Neuropathology service specification

Adult neurooncological pathology (diagnosis of tumours of the central nervous system with histological and molecular methods).

The British Neuropathology Society
Professional Affairs Committee

Aims

This document aims to develop a national framework on how neuro-oncology pathology (surgical neuropathology) services should be organised to ensure that all patients and service users have fair access to specialised services. This framework provides a framework for principles of guidance, and thus has a more nationwide focus rather than being a blueprint for individual departments or organisations.

The following stakeholders groups were contacted to consult on this document:

- Society of British Neurosurgeons (www.sbns.org.uk)
- British Neuro-Oncology Society (www.bnos.org.uk)

A. Service Specifications

1. Population Needs: adult CNS tumours

1.1 National/local context and evidence base:

A neuropathology service will provide diagnostic information and advice relevant to the clinical care of patients with neurological diseases, including tumours of the central nervous system.

This is based on the interpretation of biopsies or resections of tumours of the nervous system, or its coverings; cytological examination of cerebrospinal fluid; or in rare instances, post-mortem examination.

The information and advice will be provided to specialists who manage patients with CNS tumours.

Diseases of the nervous system or muscle, in the context of the following prescribed specialised services are numbered as in the manual for prescribed specialised services)

https://www.england.nhs.uk/publication/manual-for-prescribed-specialised-services

76. Neurofibromatosis type 2 service (adults and children)
105. Specialist cancer services (adults), including brain/central nervous system cancers
106. Specialist cancer services for children and young people, including brain/central nervous system cancers
119. Specialist neuroscience services for children and young people

The delivery of these services depends in part on accurate diagnosis, prognosis and assessment of genetic risk, all of which are, in many instances, dependent on neuropathology.

2. Outcomes

2.1 NHS Outcomes Framework Domains & Indicators

Domain 1	**Preventing people from dying prematurely**	
Domain 2	**Enhancing quality of life for people with long-term conditions**	
Domain 3	**Helping people to recover from episodes of ill-health or following injury**	
Domain 4	**Ensuring people have a positive experience of care**	
Domain 5	**Treating and caring for people in safe environment and protecting them from avoidable harm**	

Neuropathology services can contribute to domains 1-4 (shaded red).

Neuropathological assessment is the definite diagnostic method for a wide range of neurological diseases. In this context, the assessment is relevant for the diagnosis of tumours of the brain, spinal cord and their coverings, but also includes many other disease processes.

Neuropathology provides information on prognosis and guides patient management (e.g. in relation to brain tumours), often by the combination of histological features, molecular features, and taking into account imaging and clinical presentation. This information enables clinicians to give the correct treatment (e.g. chemotherapy that is likely to be effective, immunosuppressive drugs if indicated, appropriate antibiotics for microbial diseases) and other clinical management and advice (including genetic counselling and behavioural modification), preventing premature death, enhancing the quality of life for people with long-term conditions, aiding recovery from episodes of ill-health and helping to ensure that people have a positive experience of care.

Outcome measures

Neuropathology will comply with the assessment procedures and reporting standards as set out in section 3.1 :

3. Scope

Neuropathologists have undergone formal training and qualification for independent practice in Diagnostic Neuropathology. Clinically active neuropathologists maintain CPD records, participate Neuropathology EQA, and maintain professional development.

Neuropathologists reporting surgical neuropathology biopsies will report macroscopic and microscopic assessment of biopsies from:

- the coverings of the brain or spinal cord
- the pituitary gland and other structures in the sella turcica
- the brain, spinal cord
- the skull, base of skull and spine
- nerve roots or peripheral nerve

Neuropathologists will also advise on:

- the utility of biopsies for diagnosis of CNS neoplasms
- the appropriate use of adjunctive techniques to assess biopsies, when appropriate (for example targeted sequencing, copy number assays, next generation sequencing).

