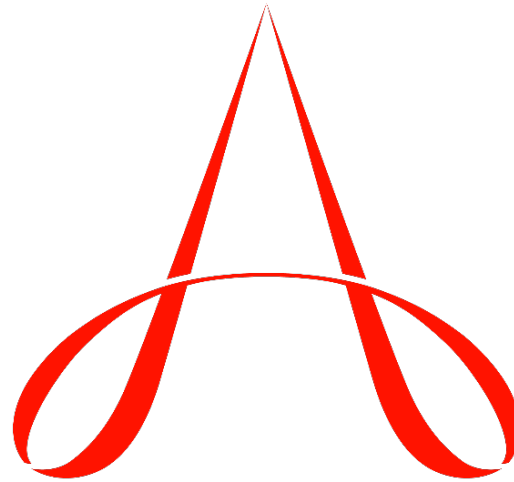




# Supplemental Guide: Neuropathology



A C G M E

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## **Milestones Supplemental Guide**

This document provides additional guidance and examples for the Neuropathology Milestones. This is not designed to indicate any specific requirements for each level, but to provide insight into the thinking of the Milestone Work Group.

Included in this document is the intent of each Milestone and examples of what a Clinical Competency Committee (CCC) might expect to be observed/assessed at each level. Also included are suggested assessment models and tools for each subcompetency, references, and other useful information.

Review this guide with the CCC and faculty members. As the program develops a shared mental model of the Milestones, consider creating an individualized guide (Supplemental Guide Template available) with institution/program-specific examples, assessment tools used by the program, and curricular components.

Additional tools and references, including the Milestones Guidebook, Clinical Competency Committee Guidebook, and Milestones Guidebook for Residents and Fellows, are available on the [Resources](#) page of the Milestones section of the ACGME website.

**Patient Care 1: Autopsy**

**Overall Intent:** To demonstrate competence in removal, sampling, and gross/histologic interpretation of autopsy neuropathology specimens

Milestones	Examples
<p><b>Level 1</b> <i>Performs simple extractions, including removal of the brain and spinal cord, with supervision</i></p> <p><i>Participates in brain cutting conference and identifies basic gross neuroanatomy</i></p> <p><i>Recognizes microscopic anatomy, as well as normal and abnormal histologic findings</i></p>	<ul style="list-style-type: none"> <li>● Performs extraction of brain and spinal cord from patient who died of hypertrophic cardiomyopathy with no anticipated central nervous system findings, with supervision</li> <li>● Identifies basal ganglia, thalamus, and hippocampus at brain cutting conference</li> <li>● Recognizes basal ganglia, hippocampus, and visual cortex on a slide</li> </ul>
<p><b>Level 2</b> <i>Independently performs simple extractions, including removal of the brain and spinal cord</i></p> <p><i>Participates in the brain cutting conference and selects tissue samples in simple cases based on gross findings and relevant clinical and imaging data</i></p> <p><i>Interprets common histologic findings and chooses relevant ancillary testing, with supervision</i></p>	<ul style="list-style-type: none"> <li>● Independently performs extraction of brain and spinal cord from patient who died of hypertrophic cardiomyopathy with no anticipated central nervous system findings</li> <li>● In a patient with right middle cerebral artery occlusion, identifies the distribution of the right middle cerebral artery and select sections to demonstrate anticipated pathology</li> <li>● Identifies acute and subacute hypoxic ischemic changes in the brain</li> </ul>
<p><b>Level 3</b> <i>Performs complex extractions, including eye removal, if indicated, with supervision</i></p> <p><i>Leads the brain cutting conference and selects tissue samples in complex cases, with supervision</i></p>	<ul style="list-style-type: none"> <li>● Performs extraction of brain from patient with prior history of brain surgery, with supervision</li> <li>● Utilizes anterior approach for spinal cord extraction in a case of a patient with posterior spine hardware</li> <li>● Safely removes, cuts, and triages brain specimen suspected of having prion disease</li> <li>● Highlights key anatomic findings to learners at brain cutting conference, and selects appropriate tissue samples from a case of Pick’s disease, with supervision</li> </ul>

<p><i>Interprets uncommon histologic findings and chooses relevant ancillary testing, with supervision</i></p>	<ul style="list-style-type: none"> <li>● Interprets findings in a complex case of multiple sclerosis and can choose stains to identify demyelination</li> <li>● Identifies subtle amyloid plaques and neurofibrillary tangles in a case of Alzheimer's disease, orders appropriate work-up, and additionally differentiates from primary age-related tauopathy</li> <li>● Identifies spongiform encephalopathy and recommends appropriate work-up to rule out prion disease</li> </ul>
<p><b>Level 4</b> <i>Independently performs all aspects of gross evaluation including complex extractions</i></p> <p><i>Independently leads the brain cutting conference and selects tissue samples in complex cases</i></p> <p><i>Independently interprets histologic findings and chooses relevant ancillary testing</i></p>	<ul style="list-style-type: none"> <li>● Independently extracts the brain and spinal cord from a patient with prior history of multiple brain surgeries and craniospinal radiation</li> <li>● Leads brain cutting conference, including providing key teaching points on a frontotemporal lobar degeneration case; can independently select appropriate sections</li> <li>● Dissects out complex vessel anatomy in a patient with Moyamoya</li> <li>● Identifies cortical Lewy bodies and orders alpha-synuclein immunostain</li> <li>● Identifies features of cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy (CADASIL) and orders NOTCH1 testing</li> <li>● Identifies a case of suspected frontotemporal lobar degeneration (FTLD), orders TDP-43 and tau immunostains and subclassifies appropriately</li> </ul>
<p><b>Level 5</b> <i>Teaches and serves as a consultant for complex extractions</i></p> <p><i>Performs complex dissections, modifying techniques according to the needs of the case</i></p>	<ul style="list-style-type: none"> <li>● Serves as a consultant on a complex case of brain hemorrhage of unknown etiology</li> <li>● Modifies approach to brain cutting for a midline craniopharyngioma</li> </ul>
<p>Assessment Models or Tools</p>	<ul style="list-style-type: none"> <li>● Assessment of final report</li> <li>● Direct observation</li> <li>● Multisource feedback</li> </ul>
<p>Curriculum Mapping</p>	<ul style="list-style-type: none"> <li>●</li> </ul>
<p>Notes or Resources</p>	<ul style="list-style-type: none"> <li>● BrainSpan. BrainSpan Reference Atlases. <a href="http://www.brainspan.org/static/atlas">http://www.brainspan.org/static/atlas</a>. 2020.</li> <li>● Consensus Guidelines for Neurodegenerative Diseases:             <ul style="list-style-type: none"> <li>○ Mackenzie I, Neumann M, Bigio E, et al. Nomenclature and nosology for neuropathologic subtypes of frontotemporal lobar degeneration: An update. <i>Acta Neuropathol.</i> 2010;119(1):1–4. <a href="https://link.springer.com/article/10.1007%2Fs00401-009-0612-2">https://link.springer.com/article/10.1007%2Fs00401-009-0612-2</a>. 2020.</li> </ul> </li> </ul>

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- University of Utah Normal Anatomy. Neuroanatomy Tutorial - Labeled Images. <https://webpath.med.utah.edu/HISTHTML/NEURANAT/NEURANCA.html>. 2020.

<b>Patient Care 2: Surgical Neuropathology</b>	
<b>Overall Intent:</b> To perform gross and histologic examination, select ancillary testing, diagnose, and report surgical neuropathology specimens, including nerve and muscle biopsies	
<b>Milestones</b>	<b>Examples</b>
<p><b>Level 1</b> <i>Performs gross examination, description, and sampling of simple neurosurgical specimens; ensures and maintains the integrity of specimens</i></p> <p><i>Recognizes normal histology of central and peripheral nervous system and broad diagnostic categories</i></p>	<ul style="list-style-type: none"> <li>● Correctly matches patient specimen to pathology order, completes gross examination and tissue selection, with relevant orientation for a meningioma</li> <li>● Identifies tissue from the cerebellum microscopically</li> </ul>
<p><b>Level 2</b> <i>Performs gross examination, description, and sampling, of complex neurosurgical specimens and prepares nerve and muscle specimens, with supervision</i></p> <p><i>Performs histologic examination, orders ancillary testing, and makes a diagnosis for simple cases, with supervision</i></p>	<ul style="list-style-type: none"> <li>● Completes gross examination and sampling of temporal lobe resection for epilepsy, with supervision</li> <li>● Properly orients a muscle specimen for embedding, with supervision</li> <li>● Identifies a pituitary adenoma and orders immunohistochemical stains for classification, with supervision</li> <li>● Identifies a diffuse glioma and orders necessary immunohistochemistry and molecular tests to refine diagnosis, with supervision</li> <li>● Identifies dermatomyositis in a muscle biopsy and orders appropriate stains, with supervision</li> </ul>
<p><b>Level 3</b> <i>Independently performs gross examination, description, and sampling, of simple neurosurgical specimens</i></p> <p><i>Independently performs histologic examination, identifies confounding factors, orders ancillary testing, and makes a diagnosis for simple cases</i></p>	<ul style="list-style-type: none"> <li>● Independently performs gross examination of a meningioma specimen</li> <li>● Independently performs gross examination of an eye with retinoblastoma</li> <li>● Independently identifies a meningothelial meningioma with possible brain invasion and orders synaptophysin for further evaluation</li> <li>● Independently identifies a diffuse glioma and orders necessary immunohistochemistry and molecular tests to refine diagnosis</li> </ul>
<p><b>Level 4</b> <i>Independently performs gross examination, description, and sampling of complex neurosurgical specimens, and prepares nerve and muscle specimens</i></p>	<ul style="list-style-type: none"> <li>● Independently performs gross examination of a temporal lobe resection</li> <li>● Modifies personal snap freezing technique to minimize ice artifacts in muscle specimen noted on prior personal attempts at snap freezing</li> </ul>

