular clinical review to monitor people with brain metastases for progression or recurrence, unless MRI is contraindicated.

3.3.4 Consider advanced MRI techniques, for example, MR perfusion and MR spectroscopy to help with image interpretation for people with possible recurrence after treatment for brain metastases when:

- early identification of recurrence is thought likely to be important, and
- findings on standard imaging do not make it clear if there is a recurrence or not.

3.3.5 Be aware that having routine imaging and waiting for the results may cause anxiety for people with brain metastases and their relatives and carers. Explain that imaging can be difficult to interpret and give results of uncertain significance.

3.3.6 Arrange an urgent clinical review, including appropriate imaging, for people with brain metastases who develop new or changing neurological symptoms or signs at any time.

An example of a possible follow-up schedule is given in Table 11.

Table 11 - Possible regular clinical review schedule for brain metastases

	Years after end of treatment:		
	0-1	1-2	2 onwards
Brain metastases	Every 3 months	Every 4-6 months	Annually

To find out why the committee made the recommendations on follow-up for brain metastases and how they might affect practice, see rationale and impact.

4 Supporting people living with a brain tumour

4.1 Care needs of people with brain tumours

4.1.1 Be aware that the care needs of people with brain tumours represent a unique challenge distinct from other cancers, because (in addition to physical disability) the tumour and treatment can have effects on:

- cognition
- personality

- behaviour.

4.1.2 Discuss health and social care support needs with the person with a brain tumour and their relatives and carers (as appropriate). Take into account the complex health and social care support needs people with any type of brain tumour and their relatives and carers will have (for example; psychological, cognitive, physical, spiritual, emotional).

4.1.3 Set aside enough time to discuss the impact of the brain tumour on the person and their relatives and carers (as appropriate), and to elicit and discuss their health and social care support needs.

4.1.4 Health and social care professionals involved in the care of people with brain tumours should address additional complex needs during or at the end of treatment and throughout follow-up. These include:

- the challenges of living with uncertainty
- maintaining a sense of hope
- changes to cognitive functioning
- loss of personal identity
- loss of independence
- fatigue
- potential for change in personal relationships
- the impact of brain tumour-associated epilepsy on wellbeing (see the NICE guideline on epilepsies: diagnosis and management).

4.1.5 Provide a named healthcare professional with responsibility for coordinating the health and social care support for people with brain tumours and their carers, for example a key worker as defined in NICE guidance on improving outcomes for people with brain and other central nervous system tumours.

4.1.6 Ensure information is given to the person with a brain tumour and their relatives and carers (as appropriate):

- in a professional and empathetic manner

- in suitable formats (usually meaning both written and spoken, with the information available to take away) following all principles as outlined in NICE guidance on patient experience in adult NHS services: improving the experience of care for people using adult NHS services
- at appropriate times throughout their care pathway.

4.1.7 Explain to the person the implications of having a brain tumour on driving and any relevant legal consequences (for example if the person with the brain tumour has a responsibility to inform the DVLA).

4.1.8 Provide and explain clinical results, for example imaging and pathology reports, to the person with a brain tumour and their relatives and carers (as appropriate) at the earliest opportunity.

4.1.9 Offer supportive care to people with brain tumours and their relatives and carers (as appropriate) throughout their treatment and care pathway.

4.1.10 If the person with a brain tumour is likely to be within the last year of their life, refer to the NICE quality standards on end of life care for adults and, when appropriate, care of dying adults in the last days of life.

To find out why the committee made the recommendations on care needs of people with brain tumours and how they might affect practice, see rationale and impact.

4.2 Neurorehabilitation assessment needs of people with brain tumours

4.2.1 Consider referring the person with a brain tumour for a neurological rehabilitation assessment at diagnosis and every stage of follow-up.

4.2.2 Offer people with brain tumours and their relatives and carers (as appropriate) information on accessing neurological rehabilitation, and on what needs it can help address.

To find out why the committee made the recommendations on neurorehabilitation needs of people with brain tumours and how they might affect practice, see rationale and impact.

4.3 Surveillance for the late-onset side effects of treatment

4.3.1 Be aware that people with brain tumours can develop side effects months or years after treatment, which can include:

- cognitive decline
- hypopituitarism
- epilepsy
- SMART (stroke like migraine attacks after radiotherapy)
- stroke
- hearing loss
- cataracts
- neuropathy (for example nerve damage causing visual loss, numbness, pain or weakness)
- infertility
- radionecrosis
- cavernoma
- secondary tumours.