3.1 Aims and objectives of neurosurgical pathology service

The aims of neuropathology, as specified by the General Medical Council in the curriculum for training in Diagnostic Neuropathology, are to provide the NHS with competent advice on:

[1] diagnosis, [2] cause, [3] natural history of the disease, [4] features that may signal a response to treatment, [5] clinical-pathological correlation, [6] clinical-anatomical correlation, based on the assessment of tissue removed from the central nervous system and its coverings, including meninges, bone and adjacent soft tissues, which meets the needs of patients and healthcare professionals engaged in the delivery of clinical neuroscience services.

Neuropathologists also have a responsibility:

a) to apply their knowledge of neuro-oncology and their skills in handling and interpreting tumour histology, to engage with others in applied and clinical neuroscience research, particularly within the context of the NIHR.
b) to be up to date with development and updates of guidelines and recommendations, such as
    i) National Institute for Clinical Excellence (NICE)
    ii) WHO classification of CNS tumours (current version 2021)
    iii) Other guidance and recommendations such as the cIMPACT-NOW (“the Consortium to Inform Molecular and Practical Approaches to CNS Tumor Taxonomy”)
    iv) Datasets published by the Royal College of Pathologists
    v) Datasets published by the International Collaboration for Cancer Reporting (ICCR)
    vi) To compy with comply with UKAS standards for medical laboratories.
    vii) In Scotland: Scottish Brain and Central Nervous System Cancer Clinical Quality Performance Indicators

c) to impart knowledge of, and skills in, diagnostic neuropathology to medical students, doctors and nurses, as well as by biomedical scientists and researchers.

d) to deliver training in diagnostic neuropathology, after appropriate training as educational supervisors and examiners.

e) To contribute to local, regional, and national events to promote teaching, training, and education, such as those of the Royal College of Pathologists.

3.2 Service description/care pathway

The numericals relate related to the Manual for Prescribed Specialised Services, published on NHS England websites.

https://www.england.nhs.uk/wp-content/uploads/2017/10/list-prescribed-specialised-services-2018.pdf

The full manual with narrative content can be found here:

https://www.england.nhs.uk/publication/manual-for-prescribed-specialised-services/

The section of the NHS England manual relevant to brain tumours is highlighted below

Specialist cancer services (adults), including brain/central nervous system cancers [105]

As specified in NICE guidance on Improving Outcomes for People with Brain and Other CNS Tumours https://pathways.nice.org.uk/pathways/brain-tumours-and-metastases

Neuropathologists are core members of multidisciplinary teams responsible for the management of patients with tumours of the brain, spinal cord, skull base, spine and pituitary. Neuropathologists will contribute to preoperative discussion regarding the optimum approach to surgery and the processing of tissue specimens if required.

Neuropathologists will offer an intraoperative diagnostic service, either on-site, or by means of remote digital imaging, particularly to confirm the adequacy of biopsy specimens.

They will provide an initial histological report, usually including results from initial immunohistochemical workup with lineage markers or mutation-specific antibodies, with a provisional grade. In some instances, such reports can provide a definitive diagnosis, if a diagnostic mutation can be detected with specific antibodies.

A final 'integrated' report will contain additional information from further samples received and of molecular testing to formulate an integrated diagnosis and to provideincluding information from predictive testing such as MGMT promoter methylation. These reports, together with a discussion of the results in follow-up MDT, inform decisions on subsequent patient management (including further neurosurgery, chemotherapy and radiotherapy).

Neuropathological assessment, including the use of adjunctive tests as appropriate, will also allow patients to participate in clinical trials (for which this assessment is mandatory).

Scotland

Further guidance on standards for neuropathology services in Scotland are given by Healthcare Improvement Scotland's Clinical Quality Performance Indicators http://www.healthcareimprovementscotland.org/his/idoc.ashx?docid=ca26c68d-3c85-4672-a500-05445db760a0&version=-1.

3.3 Population covered

3.3.1 Neuropathology diagnostics will usually be provided in tertiary referral centres, where neurosurgical and neurology services are also provided. Neuropathology will provide continual cover for the neuro-oncology service in these centres. Workload will be monitored according to Royal College of Pathologists guidelines (https://www.rcpath.org/uploads/assets/20594429-6bb9-4b82-945f811ec81fb9bd/G140a-BPR-Staffing-and-workload-for-neuropathology-departments.pdf) and neuropathology units will be staffed in accordance with these guidelines.