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<p><i>Independently performs histologic examination, identifies confounding factors, orders relevant ancillary testing, and makes a diagnosis for complex or challenging cases</i></p>	<ul style="list-style-type: none"> <li>● Independently diagnoses pleomorphic xanthoastrocytoma and orders a BRAF V600E</li> <li>● Identifies patterns of myofibrillary disorganization, interprets electron microscopy, and provides appropriately worded diagnosis in the context of the clinical findings</li> </ul>
<p><b>Level 5</b> <i>Designs novel approaches to complex specimens through collaboration with other members of the health care team</i></p> <p><i>Serves as a consultant for complex or challenging cases</i></p>	<ul style="list-style-type: none"> <li>● Plans grossing for orbital exenteration specimen for uveal melanoma with extra scleral extension</li> <li>● Serves as a consultant for a case of a low-grade glioneuronal tumor in a child</li> </ul>
<p>Assessment Models or Tools</p>	<ul style="list-style-type: none"> <li>● Assessment of final report</li> <li>● Direct observation</li> <li>● Multisource feedback</li> </ul>
<p>Curriculum Mapping</p>	<ul style="list-style-type: none"> <li>●</li> </ul>
<p>Notes or Resources</p>	<ul style="list-style-type: none"> <li>● Dubowitz V, Oldfors A, Sewry C. <i>Muscle Biopsy: A Practical Approach</i>. 4th ed. China: Elsevier; 2013. ISBN:978-0702043406.</li> <li>● Eagle RC Jr. <i>Eye Pathology: An Atlas and Text</i>. 2nd ed. Philadelphia, PA: Wolters Kluwer; 2011. ISBN:978-1608317882.</li> <li>● Ellison D, Love S, Cardao Chimelli LM, et al. <i>Neuropathology</i>. 3rd ed. Italy: Elsevier; 2013. ISBN:978-0723435150.</li> <li>● Louis DN, Ohgaki H, Wiestler OD, Cavenee WK. <i>WHO Classification of Tumours of the Central Nervous System</i>. Revised 4th ed. World Health Organization; 2016. ISBN:9789283244929.</li> <li>● Love S, Perry A, Ironside J, Budka H. <i>Greenfield's Neuropathology</i>. 9th ed. Boca Raton, FL: Taylor &amp; Francis Group; 2015. ISBN:9781498721288.</li> <li>● Neuromuscular Disease Center. Muscle and Nerve Histology and Pathology. <a href="https://neuromuscular.wustl.edu/">https://neuromuscular.wustl.edu/</a>. 2020.</li> <li>● Perry A, Brat DJ. <i>Practical Surgical Neuropathology: A Diagnostic Approach: A Volume in the Pattern Recognition Series</i>. 2nd ed. Philadelphia, PA: Elsevier; 2017. ISBN:0323449417.</li> <li>● University of Rochester Medical Center. Neuropathology Laboratory Neuropathology and Neuroimaging Specimens. <a href="https://www.urmc.rochester.edu/libraries/courses/neuroslides/">https://www.urmc.rochester.edu/libraries/courses/neuroslides/</a>. 2020.</li> <li>● Virtual Pathology at the University of Leeds. Neuropathology Teaching. <a href="https://www.virtualpathology.leeds.ac.uk/teaching/collections/neuro/">https://www.virtualpathology.leeds.ac.uk/teaching/collections/neuro/</a>. 2020.</li> </ul>

<b>Patient Care 3: Intra-Operative Consultation (IOC), including Frozen Section</b> <b>Overall Intent:</b> To manage, prioritize, interpret, and timely communicate intra-operative consultations	
Milestones	Examples
<p><b>Level 1</b> <i>Identifies indications and identifies common neurosurgical procedures and recognizes the indications for IOC, frozen section, and cytologic preparations</i></p> <p><i>Discusses specimen-dependent variability in the approach to IOC</i></p> <p><i>Identifies broad diagnostic categories incorporating all available clinical and imaging data in routine IOC</i></p>	<ul style="list-style-type: none"> <li>● Identifies the need for intra-operative consultation on a rim-enhancing lesion in the brain, and explains the necessity to differentiate tumor, infectious, and autoimmune etiologies using frozen section and cytologic preparations</li> <li>● In a case of suspected infiltrative glioma, identifies the need to sample regions likely to have higher grade features</li> <li>● Identifies infection and lymphoma as primary differential diagnoses in a patient with human immunodeficiency virus (HIV) and multiple rim-enhancing lesions on imaging</li> </ul>
<p><b>Level 2</b> <i>Assesses requests for simple IOC and plans workflow, with supervision</i></p> <p><i>Selects tissue for diagnosis and prepares quality slides on simple specimens, in a timely manner</i></p> <p><i>Interprets and communicates routine IOC, with supervision</i></p>	<ul style="list-style-type: none"> <li>● In a glioblastoma case with abundant tissue, selects tissue for frozen section and cytology, with supervision</li> <li>● Independently performs a frozen section on a case of glioblastoma</li> <li>● Identifies a glioblastoma with palisading necrosis and microvascular proliferation in the frozen section, and clearly communicates the diagnosis to the surgeon intraoperatively, with supervision</li> </ul>
<p><b>Level 3</b> <i>For complex cases, addresses requests for IOC with supervision; independently assesses and manages requests for simple IOC and plans workflow</i></p> <p><i>Selects tissues for diagnosis and prepares quality slides for complex specimens, in a timely manner</i></p> <p><i>Independently interprets and communicates routine IOC</i></p>	<ul style="list-style-type: none"> <li>● In a spinal cord biopsy with limited tissue, prioritizes tissue for frozen section and cytology, with supervision</li> <li>● Selects tissue for flow cytometry on a specimen with a differential of inflammation versus lymphoma based on intra-operative consultation findings</li> <li>● Communicates the need for additional specimens for microbiological testing on a specimen with a differential of infectious versus demyelinating process based on intra-operative consultation findings</li> </ul>

	<ul style="list-style-type: none"> <li>Independently interprets and recognizes a psammomatous meningioma at the time of intra-operative consultation, and independently communicates the diagnosis to the surgeon</li> </ul>
<p><b>Level 4</b> <i>For complex cases, independently manages, prioritizes, and addresses requests for IOC</i></p> <p><i>Supervises residents and advises technical staff members in the performance of IOC</i></p> <p><i>Independently interprets and communicates IOC for complex cases and uses language of uncertainty, as indicated</i></p>	<ul style="list-style-type: none"> <li>For a case of a possible inflammatory process (differential including lymphoma, infection, and autoimmune etiologies), independently triages tissue at the time of intra-operative consultation for necessary studies</li> <li>Supervises residents performing frozen sections on a small spinal cord biopsy and advises staff on tissue selection for frozen section</li> <li>Independently recognizes an inflammatory process of uncertain etiology, and communicates diagnosis and plan to surgeon</li> </ul>
<p><b>Level 5</b> <i>Develops a plan for process improvement in the performance of IOC</i></p> <p><i>Serves as a consultant for interpreting and communicating IOC</i></p>	<ul style="list-style-type: none"> <li>Develops plan to introduce new method for freezing of tissue to minimize frozen section artifact</li> <li>Serves as a consultant to general surgical pathology colleagues performing a frozen section on a spine case concerning for a malignant peripheral nerve sheath tumor sent by an orthopedic surgeon</li> </ul>
Assessment Models or Tools	<ul style="list-style-type: none"> <li>Comparison of final pathology diagnosis versus intra-operative consultation diagnosis</li> <li>Direct observation</li> <li>Multisource feedback</li> </ul>
Curriculum Mapping	<ul style="list-style-type: none"> <li></li> </ul>
Notes or Resources	<ul style="list-style-type: none"> <li>Burger P. <i>Smears and Frozen Sections in Surgical Neuropathology: A manual</i>. 1st ed. Ashland, OH: PB Medical Publishing, LLC; 2009. ISBN:9780692003169.</li> <li>Ellison D, Love S, Cardao Chimelli LM, et al. <i>Neuropathology</i>. 3rd ed. Italy: Elsevier; 2013. ISBN:978-0723435150.</li> <li>Louis DN, Ohgaki H, Wiestler OD, Cavenee WK. <i>WHO Classification of Tumours of the Central Nervous System</i>. Revised 4th ed. World Health Organization; 2016. ISBN:9789283244929.</li> <li>Love S, Perry A, Ironside J, Budka H. <i>Greenfield's Neuropathology</i>. 9th ed. Boca Raton, FL: Taylor &amp; Francis Group; 2015. ISBN:9781498721288.</li> <li>Perry A, Brat DJ. <i>Practical Surgical Neuropathology: A Diagnostic Approach: A Volume in the Pattern Recognition Series</i>. 2nd ed. Philadelphia, PA: Elsevier; 2017. ISBN:0323449417.</li> </ul>

**Patient Care 4: Reporting**

**Overall Intent:** To generate complete and timely reports in surgical neuropathology and autopsy

Milestones	Examples
<p><b>Level 1</b> <i>Generates a timely report for a simple case, with supervision</i></p> <p><i>Identifies the role of comments in a pathology report</i></p>	<ul style="list-style-type: none"> <li>● Reviews case material for a meningioma and prepares a report for sign-out with supervision</li> <li>● Explains the need for a comment when insufficient tissue is present for ancillary testing</li> </ul>
<p><b>Level 2</b> <i>Generates a timely report that includes synoptic templates and/or ancillary testing for a complex case, with supervision</i></p> <p><i>Generates comments and makes simple recommendations</i></p>	<ul style="list-style-type: none"> <li>● Generates an integrated diagnostic report for oligodendroglioma with astrocytic morphology, with supervision</li> <li>● Suggests additional radiographic studies for evaluation of metastatic disease based on immunostain evidence of likely primary site of origin</li> </ul>
<p><b>Level 3</b> <i>Independently generates timely integrated reports for simple cases</i></p> <p><i>Generates comments that include the language of uncertainty, with supervision</i></p>	<ul style="list-style-type: none"> <li>● Independently reviews case material and prepares a report for a pituitary adenoma, documenting the results of immunohistochemical stains and incorporating the results into the final diagnosis</li> <li>● Generates a comment addressing discrepancy of a histologically low-grade glioma with imaging suggesting a higher grade tumor, with supervision</li> </ul>
<p><b>Level 4</b> <i>Independently generates timely integrated reports for complex cases</i></p> <p><i>Independently generates a nuanced comment that includes the language of uncertainty and complex recommendations</i></p>	<ul style="list-style-type: none"> <li>● Independently generates an integrated diagnostic report for oligodendroglioma with astrocytic morphology</li> <li>● For a patient with dementia, both aberrant TDP-43 expression in the frontal cortex and Alzheimer-type changes, generates a comment explaining the difficulty in differentiating age-related changes and FTLN-TDP43</li> </ul>
<p><b>Level 5</b> <i>Independently generates a report that addresses a discordant diagnosis or clinical discrepancy in complex cases</i></p>	<ul style="list-style-type: none"> <li>● Generates an autopsy report identifying that the age of a subdural hematoma predates the witnessed timing of a fatal assault and effectively communicates the discrepancy</li> </ul>
<p>Assessment Models or Tools</p>	<ul style="list-style-type: none"> <li>● Assessment of reports</li> <li>● Direct observation</li> <li>● Multisource feedback</li> </ul>
<p>Curriculum Mapping</p>	<ul style="list-style-type: none"> <li>●</li> </ul>
<p>Notes or Resources</p>	<ul style="list-style-type: none"> <li>● College of American Pathologists (CAP). Cancer Protocol Templates <a href="http://www.cap.org/cancerprotocols">www.cap.org/cancerprotocols</a>. 2020.</li> </ul>