4.3.2 Assess the person's individual risk of developing late effects when they finish treatment. Record these in the written treatment summary and explain them to the person (and their relatives and carers, as appropriate).

4.3.3 Encourage healthy lifestyle interventions such as exercise, healthy diet and smoking cessation advice in all those who have been treated with cranial radiotherapy to improve modifiable risk factors related to risk of stroke. See the NICE guidelines on obesity prevention, physical activity and smoking cessation.

4.3.4 For people who are at high risk of stroke, consider checking blood pressure, Hba1c and cholesterol profile regularly.

4.3.5 Consider ongoing neuropsychology assessment for people at high risk of cognitive decline.

4.3.6 If a person has received a radiotherapy dose that has the potential to affect pituitary function, consider checking endocrine function regularly after the end of treatment.

4.3.7 Consider ophthalmic review for people at high risk of visual impairment, for an eye examination.

4.3.8 Consider referral to audiology for people who are at high risk of hearing loss, for a hearing test.

4.3.9 Consider referral to stroke services if an MRI during active monitoring identifies asymptomatic ischaemic stroke.

To find out why the committee made the recommendations on surveillance for the late-onset side effects of treatment and how they might affect practice, see rationale and impact.

Terms used in this guideline

Regular clinical review

This is a review of how the person with a brain tumour is doing and their treatment. It is also when scanning and assessment should happen (unless it is more clinically sensible to give the scan a few days or weeks before assessment).

Recommendations for research

The guideline committee has made the following high-priority recommendations for research**.**

1 Managing glioma

Does the addition of concurrent and adjuvant temozolomide to radiotherapy improve overall survival in patients with IDH wildtype grade II glioma?

Why this is important

The WHO 2016 reclassification of brain tumours recognised that the molecular characteristics of glioma are extremely important in helping differentiate between disease entities with very different outcomes. Although evidence exists to guide management recommendations for certain molecular gliomas, such as codeleted and non-codeleted grade III glioma, currently no studies have investigated the best approach for the management of grade II glioma with IDH wildtype. The biological behaviour of these tumours is more like a high-grade glioma with a much shorter prognosis than IDH-mutated grade II glioma.

Because of this, some clinicians have advocated treating such tumours with concurrent chemoradiation recommended for grade IV glioma (GBM). However, there is currently no research evidence to support this approach and this regimen is more intensive and people experience increased acute and late side effects compared to radiotherapy alone.

Research is needed to establish whether or not this approach is beneficial in terms of improved survival, and at what cost in terms of toxicity and, potentially, reduced quality of life.

2 Managing glioma

Does a dedicated supportive care clinic in addition to standard care improve outcomes for people with low-grade gliomas?

Why this is important

People with low-grade gliomas have significant symptoms and complex health care needs across multiple physical, cognitive, emotional and social domains. This is often from the initial diagnosis onwards. There are indications from research literature and patient reports that these needs are currently unmet. Helping people with low-grade gliomas maintain their quality of life and function is important, especially as there is currently no cure.

As no research literature exists which establishes the effectiveness of a specific health care intervention, uncertainty exists about the most appropriate intervention to address unmet needs and improve patient-reported outcome measures (or to

establish whether current healthcare provision can meet these needs). Current uncertainty is likely to have led to variations in service provision across the UK. It is also possible that no specific intervention is available in some areas.

Research is needed to identify whether, in addition to standard care, a specific supportive care intervention can significantly improve patient-reported outcome measures, and if so to establish what this intervention should consist of.

3 Managing glioma

Does early referral to palliative care improve outcomes for people with glioblastomas in comparison with standard oncology care?

Why this is important

People with grade IV brain tumours (glioblastomas) have a poor prognosis which has not improved in over a decade. Median overall survival is 14-18 months even with gold-standard chemoradiation following surgery.

From initial diagnosis people experience multiple complex symptoms resulting from neurological impairment. These can significantly impact on their quality of life, function, and psychological wellbeing. Their informal caregivers report high levels of distress and carer burden.

The aim of palliative care is to relieve symptoms and improve people's quality of life and function - not just towards the end of life but throughout the duration of illness. There is some evidence that early palliative care referral significantly improves overall survival, quality of life and mood.

Research in this area is important because this group of people have substantial health needs, which use significant health care resources. Supportive care interventions such as early palliative care may improve quality of life and function throughout the duration of illness. It may also help people to manage the distress associated with a reduced life expectancy and participate in advanced care planning.

4 Managing glioma

Does early detection of recurrence after treatment improve overall survival/outcomes in molecularly stratified glioma?