3.3.2 Arrangements may need to be made for the referral of biopsies and transport of specimens to additional centres specialising in particular aspects of molecular diagnostics to ensure accuracy of diagnosis. These arrangements will comply with UKAS and are usually laid out in service level agreements.

3.4 Any acceptance and exclusion criteria and thresholds

Pathways must be established between neuropathology and specialist histopathology services, such as soft tissue/bone, and haematopathology, to ensure rapid, standardised referrals with short turnaround times. In particular tumours of the skull base and the spine and some malignancies of peripheral nerve and muscle, some metastatic tumours to the nervous system and most lymphomas are managed on the basis of diagnostic assessment and advice from specialist bone or haematopathologists.

3.5 Interdependencies with other services/providers

Neuropathology services are almost always part of wider care pathways for patients with CNS tumours. A proportion of biopsies, initially referred for cancer diagnosis may yield a non-neoplastic diagnosis and will need to be fed into an appropriate pathway, usually involving specialist neurology subdisciplines.

Examples of interdependence with services other than those in the clinical neurosciences may include: Adult specialist endocrinology services in the context biopsies of pituitary lesions; Adult specialist ophthalmology services; Primary malignant bone tumour service; Specialist haematology services.

Interdependence with local and regional genomic laboratory hubs: genomic testing of brain tumours is delivered through a national testing network. 7 GLH have been formed in England to address inequality to the access to specialised cancer tests in the NHS. https://www.england.nhs.uk/genomics/genomic-laboratory-hubs/

Neuropathology departments and units will have access to a genomics laboratory hub (GLH) and their services. Each of the 7 GLH provides access to all molecular tests listed in the NHS England test directory. This comprehensive test directory offers molecular tests for a wide range of brain tumours. It is updated biannually, and takes into consideration the development of novel technologies, discoveries of biomarkers and clinical needs.

4. Quality indicators and standards

4.1 The Care Quality Commission (CQC), an independent regulator of health and social care in England, performs inspections to cover a wide range of aspects of healthcare providers, to ensure services are providing care that is safe, caring, effective, responsive to people's needs and well-led.

4.2. The Tessa Jowell brain Cancer Mission, established as a legacy of Dame Tessa Jowell who passed away from a brain tumour, has founded a national network of Tessa Jowell centres of excellence. A rigorous assessment process is in place to assess hospitals and those meeting the standards are awarded a Tessa Jowell Centre of excellence status. https://www.thebraintumourcharity.org/media-centre/news/research-news/announcing-tessa-jowell-centres-excellence/

4.3 Commissioning for quality and innovation (CQUIN) publishes guidance of quality in safety indicators, based on the guidance issued by the clinical commissioning groups (CCGs).

https://www.england.nhs.uk/nhs-standard-contract/cquin/cquin-20-21/

https://www.england.nhs.uk/ccgs/

5. Location of provider premises

5.1 Current practice usually has Neuropathology units co-localised with the neuroscience centres for whom they provide services while a few centres additionally support remote neuro science units by a hub-and-spoke network (see below and section 3).

5.2. Where geographically possible and organisationally adequate, centres can form networks in a hub and spoke model. Digital pathology for intraoperative assessment can mitigate the absence of a physically present neuropathologist. Bundling on service in larger centres can realise significant efficiency savings, provision of highly specialised services with a broader spectrum of highly specialised tests. Such consolidations are a desirable strategy to avoid single-handed services in smaller centres, which should be avoided.