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- Smith SM, Yearsley M. Constructing comments in a pathology report: advice for the pathology resident. *Arch Pathol Lab Med*. 2016;140(10):1023-1024. <https://www.archivesofpathology.org/doi/full/10.5858/arpa.2016-0220-ED>. 2020.

<b>Medical Knowledge 1: Diagnostic Knowledge</b>	
<b>Overall Intent:</b> To demonstrate advanced knowledge of neuropathology, including integration of histochemistry, immunohistochemistry, and molecular techniques	
<b>Milestones</b>	<b>Examples</b>
<p><b>Level 1</b> <i>Demonstrates basic knowledge of neuropathology</i></p> <p><i>Demonstrates basic knowledge of histochemistry, immunohistochemistry, and molecular techniques</i></p>	<ul style="list-style-type: none"> <li>● Demonstrates knowledge of categories of diffuse gliomas and criteria for grading</li> <li>● Recognizes glial fibrillary acidic protein as a marker of glial cells</li> </ul>
<p><b>Level 2</b> <i>Demonstrates advanced knowledge of the neuropathology of common neoplastic and non-neoplastic diseases</i></p> <p><i>Demonstrates advanced knowledge of histochemistry, immunohistochemistry, and molecular techniques</i></p>	<ul style="list-style-type: none"> <li>● Demonstrates knowledge of the molecular definition of oligodendroglioma</li> <li>● Demonstrates knowledge of the molecular subclassification of medulloblastoma</li> <li>● Demonstrates knowledge of muscle histochemical stains</li> <li>● Uses Luxol Fast Blue and neurofilament protein immunostain in the setting of demyelinating disease</li> </ul>
<p><b>Level 3</b> <i>Applies advanced knowledge of the neuropathology of uncommon neoplastic and non-neoplastic diseases</i></p> <p><i>Applies advanced knowledge of histochemistry, immunohistochemistry, and molecular techniques</i></p>	<ul style="list-style-type: none"> <li>● Applies knowledge of Rosai-Dorfman disease in the setting of a dural-based inflammatory lesion</li> <li>● Applies knowledge of muscle histochemical stains to select stains for an inflammatory myopathy</li> <li>● Uses myelin sheath thickness versus axon diameter in plastic sections to diagnose chronic demyelinating disease</li> </ul>
<p><b>Level 4</b> <i>Applies advanced knowledge of the neuropathology of uncommon neoplastic and non-neoplastic diseases, with reference to literature</i></p> <p><i>Integrates advanced knowledge of histochemistry, immunohistochemistry, and molecular techniques with reference to literature, in nuanced diagnoses</i></p>	<ul style="list-style-type: none"> <li>● For biopsies of demyelinating disease, uses relevant immunostains to rule out lymphoma</li> <li>● Incorporates genetic data into the classification of ependymomas, based upon current literature</li> </ul>
<p><b>Level 5</b> <i>Demonstrates expertise in neuropathology to a multidisciplinary team</i></p>	<ul style="list-style-type: none"> <li>● Leads a discussion at a case conference about RELA-fusion ependymomas</li> <li>● Presents autopsy findings for a case of N-methyl-D-aspartate receptor (NMDAR) encephalitis at morbidity and mortality (M and M) conference</li> </ul>

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<p><i>Demonstrates expertise in histochemistry, immunohistochemistry, and molecular techniques</i></p>	<ul style="list-style-type: none"> <li>● Discusses implications for prognosis of a patient with incompletely resected focal cortical dysplasia</li> <li>● Discusses the results of a cancer gene panel and the implications for treatment and prognosis for a patient diagnosed with glioblastoma subsequently found to have BRAF V600E mutation</li> </ul>
<p>Assessment Models or Tools</p>	<ul style="list-style-type: none"> <li>● Case-based discussion</li> <li>● Direct observation</li> <li>● Fellow Neuropathology In-Service Examination (NPISE)</li> <li>● Review of reports</li> </ul>
<p>Curriculum Mapping</p>	<ul style="list-style-type: none"> <li>●</li> </ul>
<p>Notes or Resources</p>	<ul style="list-style-type: none"> <li>● Dubowitz V, Oldfors A, Sewry C. <i>Muscle Biopsy: A Practical Approach</i>. 4th ed. China: Elsevier; 2013. ISBN:978-0702043406.</li> <li>● Eagle RC Jr. <i>Eye Pathology: An Atlas and Text</i>. 2nd ed. Philadelphia, PA: Wolters Kluwer; 2011. ISBN:978-1608317882.</li> <li>● Ellison D, Love S, Cardao Chimelli LM, et al. <i>Neuropathology</i>. 3rd ed. Italy: Elsevier; 2013. ISBN:978-0723435150.</li> <li>● Iobst WF, Trowbride R, Philibert I. Teaching and assessing critical reasoning through the use of entrustment. <i>J Grad Med Educ</i>. 2013;5(3):517-8. <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3771188/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3771188/</a>. 2020.</li> <li>● Love S, Perry A, Ironside J, Budka H. <i>Greenfield's Neuropathology</i>. 9th ed. Boca Raton, FL: Taylor &amp; Francis Group; 2015. ISBN:9781498721288.</li> <li>● Perry A, Brat DJ. <i>Practical Surgical Neuropathology: A Diagnostic Approach: A Volume in the Pattern Recognition Series</i>. 2nd ed. Philadelphia, PA: Elsevier; 2017. ISBN:0323449417.</li> </ul>

<b>Medical Knowledge 2: Neuropathology Instruction</b>	
<b>Overall Intent:</b> To educate others about neuropathology topics	
<b>Milestones</b>	<b>Examples</b>
<b>Level 1</b> <i>Presents at interdisciplinary conference, with supervision</i>	<ul style="list-style-type: none"> <li>• Prepares for and presents a case of glioblastoma, isocitrate dehydrogenase-wildtype at tumor board, with supervision</li> </ul>
<b>Level 2</b> <i>Leads instruction of basic neuropathology concepts</i>	<ul style="list-style-type: none"> <li>• Teaches general pathology residents about basic concepts of neuropathology intra-operative consultation</li> <li>• Teaches neurological surgery and neurology residents basic concepts of intra-operative consultation</li> <li>• Teaches small groups of medical students about pathological types of “stroke”</li> </ul>
<b>Level 3</b> <i>Independently presents at interdisciplinary conference</i>	<ul style="list-style-type: none"> <li>• Prepares for and presents a case of diffuse astrocytoma with oligodendroglioma-like morphology at tumor board</li> <li>• Presents a case of dural-based mucosa-associated lymphoid tissue lymphoma at clinical-pathological correlation conference</li> <li>• Presents a case of fatal intracerebral hemorrhage due to amyloid angiopathy at a M and M conference</li> </ul>
<b>Level 4</b> <i>Leads instruction of advanced neuropathology concepts</i>	<ul style="list-style-type: none"> <li>• Leads multidisciplinary neuromuscular conference discussing the findings of a wide range of specimens</li> <li>• Teaches surgical pathology fellow about challenging neurosurgical frozen section diagnoses</li> </ul>
<b>Level 5</b> <i>Independently designs and develops enduring instructional materials</i>	<ul style="list-style-type: none"> <li>• Designs a module to teach gross neuroanatomy in a medical school anatomy course</li> </ul>
Assessment Models or Tools	<ul style="list-style-type: none"> <li>• Direct observation</li> <li>• Multisource feedback</li> </ul>
Curriculum Mapping	<ul style="list-style-type: none"> <li>•</li> </ul>
Notes or Resources	<ul style="list-style-type: none"> <li>• Alpert JS. Some simple rules for effective communication in clinical teaching and practice environments. <i>Am J Med.</i> 2011;124(5):381-382. <a href="https://www.amjmed.com/article/S0002-9343(11)00058-1/fulltext">https://www.amjmed.com/article/S0002-9343(11)00058-1/fulltext</a>. 2020.</li> <li>• Find resources</li> <li>• lobst WF, Trowbride R, Philibert I. Teaching and assessing critical reasoning through the use of entrustment. <i>J Grad Med Educ.</i> 2013;5(3):517-8. <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3771188/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3771188/</a>. 2020.</li> <li>• McCloskey CB, Domen RE, Conran RM, et al. Entrustable professional activities for pathology: Recommendations from the College of American Pathologists Graduate Medical Education Committee. <i>Academic Pathology.</i> 2017;4:1-9. <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5496684/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5496684/</a>. 2020.</li> </ul>