Why this is important

Prognosis for brain tumours is inherently uncertain, and recent advances in treatment mean many people with a brain tumour will live for a long time after the initial diagnosis. For these individuals, follow-up is the longest component of their treatment and it is both expensive for the NHS and (sometimes) a burden for the person. There is no high-quality evidence that follow-up after treatment is beneficial, and clinical uncertainty about whether such follow-up is likely to alter outcomes of importance to people with tumours (such as overall life expectancy or quality of life).

Research is needed to establish at what point the value of identifying recurrence early is outweighed by the harms of increasing burden to patients.

5 Managing meningioma

Is immediate or deferred radiotherapy better for incompletely excised grade I meningioma?

Why this is important

There are no randomised studies on the use of radiotherapy in the treatment of grade I meningioma. Though case series have shown that people with inoperable and incompletely excised grade I meningioma treated with radiotherapy have high rates of control of their tumour, treatment risks significant side effects. The side effects include: neuropathy, radionecrosis, significant oedema, neuro-cognitive effects, increased risk of stroke and secondary tumours. Therefore the timing of treatment is a balance between control of tumour and side effects. It is not known if early treatment has a greater or lesser chance of long-term tumour control or risk of tumour complications, or if this just risks complications of treatment earlier.

People with grade I meningioma have traditionally been overlooked as a priority area for research. This is likely because of the slow nature of the disease resulting in need for long-term follow up and the difficulty to obtain funding for radiotherapy-only studies. However, this lack of research is inequitable, hence the reason for its prioritisation by the committee.

A study on this topic would provide clear information to guide clinicians and people with meningiomas, hopefully leading to overall improvement in quality of life.

Rationale and impact

Imaging for suspected glioma

Why the committee made the recommendations

The discussion below explains how the committee made recommendations 1.1.1. and 1.1.2.

There was evidence that MRI could be useful in distinguishing high-grade from low-grade tumour, and the committee believed that this knowledge could be used to improve treatment for these people. There was no evidence for the use of more advanced techniques, so the committee made recommendations on these based on their experience that they could be useful for assessing malignant features of a tumour.

How the recommendations might affect practice

Currently, various imaging strategies are used between centres and depending on circumstances. These recommendations aim to reduce variation in practice, which may cause some centres to change their imaging protocols.

Patients are often imaged at different sites and on different MR equipment during their diagnosis and treatment. The recommendations will improve the consistency of imaging practices between centres. This will mean more accurate comparison of imaging appearances across time is possible, leading to more accurate disease assessment and treatment response. This will also help to select the most appropriate further management, and allow more accurate assessment of MR appearances between patient groups for future clinical research.

Full details of the evidence and the committee's discussion are in Evidence Report A.

Use of molecular markers to determine prognosis or guide treatment for glioma

Why the committee made the recommendations

The discussion below explains how the committee made recommendations 1.1.3–1.1.5.

Molecular markers are an emerging and important area in the treatment of brain tumours. The committee looked for evidence on non-standard markers and did not find any. Therefore the committee made recommendations to ensure that all centres followed a consistent process for considering and interpreting information on molecular markers.

How the recommendations might affect practice

As molecular markers are new, practice can vary widely and this is to be expected. However, the committee noted that there are some molecular markers for which the evidence of benefit if tested were overwhelming, and that evidence to support their use was given in trials in other sections of this evidence report. The committee believed even these markers were not being consistently tested for and this should be standardised. In principle this should not be a major change, although the time it takes to implement the new molecular tests will vary significantly between departments. In practice, the committee believes that increasing awareness of molecular testing among patients and clinicians will lead to a substantial improvement in the consistency and quality of diagnosis generally. As a result of these changes, people with tumours should be more empowered to ask questions about their specific diagnosis.

Full details of the evidence and the committee's discussion are in Evidence Report A.

Initial surgery for suspected low-grade glioma

Why the committee made the recommendations

The discussion below explains how the committee made recommendations 1.2.1–1.2.5.

There was evidence that maximal safe resection improved survival, and so the committee recommended it where it was possible. The committee was aware that it was sometimes not possible to offer a maximal safe resection (for example if the balance of risks and harms favoured not resecting all areas) and consequently recommended a biopsy in these cases on the basis of evidence showing improved overall survival from a biopsy versus active monitoring. A small number of people might have received their initial treatment before it was standard practice to save a sample of tissue for biopsy, and on the basis of their experience the committee recommended that these individuals not receive further surgery as long as their condition was stable.