5.3. Arrangements will be in place for the referral of biopsies and transport of specimens to additional centres specialising in particular aspects of neuropathology (e.g. paediatric neuropathology, muscle pathology), as appropriate for further tests and assessment, to ensure accuracy of diagnosis. These arrangements will comply with UKAS

Appendix

Quality standards specific to the service using the following template:

Introduction:

Key performance indicators were first published by the Royal College of pathologists in 2011, and revised in 2013. Since then, the landscape for provision of laboratory diagnostic services has fundamentally changed, for example through consolidation, generation of hub and spoke arrangements, and joint ventures with private enterprises. These changes raise questions about the value in defining and mandating key performance indicators. Increased governance emphasis on assuring the quality of services rather than simple performance metrics has led to the development of key assurance indicators (KAI), in keeping with recommendations by the pathology quality assurance review (2014).

Key performance indicators indicate if a process has been executed, whilst key assurance indicators indicate that executed processes are also of appropriate quality. Thus, "appropriate quality" should ideally be assessed from the patient's clinical end-users perspective. Only if a KAI is met, service providers and recipients can have confidence in safety and quality, even if the time of volume defined KPI is not met.

These will conform to UKAS (previously CPA UK) Standards for the Medical Laboratory and to Standards for Neuropathological Services, published by the British Neuropathological Society.

The published key assurance indicators (publication 25/11/2019) https://www.https://www.rcpath.org/discover-pathology/news/kai-pathology-services-published.html follow 7 key areas , laid out in this document.

- KAIs for senior staff
- KAIs for training, education and innovation
- KAIs for repertoire of tests and reporting of errors
- KAIs for engagement with patients and users
- KAI for interpretative clinical advice and engagement with Multi-Disciplinary Teams (MDTs)
- KAIs for timeliness of reports and clinical advice
- KAI for external quality assurance.

The following table maps the domains of the 2014 service specifications https://www.england.nhs.uk/wp-content/uploads/2017/06/neuropathology-service-specification.pdf with the RCPath 2019 key assurance indicators

Due to the overlap of the quality requirements, domains 1-4 are now merged under a single heading.

Quality Requirement	Suggested evidence	Compliance assessment	Key assurance indicator	Consequence of breach
Domain 1: Preventing people dying prematurely **Domain 2: Enhancing the quality of life of people with long-term conditions** **Domain 3: Helping people to recover from episodes of ill-health or following injury** **Domain 4: Ensuring that people have a positive experience of care**				
Availability of clinical advice at multidisciplinary meetings	• List of MDT meetings supported by the laboratory. • Explanation of any absence of laboratory support resulting delays in sample preparation at an MDT meeting, where clinical decision-making would be expected to benefit from pathology input • Summaries of MDT meeting attendance records (number and percentage of meetings where any pathologist or life science professional was present, and records of attendance of individual pathologists or life science professional).	Annual audit	KAI 15	Risk of delayed or suboptimal patient management
Timeliness of diagnostic reports	• Statement of agreement between the laboratory and users of the laboratory services regarding turnaround times for specific patient pathways. The laboratory also needs to provide evidence that the needs of different users are balanced. • Audit of performance against agreed turnaround times (audit to be performed at least annually). • Published results of audits of turnaround times.	Quarterly audit	KAI18	Risk of delayed or suboptimal patient management
Documentation of second opinions and results of external	• A laboratory policy incorporating a defined list of critical results, the context for each and timelines for reporting, including	Annual audit of compliance	KAI 16	Risk of delayed or suboptimal patient management

Quality Requirement	Suggested evidence	Compliance assessment	Key assurance indicator	Consequence of breach
specialist investigations	processes for assuring and recording receipt by the appropriate clinician(s). • Records of laboratory audit of performance against this policy. Audit should be undertaken on at least an annual basis.			
Critical results communication	• A laboratory policy incorporating a defined list of critical results, the context for each and timelines for reporting, including processes for assuring (and recording?) receipt by the appropriate clinician(s). • Records of laboratory audit of performance against this policy. Audit should be undertaken on at least an annual basis.	Annual audit of compliance UKAS accreditation	KAI 16	Risk of delayed or suboptimal patient management
Continuity of cover	• Published rotas identifying named individuals with appropriate skills to deliver the service, with mechanisms to allow them to be contacted. • Records of management oversight and protocols of the appropriate staffing of clinical cover. • Medical and scientific staff job plans indicating availability for the provision of clinical advice. • Proof that rotas and contact arrangements are made available to service users at the point of need, with robust procedures to ensure currency and continuity of this information. • A document (agreeing services with users) that indicates cover is not required outside the working day, when appropriate	Annual audit of compliance	KAI 2	Risk of delayed or suboptimal patient management
Continuing professional development (CPD)	• Registration for CPD with appropriate organisation (e.g. RCPath, Institute of Biomedical Science [IBMS]). • Record of satisfactory performance – for the RCPath CPD scheme, this normally takes the form of a rolling five-year summary of credits accrued.	Audit of CPD records	KAI 5	Risk of suboptimal patient management