<b>Medical Knowledge 3: Clinical Reasoning</b>	
<b>Overall Intent:</b> To demonstrate clinical reasoning in neuropathology	
<b>Milestones</b>	<b>Examples</b>
<p><b>Level 1</b> <i>Demonstrates a basic framework for clinical reasoning</i></p> <p><i>Identifies resources to inform clinical reasoning</i></p>	<ul style="list-style-type: none"> <li>• Navigates electronic health record, laboratory information system, internet, and literature to obtain information for a muscle biopsy specimen</li> </ul>
<p><b>Level 2</b> <i>Demonstrates clinical reasoning to determine relevant information</i></p> <p><i>Selects relevant resources based on scenario to inform decisions</i></p>	<ul style="list-style-type: none"> <li>• Identifies history of statin use in a patient being worked up for elevated creatine phosphokinase</li> <li>• For a patient with suspected dermatomyositis, extracts pertinent dermatologic findings from the patient’s medical record and distinguishes between relevant and extraneous data</li> <li>• Is aware of and uses appropriate algorithms and published literature for identification of likely primary sites for metastatic cancer</li> </ul>
<p><b>Level 3</b> <i>Synthesizes information to inform clinical reasoning, with supervision</i></p> <p><i>Seeks and integrates evidence-based information to inform diagnostic decision making in complex cases, with supervision</i></p>	<ul style="list-style-type: none"> <li>• Employs consensus guideline data to appropriately work-up suspected Alzheimer Disease</li> <li>• For an autopsy of pediatric brain malformation, integrates autopsy findings, karyotyping, and molecular data to make a diagnosis and inform genetic counseling, with supervision</li> </ul>
<p><b>Level 4</b> <i>Independently synthesizes information to inform clinical reasoning in complex cases</i></p> <p><i>Independently seeks out, analyzes, and applies relevant original research to diagnostic decision making in complex clinical cases</i></p>	<ul style="list-style-type: none"> <li>• Uses imaging, histopathologic, and molecular data to diagnose angiocentric glioma</li> <li>• Uses clinical, laboratory, and epidemiologic data to guide work-up of a patient with infectious encephalitis</li> </ul>
<p><b>Level 5</b> <i>Serves as a resource for resolving difficult differential diagnoses</i></p>	<ul style="list-style-type: none"> <li>• Using published literature and recommendations, serves as a consultant to correctly direct work-up of a fetal autopsy patient whose mother traveled to a Zika-endemic area</li> </ul>
<p>Assessment Models or Tools</p>	<ul style="list-style-type: none"> <li>• Case-based discussion</li> <li>• Clinical management conferences</li> <li>• Direct observation</li> <li>• Multisource feedback</li> <li>• Presentations</li> <li>• Review of reports</li> </ul>
<p>Curriculum Mapping</p>	<ul style="list-style-type: none"> <li>•</li> </ul>

Notes or Resources	<ul style="list-style-type: none"><li>● Clinical reasoning relies on foundational knowledge that requires the trainee to apply that knowledge in a thoughtful, deliberate and logical fashion to clinical cases to inform clinical care</li><li>● Iobst WF, Trowbride R, Philibert I. Teaching and assessing critical reasoning through the use of entrustment. <i>J Grad Med Educ.</i> 2013;5(3):517-8. <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3771188/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3771188/</a>. 2020.</li><li>● McCloskey CB, Domen RE, Conran RM, et al. Entrustable professional activities for pathology: Recommendations from the College of American Pathologists Graduate Medical Education Committee. <i>Academic Pathology.</i> 2017;4:1-9. <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5496684/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5496684/</a>. 2020.</li><li>● Society to Improve Diagnosis in Medicine. Assessment of Reasoning Tool. <a href="https://www.improvediagnosis.org/art/">https://www.improvediagnosis.org/art/</a>. 2020.</li></ul>
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<b>Systems-Based Practice 1: Patient Safety and Quality Improvement (QI)</b>	
<b>Overall Intent:</b> To engage in the analysis and management of patient safety events, including relevant communication with patients, families, and health care professionals; to conduct a QI project	
<b>Milestones</b>	<b>Examples</b>
<p><b>Level 1</b> <i>Demonstrates knowledge of common patient safety events</i></p> <p><i>Demonstrates knowledge of how to report patient safety events</i></p> <p><i>Demonstrates knowledge of basic QI methodologies and metrics</i></p>	<ul style="list-style-type: none"> <li>● Recognizes a specimen swap or patient identification error</li> <li>● Recognizes artifacts on a slide that could lead to misinterpretation</li>   <li>● Identifies event reporting systems at own institution</li>   <li>● Understands basic LEAN principles</li> <li>● Describes fishbone tools</li> </ul>
<p><b>Level 2</b> <i>Identifies system factors that lead to patient safety events</i></p> <p><i>Reports patient safety events through institutional reporting systems (simulated or actual)</i></p> <p><i>Describes departmental and institutional QI initiatives</i></p>	<ul style="list-style-type: none"> <li>● Describes pre-analytical, analytical, and post-analytical sources of patient safety events</li> <li>● Identifies an inappropriately timed muscle biopsy on the operating room schedule in a pediatric patient and works with team to reschedule so that tissue can be appropriately handled for proper evaluation</li>   <li>● Initiates the reporting process for swapped specimens at time of intra-operative consultation</li>   <li>● Is aware of improvement initiatives within their scope of practice</li> </ul>
<p><b>Level 3</b> <i>Participates in analysis of patient safety events (simulated or actual)</i></p> <p><i>Participates in disclosure of patient safety events to clinicians and/or patients and families (simulated or actual)</i></p> <p><i>Participates in departmental and institutional QI initiatives</i></p>	<ul style="list-style-type: none"> <li>● Attends a root cause analysis or patient safety debrief</li> <li>● Investigates source of tissue contamination</li>   <li>● Is present when attending discloses a safety event to a surgeon</li> <li>● Assesses clinical impact of frozen section discrepancy</li>   <li>● Participates in validation of a new immunostain</li> <li>● Presents at consensus conference</li> </ul>
<p><b>Level 4</b> <i>Conducts analysis of patient safety events and offers error prevention strategies (simulated or actual)</i></p>	<ul style="list-style-type: none"> <li>● Serves as a team lead in a component of root cause analysis</li> </ul>

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<p><i>Discloses patient safety events to clinicians and/or patients and families (simulated or actual)</i></p> <p><i>Demonstrates the skills required to identify, develop, implement, and analyze a QI project</i></p>	<ul style="list-style-type: none"> <li>● Informs the surgeon about a lost or delayed specimen, or amended report</li> <li>● Initiates and completes a QI project on optimal sampling of a large meningioma specimen</li> </ul>
<p><b>Level 5</b> <i>Actively engages teams and processes to modify systems to prevent patient safety events</i></p> <p><i>Role models or mentors others in the disclosure of patient safety events</i></p> <p><i>Creates, implements, and assesses QI initiatives at the institutional or community level</i></p>	<ul style="list-style-type: none"> <li>● Creates, completes, and implements a QI project that assesses three different methods of freezing tissue for frozen sections</li> </ul>
<p>Assessment Models or Tools</p>	<ul style="list-style-type: none"> <li>● Chart or other system documentation by fellow</li> <li>● Direct observation</li> <li>● Documentation of QI or patient safety project processes or outcomes</li> <li>● E-module multiple choice tests</li> <li>● Portfolio</li> <li>● Reflection</li> <li>● Simulation</li> <li>● 360-degree evaluations</li> </ul>
<p>Curriculum Mapping</p>	<ul style="list-style-type: none"> <li>●</li> </ul>
<p>Notes or Resources</p>	<ul style="list-style-type: none"> <li>● Banks P, Brown R, Laslowski A, et al. A proposed set of metrics to reduce patient safety risk from within the anatomic pathology laboratory. <i>Lab Med.</i> 2017;48(2):195-201. <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5424539/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5424539/</a>. 2020.</li> <li>● Institute of Healthcare Improvement. <a href="http://www.ihp.org/Pages/default.aspx">http://www.ihp.org/Pages/default.aspx</a>. 2020.</li> <li>● Nakhleh RE. Patient safety and error reduction in surgical pathology. <i>Arch of Pathol Lab Med.</i> 2008;132(2):181-185. <a href="https://www.archivesofpathology.org/doi/10.1043/1543-2165(2008)132[181:PSAERI]2.0.CO;2?url_ver=Z39.88-2003&amp;rfr_id=ori:rid:crossref.org&amp;rfr_dat=cr_pub%3dpubmed">https://www.archivesofpathology.org/doi/10.1043/1543-2165(2008)132[181:PSAERI]2.0.CO;2?url_ver=Z39.88-2003&amp;rfr_id=ori:rid:crossref.org&amp;rfr_dat=cr_pub%3dpubmed</a>. 2020.</li> </ul>

<b>Systems-Based Practice 2: Systems Navigation for Patient-Centered Care</b>	
<b>Overall Intent:</b> To effectively navigate the health care system, including the interdisciplinary team and other care providers, to adapt care to a specific patient population to ensure high-quality patient outcomes	
<b>Milestones</b>	<b>Examples</b>
<p><b>Level 1</b> <i>Demonstrates knowledge of case coordination</i></p> <p><i>Identifies key elements for safe and effective transitions of care and hand-offs</i></p> <p><i>Demonstrates knowledge of population and community health needs</i></p>	<ul style="list-style-type: none"> <li>● Identifies the members of the interprofessional team, including histotechnologists, laboratory technologists, pathologist assistants, consultants, clinical scientists, and other specialty physicians/nurses and describes each role</li> <li>● Lists the essential components of an effective sign-out and care transition including sharing information necessary for successful transitions of incomplete cases</li> <li>● Identifies the importance of discussing initial frozen section diagnoses in an ongoing case to the evening neuropathologist covering frozen sections</li> <li>● Identifies components of social determinants of health and how they impact the delivery of patient care</li> <li>● Identifies that germline genetic testing requires specific consent</li> </ul>
<p><b>Level 2</b> <i>Coordinates care of patients/specimens in routine cases, effectively using interprofessional teams</i></p> <p><i>Performs safe and effective transitions of care/hand-offs in routine situations</i></p> <p><i>Identifies pathology’s role in population and community health needs for the local population</i></p>	<ul style="list-style-type: none"> <li>● Ensures appropriate turnaround time based on patient appointment or procedure</li> <li>● Follows hand-off policy at the end of rotation</li> <li>● Discusses the initial frozen section diagnoses in an on-going case to the evening neuropathologist covering frozen sections</li> <li>● Identifies different populations within own panel of patients, cases, and/or the local community</li> <li>● Identifies that patients who have travelled to the American southwest are at higher risk for Coccidiomycosis</li> </ul>
<p><b>Level 3</b> <i>Coordinates care of patients/specimens in complex cases, effectively using interprofessional teams</i></p> <p><i>Performs safe and effective transitions of care/hand-offs in complex situations</i></p>	<ul style="list-style-type: none"> <li>● At interdisciplinary tumor boards/medical rounds, discusses O(6)-Methylguanine-DNA methyltransferase (MGMT) testing for diffuse gliomas and potential impact on therapy versus cost</li> <li>● When performing hand-offs, prioritizes cases and provides complete information</li> <li>● Reconciles consult pathology by calling referring pathologist on a patient who has been transferred in for continued care, and requests additional outside material</li> </ul>