How the recommendations might affect practice

The recommendations are likely to change practice in some areas, particularly by removing unnecessary clinical variation. This variation is thought to be particularly prevalent in the expectations around what molecular diagnoses should be performed and in the treatment of very low-risk tumours, where different centres have different norms. This is partly because low-grade gliomas are still sometimes managed by non-expert surgical teams, and therefore the committee hope the recommendation in this area will reduce clinical variation in other areas.

The recommendation about the management of low-grade gliomas which have already been treated but which then progress is unlikely to substantially change practice as this would be the expectation of most clinicians. However it does help to establish that the balance of risks and harms of biopsy is not sufficient to justify retroactively biopsying those who have never had a biopsy, which would be a very significant change in practice.

Full details of the evidence and the committee's discussion are in Evidence Report A.

Further management of newly diagnosed low-grade glioma

Why the committee made the recommendations

The discussion below explains how the committee made recommendations 1.2.6–1.2.11.

There was evidence that radiotherapy and PCV improved overall survival and progression free survival. The committee discussed how the evidence for the exact regime was complex, but used their judgement to determine a possible timing and dose to consider. In addition, the committee described how there were some circumstances where radiotherapy and PCV might not be appropriate (particularly the very lowest-concern and highest-concern low-grade tumours) and offered some recommendations based on their experience in these cases.

The committee included approximate age cutoffs on the basis of evidence showing improvement in those over 40 with or without residual tumour, and on the basis of their clinical judgement that this same improvement would be unlikely to happen to those under 40 without residual tumour.

How the recommendations might affect practice

These recommendations aim to standardise practice and to provide timely interventions to people with low-grade gliomas, according to the tumour type, molecular pathogenesis and biologic behaviour. This will on average probably result in the same amount of chemo- and radiotherapy, but these treatments will be more precisely targeted and so improve outcomes. It is likely that more active monitoring will occur, which will improve outcomes by preventing people with tumours from being subjected to the toxic side-effects of treatment for no probable gain.

Full details of the evidence and the committee's discussion are in Evidence Report A.

Management of newly diagnosed grade III glioma following surgery or if surgery is not possible

Why the committee made the recommendations

The discussion below explains how the committee made recommendations 1.2.12–1.2.17.

The committee considered evidence for grade III and grade IV glioma separately. On the basis of randomised control trial evidence the committee recommended

radiotherapy and either PCV or TMZ depending on the tumour subtype for grade III glioma.

Based on low quality evidence the committee recommended against certain kinds of treatment, and on the basis of their clinical experience also recommended informing people where they had searched for evidence but found none. Both of these recommendations should prevent unnecessary therapies being offered to people, in the judgement of the committee.

How the recommendations might affect practice

For co-deleted grade III glioma the use of adjuvant PCV has been standard for some time, but the use of adjuvant temozolomide for non-codeleted grade III gliomas is a change in practice. However, since the results of the study were made publically available in 2016 it is expected most centres will adopt this as their standard of care.

Full details of the evidence and the committee's discussion are in Evidence Report A.

Management of newly diagnosed grade IV glioma following surgery or if surgery is not possible

Why the committee made the recommendations

The discussion below explains how the committee made recommendations 1.2.18–1.2.27.

The committee considered evidence for grade III and grade IV glioma separately. The committee saw some evidence demonstrating improved overall survival in some groups with grade IV glioma if offered radiotherapy and TMZ, but explained that on the basis of their clinical experience they did not think these results were certain to generalise and suggested a range of possible treatments which could be considered depending on the exact clinical characteristics of the tumour. Based on low quality evidence the committee recommended against certain kinds of treatment, and on the basis of their clinical experience also recommended informing people where they had searched for evidence but found none. Both of these recommendations should

prevent unnecessary therapies being offered to people, in the judgement of the committee.

The committee made recommendations with approximate age cutoffs for those with grade IV glioma. They justified this on the basis of evidence that a lower radiotherapy dose did not have any negative impact in those aged over 70 and that therefore a lower radiotherapy dose for this group was likely to cause fewer side effects without compromising clinical effectiveness.

How the recommendations might affect practice

For younger people with better performance status with a grade IV glioma a course of radiotherapy and concurrent and adjuvant temozolomide has been standard of care for a number of years. However, for those over the age of 70, particularly with methylated MGMT, the use of concurrent and adjuvant temozolomide is a change of practice which will probably result in more people being treated.

Full details of the evidence and the committee's discussion are in Evidence Report A.