Quality Requirement	Suggested evidence	Compliance assessment	Key assurance indicator	Consequence of breach
	• Other evidence of appropriate CPD relevant to the whole scope of each individual's practice. Review of CPD at appraisal			
Internal quality assurance (IQA)	• Presence of a quality management system (as mandated by UKAS) • Implementation and management of QMS by senior biomedical staff and oversight by quality manager • Evidence that audit is being used to inform CQI rather than as stand-alone activity, mapping services against pre-existing standards • Records of systematic approaches to identifying, validating and adopting new technologies	Annual management review UKAS accreditation	KAI 8	Risk of suboptimal patient management
External quality assurance (EQA)	• Available, up-to-date EQA registration and performance records for all accredited technical schemes in which the laboratory participates	Evidence from EQA schemes (NEQAS)	KAI 19	Risk of suboptimal patient management
Communication between neuropathology and service users	• Performance of user satisfaction survey and recording of results. • Records of discussions at regular clinical liaison meetings demonstrating that views expressed by clinical users are sought to inform plans for service delivery • Records of discussions within the laboratory demonstrating that views expressed by clinical users do inform plans for service delivery. • Documentation of informal feedback collected between surveys	UKAS Annual audit	KAI 14	Risk of suboptimal patient management
Engagement with education	• Trainee feedback, both formal (e.g. multi-source) and informal •Records (to be reviewed at appraisal) showing that both educational supervisors and clinical supervisors have undertaken specific CPD for their supervisory roles	GMC, HCPC RCPath CPD	KAI 7	Risk of inferior patient management and clinical capacity building

Quality Requirement	Suggested evidence	Compliance assessment	Key assurance indicator	Consequence of breach
	• Evidence of ongoing review of the content, delivery and outcomes of training programmes by the relevant regulatory and professional bodies, including universities and teaching hospitals. • Demonstration of inter-professional learning opportunities, e.g. joint educational meetings and research involving medical and scientific laboratory staff and staff from other relevant clinical services.			
Engagement with research	• Participation in clinical trials • Provision of biobank samples to national resources such as brain UK • Provision of biobank samples for collaborative research efforts • Support or active procurement of infrastructure for archiving biobank samples	HTA UKAS		Risk of suboptimal patient care and options of treatment Risk of lack of patient engagement in contributing to research

NHS England stipulates target report turnaround times of 14 days (clinical urgency: “urgent”, category “rapid”) for mutation specific molecular pathology tests which include single targets and MGMT promoter methylation and turnaround times of 21 days (clinical urgency “non-urgent”, category “standard”) for next generation sequencing panels for molecular pathology referrals. Relevant NHSE targets are below.

Clinical urgency	Example tests	Calendar days
Urgent - rapid (Rare Disease and Cancer)	• **Mutation specific molecular pathology tests** [1] • **PCR-based tests for predictive testing** [2] •	**14 days**
Urgent - complex rapid (Rare Disease and Cancer)	• Urgent panels, gene screens and exomes for relevant indications (treatment / antenatal)	**21 days**
Non-urgent - standard (Somatic Cancer)	• **NGS panels for molecular pathology referrals** [3]	**21 days**

Legend: QF-PCR, quantitative fluorescent PCR, a test typically used in prenatal diagnostics; FISH, fluorescent in situ hybridisation, NGS, next generation sequencing; WGS, Whole-exome sequencing; GLH’s, genome laboratory hub; NIPD, MDS, Myelodysplastic syndromes

Footnotes:

1) Typical example in the context of neuropathology include IDH1, IDH2, TERT, histone, or BRAF gene sequencing; or fusion mutations such as KIAA: BRAF.
2) Typical examples in the context of neuropathology include, MGMT promoter methylation.
3) These panels apply across all cancers and include neuro-oncology. Although not specifically mentioned here, this also applies to methylation arrays.