<p><i>Identifies opportunities for pathology to participate in community and population health</i></p>	<ul style="list-style-type: none"> <li>● Recognizes incidence of von Hippel-Lindau in patients with hemangioblastoma and properly communicates recommendation for genetic testing depending on patient demographics</li> </ul>
<p><b>Level 4</b> <i>Models effective coordination of patient-centered care among different disciplines and specialties</i></p> <p><i>Models and advocates for safe and effective transitions of care/hand-offs within and across health care delivery systems</i></p> <p><i>Recommends and/or participates in changing and adapting practice to provide for the needs of communities and populations</i></p>	<ul style="list-style-type: none"> <li>● Coordinates and completes exemplary presentation at tumor board and follows up on additional testing requests</li> <li>● Performs quality reviews and correlations between cerebrospinal fluid cytology and history to assure appropriate follow-up</li> <li>● Ensures that information is not lost between the intra-operative consultation with the surgeon and the resident grossing bench</li> <li>● Supervises residents in following hand-off policy</li> <li>● Recommends adding new tests to menu according to updates in guidelines</li> </ul>
<p><b>Level 5</b> <i>Analyzes the process of care coordination and leads in the design and implementation of improvements</i></p> <p><i>Improves quality of transitions of care within and across health care delivery systems to optimize patient outcomes</i></p> <p><i>Leads innovations and advocates for populations and communities with health care needs</i></p>	<ul style="list-style-type: none"> <li>● Identifies patterns of lapses in care coordination between two grossers in failure to process specimens sitting in decal, and implements process improvements to minimize failures</li> <li>● Works with a QI mentor to identify better hand-off tools for on-call neuropathology services or to improve teaching sessions</li> <li>● Designs a pilot telepathology program for proactive outreach</li> </ul>
<p>Assessment Models or Tools</p>	<ul style="list-style-type: none"> <li>● Attendance records at lectures/rounds</li> <li>● Case management quality metrics and goals mined from EHRs</li> <li>● Chart review</li> <li>● Direct observation (including discussion during rounds, case work-up and case presentations)</li> <li>● End-of-rotation evaluation</li> <li>● Multisource feedback</li> <li>● Pathology report review</li> <li>● Review of sign-out tools, use and review of checklists between pathology services</li> </ul>
<p>Curriculum Mapping</p>	<ul style="list-style-type: none"> <li>●</li> </ul>

Notes or Resources	<ul style="list-style-type: none"><li>• Aller RD. Pathology's contributions to disease surveillance: sending our data to public health officials and encouraging our clinical colleagues to do so. <i>Archives of Path Lab Med.</i> 2009;133(6)926-932. <a href="https://www.archivesofpathology.org/doi/10.1043/1543-2165-133.6.926?url_ver=Z39.88-2003&amp;rfr_id=ori:rid:crossref.org&amp;rfr_dat=cr_pub%3dpubmed">https://www.archivesofpathology.org/doi/10.1043/1543-2165-133.6.926?url_ver=Z39.88-2003&amp;rfr_id=ori:rid:crossref.org&amp;rfr_dat=cr_pub%3dpubmed</a>. 2020.</li><li>• CAP. Competency Model for Pathologists. <a href="https://learn.cap.org/content/cap/pdfs/Competency_Model.pdf">https://learn.cap.org/content/cap/pdfs/Competency_Model.pdf</a>. 2020.</li><li>• CDC. Population Health Training. <a href="https://www.cdc.gov/pophealthtraining/whatis.html">https://www.cdc.gov/pophealthtraining/whatis.html</a>. 2020.</li><li>• Kaplan KJ. In pursuit of patient-centered care. <a href="http://tissuepathology.com/2016/03/29/in-pursuit-of-patient-centered-care/#axzz5e7nSsAns">http://tissuepathology.com/2016/03/29/in-pursuit-of-patient-centered-care/#axzz5e7nSsAns</a>. 2020.</li></ul>
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<b>Systems-Based Practice 3: Physician Role in Health Care System</b>	
<b>Overall Intent:</b> To understand the role in the complex health care system and how to optimize the system to improve patient care and the health system's performance	
<b>Milestones</b>	<b>Examples</b>
<p><b>Level 1</b> <i>Identifies key components of the complex health care system (e.g., hospital, skilled nursing facility, finance, personnel, technology)</i></p> <p><i>Describes basic health payment systems (e.g., government, private, public, uninsured care) and practice models</i></p>	<ul style="list-style-type: none"> <li>● Recognizes the multiple, often competing forces, in the health care system (e.g., names systems and providers involved in test ordering and payment)</li> <li>● Recognizes there are different payment systems (e.g., Medicare, Medicaid, Veterans Affairs (VA), commercial third-party payers)</li> <li>● With direct supervision, completes a report following a routine patient specimen and applies appropriate coding in compliance with regulations</li> </ul>
<p><b>Level 2</b> <i>Describes how components of a complex health care system are interrelated, and how this impacts patient care</i></p> <p><i>Documents testing detail and explains the impact of documentation on billing and reimbursement</i></p>	<ul style="list-style-type: none"> <li>● Understands the impact of health plans on testing workflow and reimbursement</li> <li>● Completes a report following a routine patient specimen and applies appropriate coding in compliance with regulations, with oversight</li> <li>● Is familiar with common fee codes in surgical pathology, nerve and muscle service</li> </ul>
<p><b>Level 3</b> <i>Discusses how individual practice affects the broader system (e.g., test use, turnaround time)</i></p> <p><i>Engages with clinicians and/or patients in shared decision making, such as use of preauthorization for complex testing</i></p>	<ul style="list-style-type: none"> <li>● Understands, accesses, and analyzes own individual performance data on autopsy case logs and consultation logs</li> <li>● Uses shared decision making and adapts the choice of the most cost-effective testing depending on the relevant clinical needs</li> <li>● Independently assigns fee codes</li> </ul>
<p><b>Level 4</b> <i>Manages various components of the complex health care system to provide efficient and effective patient care and transition of care</i></p> <p><i>Practices and advocates for cost effective patient care with consideration of the limitations of each patient's payment model</i></p>	<ul style="list-style-type: none"> <li>● Works collaboratively with the institution to improve patient resources, design the institution's testing needs assessment, or develop/implement/assess the resulting action plans</li> <li>● Identifies and fixes billing errors or discrepancies prior to sign-out</li> </ul>
<p><b>Level 5</b> <i>Advocates for or leads systems change that enhances high-value, efficient, and effective patient care and transition of care</i></p>	<ul style="list-style-type: none"> <li>● Performs an analysis of laboratory practices to identify and modify areas of improvement to make laboratory testing more efficient</li> </ul>

<i>Participates in health policy advocacy activities</i>	
Assessment Models or Tools	<ul style="list-style-type: none"> <li>● Audit of testing usage</li> <li>● Direct observation</li> <li>● QI project (perhaps as part of a portfolio): NOTE: The resident's QI project may serve as an excellent assessment model/tool to assess this subcompetency. The program can develop criteria to ensure the resident is able to access and analyze personal practice data, and work with others to design and implement action plans, and subsequently evaluate the outcome and the impact of the plan(s).</li> </ul>
Curriculum Mapping	<ul style="list-style-type: none"> <li>●</li> </ul>
Notes or Resources	<ul style="list-style-type: none"> <li>● Agency for Healthcare Research and Quality. Major Physician Measurement Sets. <a href="https://www.ahrq.gov/talkingquality/measures/setting/physician/measurement-sets.html">https://www.ahrq.gov/talkingquality/measures/setting/physician/measurement-sets.html</a>. 2020.</li> <li>● AHRQ. Measuring the Quality of Physician Care. <a href="https://www.ahrq.gov/talkingquality/measures/setting/physician/index.html">https://www.ahrq.gov/talkingquality/measures/setting/physician/index.html</a>. 2020.</li> <li>● The Commonwealth Fund. Health Reform Resource Center. <a href="http://www.commonwealthfund.org/interactives-and-data/health-reform-resource-center#/f:@facasubcategoriesfacet63677=[Individual%20and%20Employer%20Responsibility">http://www.commonwealthfund.org/interactives-and-data/health-reform-resource-center#/f:@facasubcategoriesfacet63677=[Individual%20and%20Employer%20Responsibility</a>. 2020.</li> <li>● The Commonwealth Fund. Health System Data Center. <a href="http://datacenter.commonwealthfund.org/?_ga=2.110888517.1505146611.1495417431-1811932185.1495417431#ind=1/sc=1">http://datacenter.commonwealthfund.org/?_ga=2.110888517.1505146611.1495417431-1811932185.1495417431#ind=1/sc=1</a>. 2020.</li> <li>● Dzau VJ, McClellan M, Burke S, et al. Vital directions for health and health care: priorities from a National Academy of Medicine Initiative. <i>NAM Perspectives</i>. Discussion Paper, National Academy of Medicine, Washington, DC. <a href="https://nam.edu/vital-directions-for-health-health-care-priorities-from-a-national-academy-of-medicine-initiative/">https://nam.edu/vital-directions-for-health-health-care-priorities-from-a-national-academy-of-medicine-initiative/</a>. 2020.</li> <li>● The Kaiser Family Foundation. <a href="http://www.kff.org">www.kff.org</a>. 2020.</li> <li>● The Kaiser Family Foundation: Topic: health reform. <a href="https://www.kff.org/topic/health-reform/">https://www.kff.org/topic/health-reform/</a>. 2020.</li> </ul>