Management of recurrent grade III and grade IV glioma (recurrent high-grade glioma)

Why the committee made the recommendations

The discussion below explains how the committee made recommendations 1.2.28–1.2.35.

On the basis of low to moderate quality evidence the committee recommended treatment options for people with recurrent glioma include TMZ, PCV or single agent CCNU (lomustine). There was no evidence on which of these three options was likely to lead to the best outcomes, and on the basis of their clinical experience the committee concluded it would probably depend on the individual features of the tumour and preferences of the person with the tumour. The committee also highlighted the possibility of considering supportive care alone, on the basis of their experience.

Based on some evidence the committee recommended against certain kinds of treatment, and on the basis of their clinical experience also recommended informing people where they had searched for evidence but found none. Both of these recommendations should prevent unnecessary therapies being offered to people, in the judgement of the committee.

How the recommendations might affect practice

These recommendations are unlikely to affect the provision of standard treatment for recurrent high-grade glioma, but should ensure that tumour treating fields, bevacizumab, erlotinib and cediranib are not used inappropriately. Some people who might have a better quality of life if offered palliative care but who are currently receiving treatment might be empowered to ask for this to stop.

Therefore these recommendations are likely to lead to a potential resource saving for the NHS, since not using tumour treating fields, bevacizumab, erlotinib or cediranib will free up resources for use elsewhere.

These recommendations might also lead to research into newer interventions, such as a ketogenic diet. This could change practice in the future.

Full details of the evidence and the committee's discussion are in Evidence Report A.

Techniques for resection of glioma

Why the committee made the recommendations

The discussion below explains how the committee made recommendations 1.2.36–1.2.42.

There was evidence that 5-ALA, diffusion tensor imaging and intraoperative MRI could improve the extent of maximal resection. The committee concluded that the evidence for MRI could be generalised to intraoperative ultrasound on the basis of their clinical experience.

The evidence for awake craniotomy was equivocal (nonsignificant), but the committee concluded it was in line with their clinical experience that some people

benefit and some are harmed by the procedure. On the basis of their judgement, the committee described how better pre-operative procedure could reduce the number of people harmed by the procedure.

How the recommendations might affect practice

Some techniques recommended by the committee require a very high level of intraoperative skill available in theatre, and this might cause resource implications for hospitals recruiting for such specialist skills. The committee noted that there is significant variation in the current provision of psychological support before and during awake craniotomy, and implementing this could carry a high cost to the individual unit.

Full details of the evidence and the committee's discussion are in Evidence Report A.

Follow-up for glioma

Why the committee made the recommendations

The discussion below explains how the committee made recommendations 1.3.1–1.3.8.

The committee made all recommendations on the basis of their clinical experience. They described how the schedule for reviews should take in all relevant characteristics about a person, including the grade of tumour that the person has. As this is quite a complex determination, the committee suggested a schedule of clinical reviews for a 'typical' individual which could be considered by clinicians.

How the recommendations might affect practice

The committee made recommendations in line with current best practice, with the intention of standardising practice nationally. This means the recommendations are unlikely to cause a significant increase in resource use, but some recommendations may have some additional cost or requirement for service configuration if current practice is different in that area.

The committee noted that their recommendations on scanning schedules are necessarily weak, as they are based on no evidence. In their clinical judgement,

similar schedules are likely to be most beneficial for most people, and therefore clinical practice may change to reflect these schedules.

Full details of the evidence and the committee's discussion are in Evidence Report A.

Investigation of suspected meningioma

Why the committee made the recommendations

The discussion below explains how the committee made recommendations 2.1.1 and 2.1.2.

There was evidence that MRI could be useful in distinguishing high-grade from low-grade glioma, and the committee believed that it was appropriate to extrapolate from this evidence to meningioma. Based on their experience, the committee recommended CT scans to assess bone involvement.

How the recommendations might affect practice

Currently, various imaging strategies are used between centres and depending on circumstances. These recommendations aim to reduce variation in practice, which may cause some centres to change their imaging protocols.

Patients are often imaged at different sites and on different MR equipment during their diagnosis and treatment. The recommendations will improve the consistency of imaging practices between centres. This will mean more accurate comparison of imaging appearances across time is possible, leading to more accurate disease assessment and treatment response. This will also help to select the most appropriate further management, and allow more accurate assessment of MR appearances between patient groups for future clinical research.

Full details of the evidence and the committee's discussion are in Evidence Report B.

Management of confirmed meningioma following surgery or if surgery is not possible

Why the committee made the recommendations

The discussion below explains how the committee made recommendations 2.2.1–2.2.4.