In addition, the Scottish Cancer Taskforce National Cancer Quality Steering Group’s Brain and Central Nervous System Cancer Clinical Quality Performance Indicators apply in Scotland.

These have indicated 21 day target for MGMT promoter methylation and 1p/19q codeletion tests. There is a national effort to reduce turnaround times for cancer testing to an aspirational 14 day target.

QPI 3 - Molecular Analysis

QPI Title:	Patients with biopsied or resected gliomas should have molecular analysis performed on the tumour tissue.
Description:	Proportion of patients with biopsied or resected gliomas who undergo relevant molecular analysisb of tumour tissue within 21 days of surgery. **Please note:** This QPI measures 2 distinct elements: (i): Patients with Grade II or III gliomas who have the tumour tested for combined loss of 1p/19q; and (ii): Patients with glioblastomasc who have the tumour tested for MGMT promoter methylation status.
Rationale and Evidence:	Combined loss of 1p/19q in gliomas is associated with a more favourable response to therapy (chemotherapy or radiotherapy) and is associated with considerably better prognosis when compared to tumours with intact 1p/19q. As such, where indicated, 1p/19q analysis should be carried out to help determine treatment and provide information on predicted tumour response to therapy and prognosis2,4 5. Determination of MGMT promoter methylation status predicts response to therapy (chemotherapy or concomitant chemoradiotherapy) in glioblastomas and assists in determination of prognosis. As such, where indicated, MGMT promotor methylation analysis should be carried out to help determine treatment and provide information on predicted tumour response to therapy and prognosis6.
Specification (i):	**Numerator:** Number of patients with a Grade II or III glioma undergoing surgery where tissue sample is tested for 1p/19q within 21 days of surgery. **Denominator:** All patients with a Grade II or III glioma undergoing surgery. **Exclusions** No exclusions.
Target:	90% The tolerance within this target is designed to account for cases in which there is insufficient viable tissue for molecular analysis.
Specification (ii):	**Numerator:** Number of patients with glioblastomas undergoing surgery where tissue sample is assessed for MGMT promoter hypermethylation status within 21 days of surgery.

	Denominator: All patients with glioblastomas undergoing surgery. **Exclusions:** • No exclusions.
Target:	90% The tolerance within this target is designed to account for cases in which there is insufficient viable tissue for molecular analysis.

QPI4 – Neuropathological diagnosis.

QPI Title:	All pathology reports for brain/CNS cancer should contain full pathology information (including tumour type as described in World Health Organisation (WHO) Classification of CNS tumours (2016) and WHO grade where appropriate) to inform patient management.
Description:	Proportion of patients with brain/CNS cancer where the pathology report contains a full set of data items (as defined by the Royal College of Pathologists).
Rationale and Evidence:	Accurate and robust standardisation of tumour diagnosis is required for appropriate patient management. As such, Neuropathologists should report to the standards defined by the Royal College of Pathologists in 'Standards and Datasets for Reporting Cancers: Dataset for Tumours of the Central Nervous System, including Pituitary Gland2.
Specification:	**Numerator:** Number of patients with a histological diagnosis of brain/CNS cancer where histological pathology report contains all data items (as defined by relevant Royal College of Pathologists). **Denominator:** All patients with a histological diagnosis of brain/CNS cancer. **Exclusions:** • No exclusions.
Target:	95% The tolerance within this target is designed to account for tumour specimens where insufficient tissue is available for a definitive neuropathological diagnosis.