<b>Systems-Based Practice 4: Accreditation, Compliance, and Quality</b>	
<b>Overall Intent:</b> To gain in-depth knowledge of the components of laboratory accreditation, regulatory compliance, and quality management	
<b>Milestones</b>	<b>Examples</b>
<p><b>Level 1</b> <i>Demonstrates knowledge that laboratories must be accredited</i></p> <p><i>Discusses the need for quality control and proficiency testing</i></p>	<ul style="list-style-type: none"> <li>● Attends departmental quality assurance/quality control meetings, M and M conferences, and accreditation/regulatory summation meetings</li> </ul>
<p><b>Level 2</b> <i>Demonstrates knowledge of the components of laboratory accreditation and regulatory compliance (e.g., Clinical Laboratory Improvement Amendments), either through training or experience</i></p> <p><i>Interprets quality data and charts and trends, including proficiency testing results, with assistance</i></p>	<ul style="list-style-type: none"> <li>● Assesses quality of quality control QC slides for immunohistochemical stains</li> <li>● Compares frozen section to final diagnosis for own cases</li>   <li>● Evaluates turnaround times for case sign-out</li> </ul>
<p><b>Level 3</b> <i>Identifies the differences between accreditation and regulatory compliance; discusses the process for achieving accreditation and maintaining regulatory compliance</i></p> <p><i>Demonstrates knowledge of the components of a laboratory quality management plan</i></p> <p><i>Discusses implications of proficiency testing failures</i></p>	<ul style="list-style-type: none"> <li>● Reviews the CAP inspection checklist for anatomic pathology</li>   <li>● Completes inspector training for accreditation agency to understand process for achieving/maintaining regulatory/accreditation compliance</li>   <li>● Begins to actively participate in regular laboratory quality management duties; compares frozen section to final diagnosis log for department</li> </ul>
<p><b>Level 4</b> <i>Participates in an internal or external laboratory inspection</i></p> <p><i>Reviews the quality management plan to identify areas for improvement</i></p>	<ul style="list-style-type: none"> <li>● Performs mock or self-inspection using a CAP checklist</li>   <li>● Assists in developing a strategy for handling quality control or proficiency testing failures</li> </ul>

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<p><i>Performs analysis and review of proficiency testing failures and recommends a course of action, with oversight</i></p>	
<p><b>Level 5</b> <i>Serves as a resource for accreditation at the regional or national level</i></p> <p><i>Creates and follows a comprehensive quality management plan</i></p> <p><i>Independently formulates a response for proficiency testing failures</i></p>	<ul style="list-style-type: none"> <li>● Serves on a committee for CAP</li> <li>● Oversees laboratory quality management as part of the duties acting as a representative of the medical director</li> </ul>
<p>Assessment Models or Tools</p>	<ul style="list-style-type: none"> <li>● Assignment of duties for departmental or hospital quality assurance/quality control committees</li> <li>● Documentation of inspector training and participation in resident portfolio</li> <li>● Planning and completion of QI projects</li> <li>● Presentation at M and M conferences</li> <li>● Rotation evaluations</li> </ul>
<p>Curriculum Mapping</p>	<ul style="list-style-type: none"> <li>●</li> </ul>
<p>Notes or Resources</p>	<ul style="list-style-type: none"> <li>● CAP. Competency Model for Pathologists. <a href="https://learn.cap.org/content/cap/pdfs/Competency_Model.pdf">https://learn.cap.org/content/cap/pdfs/Competency_Model.pdf</a>. 2020.</li> <li>● CAP. Inspector Training Options. <a href="https://www.cap.org/laboratory-improvement/accreditation/inspector-training">https://www.cap.org/laboratory-improvement/accreditation/inspector-training</a>. 2020.</li> <li>● Look for more resources for quality and compliance</li> </ul>

<b>Systems-Based Practice 5: Utilization</b>	
<b>Overall Intent:</b> To understand and apply principles of laboratory resource utilization	
<b>Milestones</b>	<b>Examples</b>
<b>Level 1</b> <i>Identifies general neuropathology work practices and workflow (e.g., molecular diagnostic, histology, immunohistochemistry stains, chemical tests)</i>	<ul style="list-style-type: none"> <li>• Knows when the immunostain ordering cutoff time is</li> </ul>
<b>Level 2</b> <i>Explains rationale for utilization patterns in own practice setting</i>	<ul style="list-style-type: none"> <li>• Understands the approximate cost of each immunostain</li> <li>• Understands the turnaround time for performing a given stain or molecular test</li> </ul>
<b>Level 3</b> <i>Identifies opportunities to optimize utilization of pathology resources</i>	<ul style="list-style-type: none"> <li>• Recognizes that an isocitrate dehydrogenase mutant tumor does not need to have a repeat isocitrate dehydrogenase immunostain upon re-excision</li> <li>• Troubleshoots an alpha-thalassemia/mental retardation syndrome X-linked (ATRX) immunostain for appropriate internal control staining</li> </ul>
<b>Level 4</b> <i>Initiates efforts to optimize utilization</i>	<ul style="list-style-type: none"> <li>• Orders appropriate number and relevant immunostains for case</li> <li>• Counsels clinician about inappropriate testing for isocitrate dehydrogenase mutations in tumors other than diffuse gliomas</li> </ul>
<b>Level 5</b> <i>Completes a utilization review and implements change</i>	<ul style="list-style-type: none"> <li>• Implements policy change avoiding overuse of Ki-67 immunostain</li> </ul>
Assessment Models or Tools	<ul style="list-style-type: none"> <li>• Audit of testing usage</li> <li>• Direct observation</li> <li>• QI project</li> </ul>
Curriculum Mapping	<ul style="list-style-type: none"> <li>•</li> </ul>
Notes or Resources	<ul style="list-style-type: none"> <li>• Local coverage determination documents</li> <li>• Louis DN, Ohgaki H, Wiestler OD, Cavenee WK. <i>WHO Classification of Tumours of the Central Nervous System</i>. Revised 4th ed. World Health Organization; 2016. ISBN:9789283244929.</li> </ul>

<b>Practice-Based Learning and Improvement 1: Evidence-Based Practice and Scholarship</b> <b>Overall Intent:</b> To incorporate evidence into clinical practice and is involved in contributing to the body of knowledge in pathology	
Milestones	Examples
<p><b>Level 1</b> <i>Demonstrates how to access and select applicable evidence</i></p> <p><i>Is aware of the need for patient privacy, autonomy, and consent as applied to clinical research</i></p>	<ul style="list-style-type: none"> <li>● Recognizes that molecular testing is useful in the work-up for gliomas</li> <li>● Identifies the need for an Institutional Review Board (IRB) approval when collecting cases for a possible research project</li> </ul>
<p><b>Level 2</b> <i>Identifies and applies the best available evidence to guide diagnostic work-up of simple cases</i></p> <p><i>Develops knowledge of the basic principles of research (demographics, Institutional Review Board, human subjects), including how research is evaluated, explained to patients, and applied to patient care</i></p>	<ul style="list-style-type: none"> <li>● Orders a 1p-19q codeletion fluorescence in situ hybridization on a glioma to look for the molecular signature of oligodendroglioma</li> <li>● Completes necessary human subjects research training</li> <li>● Drafts an IRB protocol with attending oversight</li> </ul>
<p><b>Level 3</b> <i>Identifies and applies the best available evidence to guide diagnostic work-up of complex cases</i></p> <p><i>Applies knowledge of the basic principles of research such as informed consent and research protocols to clinical practice, with supervision</i></p>	<ul style="list-style-type: none"> <li>● Orders molecular testing (isocitrate dehydrogenase and ATRX studies) to further classify gliomas based on the 2016 World Health Organization criteria</li> <li>● Orders INI1 immunostains for all posterior fossa embryonal tumors in children, other than in desmoplastic medulloblastoma</li> <li>● Drafts an IRB protocol with minimal oversight</li> <li>● Submits an abstract for a national meeting</li> </ul>
<p><b>Level 4</b> <i>Critically appraises and applies evidence to guide care, even in the face of conflicting data</i></p> <p><i>Proactively and consistently applies knowledge of the basic principles of research such as informed consent and research protocols to clinical practice</i></p>	<ul style="list-style-type: none"> <li>● Appropriately researches the primary literature to explain BCOR alteration that is revealed by additional molecular testing in a neuroepithelial neoplasm</li> <li>● Independently writes the IRB protocol necessary to perform a research study</li> </ul>

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<p><b>Level 5</b> <i>Teaches others to critically appraise and apply evidence for complex cases and/or participates in the development of guidelines</i></p> <p><i>Suggests improvements to research regulations and/or substantially contributes to the primary literature through basic, translational, or clinical research</i></p>	<ul style="list-style-type: none"> <li>● Moderates a discussion with clinicians over disparate molecular, morphologic, and immunohistochemical findings of a tumor to formulate the best course forward based on the primary literature</li> <li>● Submits a research paper for publication</li> </ul>
<p>Assessment Models or Tools</p>	<ul style="list-style-type: none"> <li>● Direct observation</li> <li>● Oral or written examination</li> <li>● Presentation</li> <li>● Research portfolio</li> </ul>
<p>Curriculum Mapping</p>	<ul style="list-style-type: none"> <li>●</li> </ul>
<p>Notes or Resources</p>	<ul style="list-style-type: none"> <li>● Institutional IRB guidelines</li> <li>● U.S. National Library of Medicine. PubMed Tutorial. <a href="https://www.nlm.nih.gov/bsd/disted/pubmedtutorial/cover.html">https://www.nlm.nih.gov/bsd/disted/pubmedtutorial/cover.html</a>. 2020.</li> <li>● Various journal submission guidelines</li> </ul>