Based on very low quality evidence and their clinical experience, the committee concluded that management of this group of meningiomas depended on the type of meningioma, and that evidence from one type of meningioma could not normally be used to indirectly infer the optimal management for another type. Therefore the committee chose to make recommendations on each type of meningioma separately, using evidence where this was available and their judgement where not.

Based on very low quality evidence, the committee made recommendations on how to deliver radiotherapy where this was appropriate.

How the recommendations might affect practice

The recommendations made on management are already standard practice in many parts of the UK, so the guidance will make treatment more consistent.

The recommendation to offer an appointment with an oncologist to all people who may have radiotherapy is not standard across the UK. However, for most people this is likely to just mean a change in the timing of the first appointment with the oncologist rather than many more people needing oncologist appointments.

Full details of the evidence and the committee's discussion are in Evidence Report B.

Follow-up for meningioma

Why the committee made the recommendations

The discussion below explains how the committee made recommendations 2.3.1–2.3.5.

The committee made all recommendations on the basis of their clinical experience. They described how the schedule for reviews should take in all relevant characteristics about a person, including the grade of meningioma that the person has. As this is quite a complex determination, the committee suggested a schedule of clinical reviews for a 'typical' individual which could be considered by clinicians.

How the recommendations might affect practice

The committee has made recommendations in line with current best practice, with the intention of standardising practice nationally. This means the recommendations are unlikely to cause a significant increase in resource use, but some recommendations may have some additional cost or requirement for service configuration if current practice is different in that area.

The committee note that their recommendation on scanning schedules are necessarily weak, as they are based on no evidence. In their clinical judgement, similar schedules are likely to be most beneficial for most people, and therefore clinical practice may change to reflect these schedules.

Full details of the evidence and the committee's discussion are in Evidence Report B.

Investigation of suspected brain metastases

Why the committee made the recommendations

The discussion below explains how the committee made recommendations 3.1.1–3.1.3.

On the basis of their experience, the committee recommended standard structural MRI as they believed it was important for establishing the exact number of metastases in the brain, which could guide further treatment. On the basis of their experience they also recommended offering extracranial imaging, and performing all imaging before referral to a multidisciplinary team meeting. These recommendations should help people access treatment quicker by preventing delays due to incomplete information.

How the recommendations might affect practice

The recommendations will reinforce current best practice. Performing all imaging before the multidisciplinary team meeting referral will reduce delays to local intracranial treatment if it is appropriate and give clarity for people with brain tumours, and their family and carers.

Full details of the evidence and the committee's discussion are in Evidence Report C.

Management of confirmed brain metastases

Why the committee made the recommendations

The discussion below explains how the committee made recommendations 3.2.1–3.2.10.

The committee made recommendations on the basis of very low to moderate quality evidence and their judgement. They described how features of the metastases, including the number, should be evaluated before starting treatment, and then treatment selected on the basis of these features. On the basis of very low to moderate quality evidence, the committee recommended either stereotactic radiosurgery or surgery for a single brain metastasis, but did not have evidence to recommend one technique over the other. For people with multiple brain metastases, the committee described how treatment options were more variable, but that resection, stereotactic radiosurgery and whole-brain radiotherapy could all be considered in certain circumstances.

The committee recommended not to use memantine and concurrent systemic therapy to enhance the efficacy of whole brain radiotherapy on the basis of evidence of no effect and a potential risk of harm.

How the recommendations might affect practice

Current practice varies greatly between centres. Some of the variation is in response to clinically relevant factors such as expertise in a particular technique or patient population. The recommendations should help standardise care and prevent some harmful and wasteful practices from continuing elsewhere.

Full details of the evidence and the committee's discussion are in Evidence Report C.

Follow-up for brain metastases

Why the committee made the recommendations

The discussion below explains how the committee made recommendations 3.3.1–3.3.6.

The committee made all recommendations on the basis of their clinical experience. They described how the schedule for reviews should take in all relevant characteristics about a person, including the number of metastases that that person has. As this is quite a complex determination, the committee suggested a schedule of clinical reviews for a 'typical' individual which could be considered by clinicians.

How the recommendations might affect practice

The committee has made recommendations in line with current best practice, with the intention of standardising practice nationally. This means the recommendations are unlikely to cause a significant increase in resource use, but some recommendations may have some additional cost or requirement for service configuration if current practice is different in that area.

The committee note that their recommendation on scanning schedules are necessarily weak, as they are based on no evidence. In their clinical judgement, similar schedules are likely to be beneficial for most people, and therefore clinical practice may change to reflect these schedules.

Full details of the evidence and the committee's discussion are in Evidence Report C.

Care needs of people brain tumours

Why the committee made the recommendations

The discussion below explains how the committee made recommendations 4.1.1–4.1.10.

The committee determined that people with brain tumours had very specific needs which were not being met. In particular they highlighted ways in which the care needs of people with brain tumours were different from the care needs of people with other types of cancers, such as the impact on the person's sense of self-identity or legal requirements related to driving. The committee believed that in doing this they would improve the support offered to people with brain tumours.

How the recommendations might affect practice

The recommendations should improve care, and pre-empt the potential future needs of the person living with a brain tumour, and their relatives and carers. Forward planning is especially important if there is an expectation that a brain tumour will progress. It is likely that there will be a short-term resource impact of these recommendations in some geographical areas, as currently care for people with brain tumours is variable, with some areas offering very little support. The committee hoped that the recommendations will encourage an assessment of the wider health and social care needs alongside medical management with implications for investment in the individual's long-term future care and quality of life.

Full details of the evidence and the committee's discussion are in Evidence Report D.

Neurorehabilitation assessment needs of people with brain tumours

Why the committee made the recommendations

The discussion below explains how the committee made recommendations 4.2.1–4.2.2.

Based on their experience, the committee considered that neurological rehabilitation might be appropriate for many people with brain tumours. Given that neurological rehabilitation is time consuming and sometimes not appropriate, the committee agreed on the basis of their experience that referral for regular assessment was needed to identify which, if any, forms of rehabilitation would be appropriate. The committee therefore drafted recommendations to ensure that – if appropriate –

referral for neurological rehabilitation assessment would be considered at every stage of the treatment and follow-up pathway.

How the recommendations might affect practice

There are high quality neurological rehabilitation services across the entire UK. However, access of people with brain tumours to these services is variable, with variations in access to assessment being an especially important area of clinical variation. The recommendations may therefore mean a change in practice in some areas, as some people with brain tumours who would not have been referred for assessment for neurological rehabilitation before will now be referred for assessment. This will not require the provision of new services, however, as the referrals will be made into the existing neurological rehabilitation pathway.

People with a brain tumour make up a small percentage of people referred for neurological rehabilitation, so only a small increase in demand on resources may be expected. However, there should not be any increase in training needs for professionals involved as they would already have the knowledge and skills to provide the recommended services.

Despite being a small group relative to the numbers referred for neurological rehabilitation in general, people with brain tumours are unequally served by the current system and so these recommendations should increase equality.

Full details of the evidence and the committee's discussion are in Evidence Report D.

Surveillance for the late-onset side effects of treatment

Why the committee made the recommendations

The discussion below explains how the committee made recommendations 4.3.1–4.3.9.

Based on their experience, the committee was aware that some people experience late effects after treatment for a brain tumour. With the possible exception of stroke risk it is unknown if these effects can be prevented, but the committee determined that the negative impact of these late effects could be managed through clinical

vigilance and referral into appropriate specialist monitoring pathways. They therefore drafted recommendations to ensure that those at high risk of adverse outcome due to late effects could be monitored and managed appropriately.

How the recommendations might affect practice

The recommendations should not significantly alter practice, as they are common clinical practice. However the committee noted that they might help empower people with tumours to ask about specific monitoring if they have not received it.

Full details of the evidence and the committee's discussion are in Evidence Report D.

Putting this guideline into practice

[This section will be finalised after consultation]

NICE has produced tools and resources to help you put this guideline into practice.

[Optional paragraph if issues raised] Some issues were highlighted that might need specific thought when implementing the recommendations. These were raised during the development of this guideline. They are:

- [add any issues specific to guideline here]
- [Use 'Bullet left 1 last' style for the final item in this list.]

Putting recommendations into practice can take time. How long may vary from guideline to guideline, and depends on how much change in practice or services is needed. Implementing change is most effective when aligned with local priorities.

Changes recommended for clinical practice that can be done quickly – like changes in prescribing practice – should be shared quickly. This is because healthcare professionals should use guidelines to guide their work – as is required by professional regulating bodies such as the General Medical and Nursing and Midwifery Councils.

Changes should be implemented as soon as possible, unless there is a good reason for not doing so (for example, if it would be better value for money if a package of recommendations were all implemented at once).

Different organisations may need different approaches to implementation, depending on their size and function. Sometimes individual practitioners may be able to respond to recommendations to improve their practice more quickly than large organisations.