<b>Practice-Based Learning and Improvement 2: Reflective Practice and Commitment to Personal Growth</b> <b>Overall Intent:</b> To seek clinical performance information with the intent to improve care; reflects on all domains of practice, personal interactions, and behaviors, and their impact on technologists, colleagues and patients (if applicable) (reflective mindfulness); develop clear objectives and goals for improvement in some form of a learning plan	
Milestones	Examples
<p><b>Level 1</b> <i>Accepts responsibility for personal and professional development by establishing goals</i></p> <p><i>Identifies the gap(s) between expectations and actual performance</i></p> <p><i>Actively seeks opportunities to improve</i></p>	<ul style="list-style-type: none"> <li>● Aware of process of using Milestones for self-assessment</li> <li>● Can state personal learning goals</li> <li>● Does not blame others for personal failures</li>   <li>● Keeps a record of personal correct and incorrect diagnoses</li>   <li>● Begins to seek ways to determine where improvements are needed and makes some specific goals that are reasonable to execute and achieve</li> </ul>
<p><b>Level 2</b> <i>Demonstrates openness to receiving performance data and feedback in order to inform goals</i></p> <p><i>Analyzes and reflects on the factors which contribute to gap(s) between expectations and actual performance</i></p> <p><i>Designs and implements a learning plan, with supervision</i></p>	<ul style="list-style-type: none"> <li>● Upon receiving feedback about inadequate sampling on autopsy, works with attending to develop better approach for sampling</li>   <li>● Realizes that turnaround time is negatively impacted by improper ordering of immunohistochemical stains</li>   <li>● Recognizes deficiency in knowledge of pituitary adenomas and develops a reading plan with an advisor</li> </ul>
<p><b>Level 3</b> <i>Seeks performance data and feedback with humility</i></p> <p><i>Institutes behavioral change(s) to narrow the gap(s) between expectations and actual performance</i></p> <p><i>Independently creates and implements a learning plan</i></p>	<ul style="list-style-type: none"> <li>● Asks the attending if their sampling of an autopsy was appropriate</li>   <li>● Changes approach to ordering immunohistochemical stains to decrease the turnaround time</li>   <li>● Develops a reading plan to improve knowledge of meningioma molecular alterations</li> </ul>
<p><b>Level 4</b> <i>Actively and consistently seeks performance data and feedback with humility</i></p>	<ul style="list-style-type: none"> <li>● Regularly reviews final autopsy reports to identify substantial changes from the draft report</li> </ul>

<p><i>Critically evaluates the effectiveness of behavioral changes in narrowing the gap(s) between expectations and actual performance</i></p> <p><i>Uses performance data to measure the effectiveness of the learning plan and improves it when necessary</i></p>	<ul style="list-style-type: none"> <li>● After reading more on cortical dysplasia, alters the histologic evaluation and reviews final reports for improved accuracy</li> <li>● Alters learning plan following low score in infectious disease section of NPISE</li> </ul>
<p><b>Level 5 Models seeking performance data and accepting feedback with humility</b></p> <p><i>Coaches others in reflective practice</i></p> <p><i>Facilitates the design and implementation of learning plans for others</i></p>	<ul style="list-style-type: none"> <li>● Presents own errors at quality assurance conference and solicits feedback for improvement</li> <li>● Encourages other learners on the team to consider how their behavior affects the rest of the team</li> <li>● Guides other learners in creating a learning plan</li> </ul>
<p>Assessment Models or Tools</p>	<ul style="list-style-type: none"> <li>● Direct observation</li> <li>● NPISE</li> <li>● Review of learning plan</li> </ul>
<p>Curriculum Mapping</p>	<ul style="list-style-type: none"> <li>●</li> </ul>
<p>Notes or Resources</p>	<ul style="list-style-type: none"> <li>● Burke AE, Benson B, Englander R, Carraccio C, Hicks PJ. Domain of competence: practice-based learning and improvement. <i>Acad Pediatr.</i> 2014;14: S38-S54. <a href="https://www.academicpedsjnl.net/article/S1876-2859(13)00333-1/fulltext">https://www.academicpedsjnl.net/article/S1876-2859(13)00333-1/fulltext</a>. 2020.</li> <li>● Hojat M, Veloski JJ, Gonnella JS. Measurement and correlates of physicians' lifelong learning. <i>Academic Medicine.</i> 2009;84(8):1066-1074. <a href="https://journals.lww.com/academicmedicine/fulltext/2009/08000/Measurement_and_Correlates_of_Physicians_Lifelong.21.aspx">https://journals.lww.com/academicmedicine/fulltext/2009/08000/Measurement_and_Correlates_of_Physicians_Lifelong.21.aspx</a>. 2020.</li> <li>● Lockspeiser TM, Schmitter PA, Lane JL, Hanson JL, Rosenberg AA, Park YS. Assessing residents' written learning goals and goal writing skill: validity evidence for the learning goal scoring rubric. <i>Academic Medicine.</i> 2013;88(10):1558-1563. <a href="https://journals.lww.com/academicmedicine/fulltext/2013/10000/Assessing_Residents_Written_Learning_Goals_and.39.aspx">https://journals.lww.com/academicmedicine/fulltext/2013/10000/Assessing_Residents_Written_Learning_Goals_and.39.aspx</a>. 2020.</li> </ul>

<b>Professionalism 1: Professional Behavior and Ethical Principles</b>	
<b>Overall Intent:</b> To recognize and address lapses in ethical and professional behavior, demonstrates ethical and professional behaviors, and use appropriate resources for managing ethical and professional dilemmas	
<b>Milestones</b>	<b>Examples</b>
<p><b>Level 1</b> <i>Demonstrates knowledge of the ethical principles underlying informed consent, surrogate decision making, advance directives, confidentiality, error disclosure, stewardship of limited resources, and related topics</i></p> <p><i>Describes when and how to appropriately report professionalism lapses, including strategies for addressing common barriers; identifies and describes potential triggers for professionalism lapses</i></p>	<ul style="list-style-type: none"> <li>● Discusses the basic principles of beneficence, nonmaleficence, justice, and autonomy and how they apply when performing research studies using patient tissues</li> <li>● Evaluates autopsy consent forms for completeness and accuracy</li> <li>● Identifies stress and fatigue as potential triggers for professionalism lapses</li> <li>● Demonstrates awareness of institutional reporting system for disruptive physicians</li> <li>● Demonstrates awareness of Title IX reporting responsibilities</li> </ul>
<p><b>Level 2</b> <i>Analyzes straightforward situations using ethical principles</i></p> <p><i>Demonstrates insight into professional behavior in routine situations; takes responsibility for own professionalism lapses</i></p>	<ul style="list-style-type: none"> <li>● Demonstrates professional behavior in routine situations, uses ethical principles to analyze straightforward situations, and can acknowledge a lapse without becoming defensive, making excuses, or blaming others</li> <li>● Apologizes when late for a meeting and identifies behaviors to prevent future occurrence</li> <li>● Monitors and responds to fatigue, hunger, stress, etc. in self and team members</li> <li>● Recognizes and responds effectively to the emotions of others</li> </ul>
<p><b>Level 3</b> <i>Recognizes the need and uses relevant resources to seek help in managing and resolving complex ethical situations</i></p> <p><i>Demonstrates professional behavior in complex or stressful situations</i></p>	<ul style="list-style-type: none"> <li>● Identifies sources of conflict with fellow colleague and seeks counsel for future interactions</li> <li>● Calmly and collegially interacts with surgeon who challenges the frozen section diagnosis</li> </ul>
<p><b>Level 4</b> <i>Independently resolves and manages complex ethical situations</i></p> <p><i>Recognizes situations that may trigger professionalism lapses and intervenes to prevent lapses in self and others</i></p>	<ul style="list-style-type: none"> <li>● Recognizes that a faculty member is using outdated diagnostic guidelines and respectfully brings to the faculty members attention</li> <li>● Recognizes the challenges of necessary but expensive ancillary testing and coordinates funding options with laboratory staff in a collegial fashion</li> <li>● Identifies abusive behavior in fellow colleague and intervenes to defuse the situation</li> </ul>

<p><b>Level 5</b> <i>Identifies and seeks to address system-level factors that induce or exacerbate ethical problems or impede their resolution</i></p> <p><i>Coaches others when their behavior fails to meet professional expectations</i></p>	<ul style="list-style-type: none"> <li>• Participates as a member of the hospital ethics committee</li> <li>• Coaches colleague with abusive behavior to identify their triggers for the behavior</li> </ul>
<p>Assessment Models or Tools</p>	<ul style="list-style-type: none"> <li>• Direct observation</li> <li>• Global evaluation</li> <li>• Multisource feedback</li> <li>• Oral or written self-reflection (e.g., of a personal or observed lapse, ethical dilemma, or systems-level factors)</li> <li>• Simulation</li> </ul>
<p>Curriculum Mapping</p>	<ul style="list-style-type: none"> <li>•</li> </ul>
<p>Notes or Resources</p>	<ul style="list-style-type: none"> <li>• American Medical Association. Ethics. <a href="https://www.ama-assn.org/delivering-care/ama-code-medical-ethics">https://www.ama-assn.org/delivering-care/ama-code-medical-ethics</a>. 2020.</li> <li>• Brissette MD, Johnson K, Raciti PM, et al. Perceptions of unprofessional attitudes and behaviors: implications for faculty role modeling and teaching professionalism during pathology residency. <i>Arch Pathol Lab Med</i>. 2017;141:1349-1401. <a href="https://www.archivesofpathology.org/doi/10.5858/arpa.2016-0477-CP">https://www.archivesofpathology.org/doi/10.5858/arpa.2016-0477-CP</a>. 2020.</li> <li>• Byyny RL, Paauw DS, Papadakis MA, Pfeil, S. <i>Medical Professionalism Best Practices: Professionalism in the Modern Era</i>. Menlo Park, CA: Alpha Omega Alpha Medical Society; 2017. <a href="http://alphaomegalpha.org/pdfs/Monograph2018.pdf">http://alphaomegalpha.org/pdfs/Monograph2018.pdf</a>. 2020.</li> <li>• Byyny RL, Papadakis MA, Paauw DS. <i>Medical Professionalism Best Practices</i>. Menlo Park, CA: Alpha Omega Alpha Medical Society; 2015. <a href="https://alphaomegalpha.org/pdfs/2015MedicalProfessionalism.pdf">https://alphaomegalpha.org/pdfs/2015MedicalProfessionalism.pdf</a>. 2020.</li> <li>• Conran RM, Powell SZ, Domen RE, et al. Development of professionalism in graduate medical education: a case-based educational approach from the College of American Pathologists' Graduate Medical Education Committee. 2018;5: 2374289518773493. <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6039899/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6039899/</a>. 2020.</li> <li>• Domen RE, Johnson K, Conran RM, et al. Professionalism in pathology: a case-based approach as a potential education tool. <i>Arch Pathol Lab Med</i>. 2017;141:215-219. <a href="https://www.archivesofpathology.org/doi/10.5858/arpa.2016-0217-CP?url_ver=Z39.88-2003&amp;rfr_id=ori:rid:crossref.org&amp;rfr_dat=cr_pub%3dpubmed">https://www.archivesofpathology.org/doi/10.5858/arpa.2016-0217-CP?url_ver=Z39.88-2003&amp;rfr_id=ori:rid:crossref.org&amp;rfr_dat=cr_pub%3dpubmed</a>. 2020.</li> <li>• Domen RE, Talbert ML, Johnson K, et al. Assessment and management of professionalism issues in pathology residency training: results from surveys and a workshop by the graduate medical education committee of the College of American</li> </ul>