Here are some pointers to help organisations put NICE guidelines into practice:

1. **Raise awareness** through routine communication channels, such as email or newsletters, regular meetings, internal staff briefings and other communications with all relevant partner organisations. Identify things staff can include in their own practice straight away.

2. **Identify a lead** with an interest in the topic to champion the guideline and motivate others to support its use and make service changes, and to find out any significant issues locally.

3. **Carry out a baseline assessment** against the recommendations to find out whether there are gaps in current service provision.

4. **Think about what data you need to measure improvement** and plan how you will collect it. You may want to work with other health and social care organisations and specialist groups to compare current practice with the recommendations. This may also help identify local issues that will slow or prevent implementation.

5. **Develop an action plan**, with the steps needed to put the guideline into practice, and make sure it is ready as soon as possible. Big, complex changes may take longer to implement, but some may be quick and easy to do. An action plan will help in both cases.

6. **For very big changes** include milestones and a business case, which will set out additional costs, savings and possible areas for disinvestment. A small project group could develop the action plan. The group might include the guideline champion, a senior organisational sponsor, staff involved in the associated services, finance and information professionals.

7. **Implement the action plan** with oversight from the lead and the project group. Big projects may also need project management support.

8. **Review and monitor** how well the guideline is being implemented through the project group. Share progress with those involved in making improvements, as well as relevant boards and local partners.

NICE provides a comprehensive programme of support and resources to maximise uptake and use of evidence and guidance. See our into practice pages for more information.

Also see Leng G, Moore V, Abraham S, editors (2014) Achieving high quality care – practical experience from NICE. Chichester: Wiley.

Context

It is estimated there are around 10,000 new cases of primary brain tumours per year. These tumours come from the brain tissue or its coverings – the meninges. Malignant high-grade gliomas (anaplastic gliomas and glioblastomas) and pre-malignant low-grade gliomas come from the brain tissue glial cells, and make up over 60% of primary brain tumours. Meningiomas make up a further 30%. Although often thought benign, meningiomas can have an acute presentation and are associated with significant long-term neurological morbidity. Because of this, they can behave in a malignant fashion in terms of recurrence and impact.

Over 60% of people with primary brain tumours present at, and are diagnosed by, accident and emergency services rather than from conventional GP or specialist referral. This causes a significant demand on these services. Although primary malignant brain tumours represent only 3% of all cancers, they result in the most life-years lost of any cancer. There is concern that the true incidence of these tumours is rising.

Cancers that have spread to the brain from somewhere else in the body are called secondary brain tumours, or brain metastases. Many different cancer types can spread to the brain, with lung and breast cancers being the most common. More people with systemic cancers are surviving longer and are referred to neuroscience

multidisciplinary teams for management of their brain metastases. The number of people needing assessment for cranial treatment is now over 10,000 per year in the UK and rising.

The specialist nature of neuro-imaging and the need for complex diagnostic and reductive surgery emphasises the importance of well-organised service delivery by dedicated units. The singular effects of brain tumours on mental performance (both psychological state and cognitive decline) are a particular challenge to carers and professionals alike, especially in delivering support to people at home. The peak age of presentation of brain cancer is between 65 and 69, and there are concerns that delivery of all services to these older people is suboptimal. There are also concerns that the transition from paediatric to adult units could create a care gap. This would most specifically affects patients who are between 18 and 30 years old.

Survival with malignant brain tumours has remained poor despite some improvements in surgery, radiotherapy and chemotherapy, and a greater understanding of molecular classification. The management of a low grade glioma that is likely to transform to high grade remains controversial, and presents issues for ongoing care. Follow-up for people with meningiomas after primary treatment is often long term, and there is variation in both follow-up and treatments for recurrence.

Conventional whole-brain irradiation as optimal therapy for brain metastases is being challenged by concerns about its effectiveness and toxicity, as well as the availability and immediacy of surgery and stereotactic radiotherapy.

More information

[The following sentence is for post-consultation versions only – editor to update hyperlink with guideline number]You can also see this guideline in the NICE pathway on [pathway title].

To find out what NICE has said on topics related to this guideline, see our web page on [developer to add and link topic page title or titles; editors can advise if needed].

[The following sentence is for post-consultation versions only – editor to update hyperlink with guideline number]

For full details of the evidence and the committee's discussions, see the evidence reviews. [link to evidence tab]You can also find information about how the guideline was developed, [link to documents tab] including details of the committee.

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