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<b>Professionalism 2: Accountability and Conscientiousness</b>	
<b>Overall Intent:</b> To take responsibility for one’s own actions and the impact on other members of the health care team and patients	
<b>Milestones</b>	<b>Examples</b>
<b>Level 1</b> <i>Responds promptly to instructions, requests, or reminders to complete tasks and responsibilities</i>	<ul style="list-style-type: none"> <li>● Responds promptly to reminders from program administrator to complete work hour logs</li> <li>● Timely and regular attendance at conferences</li> <li>● Responds promptly to requests to complete preliminary anatomic diagnosis report on an autopsy</li> <li>● Complies with institutional requirements for vaccines</li> </ul>
<b>Level 2</b> <i>Takes ownership and performs tasks and responsibilities in a timely manner with attention to detail</i>	<ul style="list-style-type: none"> <li>● Completes autopsy reports in a timely manner and recognizes issues that may cause delays in completing the autopsy report</li> <li>● Completes surgical neuropathology cases in a timely manner including appropriate reporting of all immunohistochemical stains</li> <li>● Completes and documents safety modules, procedure review, and licensing requirements</li> <li>● Accepts responsibility for failure to order appropriate stains and requests for molecular testing</li> </ul>
<b>Level 3</b> <i>Recognizes situations that may impact own ability to complete tasks and responsibilities in a timely manner and describes the impact on team</i>	<ul style="list-style-type: none"> <li>● Notifies attending of multiple competing demands on a busy day, appropriately triages tasks, and asks for assistance from other residents or faculty members, if needed</li> </ul>
<b>Level 4</b> <i>Anticipates and intervenes in situations that may impact others’ ability to complete tasks and responsibilities in a timely manner</i>	<ul style="list-style-type: none"> <li>● Advises residents how to manage their time in completing reports</li> <li>● Takes responsibility for potential adverse outcomes from mishandled specimen and professionally discusses with the interprofessional team</li> </ul>
<b>Level 5</b> <i>Takes ownership of system outcomes, and implements new strategies when necessary</i>	<ul style="list-style-type: none"> <li>● Sets up a meeting with the lead technologist to streamline a testing algorithm and follows through with a system-based solution</li> <li>● Leads team to find solutions to delays in placing requests and/or sending out tissue for molecular testing</li> </ul>
Assessment Models or Tools	<ul style="list-style-type: none"> <li>● Compliance with deadlines and timelines</li> <li>● Direct observation</li> <li>● Multisource feedback</li> <li>● Quality metrics of turnaround time on cases</li> <li>● Self-evaluations and reflective tools</li> <li>● Simulation</li> </ul>
Curriculum Mapping	<ul style="list-style-type: none"> <li>●</li> </ul>
Notes or Resources	<ul style="list-style-type: none"> <li>● AMA. Ethics. <a href="https://www.ama-assn.org/delivering-care/ethics">https://www.ama-assn.org/delivering-care/ethics</a>. 2020.</li> </ul>

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- Byyny RL, Papadakis MA, Paauw DS. *Medical Professionalism Best Practices*. Menlo Park, CA: Alpha Omega Alpha Medical Society; 2015. <https://alphaomegalpha.org/pdfs/2015MedicalProfessionalism.pdf>. 2020.
- Code of conduct from fellow/resident institutional manual
- Expectations of fellowship program regarding accountability and professionalism

<b>Professionalism 3: Self-Awareness and Help-Seeking</b> <b>Overall Intent:</b> To identify, use, manage, improve, and seek help for personal and professional well-being for self and others	
Milestones	Examples
<p><b>Level 1</b> <i>Recognizes limitations in the knowledge/skills/ behaviors of self or team, with assistance</i></p> <p><i>Recognizes status of personal and professional well-being, with assistance</i></p>	<ul style="list-style-type: none"> <li>● Accepts feedback and exhibits appreciative responses to criticism</li> </ul>
<p><b>Level 2</b> <i>Independently recognizes limitations in the knowledge/skills/ behaviors of self or team and seeks help when needed</i></p> <p><i>Independently recognizes status of personal and professional well-being and seeks help when needed</i></p>	<ul style="list-style-type: none"> <li>● Identifies possible sources of personal stress or lack of clinical knowledge and independently seeks help</li> </ul>
<p><b>Level 3</b> <i>Proposes and implements a plan to remediate or improve the knowledge/skills/behaviors of self or team, with assistance</i></p> <p><i>Proposes and implements a plan to optimize personal and professional well-being, with assistance</i></p>	<ul style="list-style-type: none"> <li>● Works with program director to develop a plan to promote wellness of other learners</li> </ul>
<p><b>Level 4</b> <i>Independently develops and implements a plan to remediate or improve the knowledge/skills/ behaviors of self or team</i></p> <p><i>Independently develops and implements a plan to optimize personal and professional well-being</i></p>	<ul style="list-style-type: none"> <li>● Independently develops personal plan to limit stress and burnout for self or team</li> </ul>
<p><b>Level 5</b> <i>Serves as a resource or consultant for developing a plan to remediate or improve the knowledge/ skills/behaviors</i></p> <p><i>Coaches others when responses or limitations in knowledge/skills do not meet professional expectations</i></p>	<ul style="list-style-type: none"> <li>● After a natural disaster, coaches fellows in resilience</li> </ul>

Assessment Models or Tools	<ul style="list-style-type: none"> <li>● Direct observation</li> <li>● Group interview or discussions for team activities</li> <li>● Individual interview</li> <li>● Institutional online training modules</li> <li>● Participation in institutional well-being programs</li> <li>● Self-assessment and personal learning plan</li> </ul>
Curriculum Mapping	<ul style="list-style-type: none"> <li>●</li> </ul>
Notes or Resources	<ul style="list-style-type: none"> <li>● ACGME. Tools and Resources. <a href="https://www.acgme.org/What-We-Do/Initiatives/Physician-Well-Being/Resources">https://www.acgme.org/What-We-Do/Initiatives/Physician-Well-Being/Resources</a>. 2020.</li> <li>● Conran RM, Powell SZ, Domen RE, et al. Development of professionalism in graduate medical education: a case-based educational approach from the College of American Pathologists' Graduate Medical Education Committee. <i>Acad Pathol</i>. 2018;5:2374289518773493. <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6039899/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6039899/</a>. 2020.</li> <li>● Hicks PJ, Schumacher D, Guralnick S, Carraccio C, Burke AE. Domain of competence: personal and professional development. <i>Acad Pediatr</i>. 2014;14(2 Suppl):S80-97. <a href="https://linkinghub.elsevier.com/retrieve/pii/S1876-2859(13)00332-X">https://linkinghub.elsevier.com/retrieve/pii/S1876-2859(13)00332-X</a>. 2020.</li> <li>● Joseph L, Shaw PF, Smoller BR. Perceptions of stress among pathology residents: survey results and some strategies to reduce them. <i>Am J Clin Pathol</i>. 2007;128(6):911-919. <a href="https://academic.oup.com/ajcp/article/128/6/911/1764982">https://academic.oup.com/ajcp/article/128/6/911/1764982</a>. 2020.</li> <li>● Local resources, including Employee Assistance Program</li> </ul>

<b>Interpersonal and Communication Skills 1: Patient- and Family-Centered Communication</b>	
<b>Overall Intent:</b> To deliberately use language and behaviors to form constructive relationships with patients, to identify communication barriers including self-reflection on biases, and minimize them in the doctor-patient relationships; organize and lead communication around shared decision making	
<b>Milestones</b>	<b>Examples</b>
<p><b>Level 1</b> <i>Uses language and nonverbal behavior to demonstrate respect and establish rapport</i></p> <p><i>Identifies common barriers to effective communication (e.g., language, disability) while accurately communicating own role within the health care system</i></p>	<ul style="list-style-type: none"> <li>● Avoids medical jargon when discussing an autopsy report with families; makes sure communication is at the appropriate level to be understood by a layperson</li> <li>● Self-monitors and controls tone, non-verbal responses, and language and asks questions to invite patient/family participation</li> <li>● Identifies when an interpreter is necessary</li> </ul>
<p><b>Level 2</b> <i>Establishes a relationship in straightforward encounters using active listening and clear language</i></p> <p><i>Identifies complex barriers to effective communication (e.g., health literacy)</i></p>	<ul style="list-style-type: none"> <li>● Understands that when sharing autopsy results, selected words may have a negative impact on family members</li> <li>● Identifies alternative materials to explain complex neuropathologic diagnoses</li> </ul>
<p><b>Level 3</b> <i>Sensitively and compassionately delivers medical information, with supervision</i></p> <p><i>When prompted, reflects on biases while attempting to minimize communication barriers</i></p>	<ul style="list-style-type: none"> <li>● With coaching, compassionately discusses the finding of a brain tumor with a patient as part of the family meeting</li> <li>● When prompted, recognizes bias towards certain ethnic groups in assuming lack of English fluency</li> </ul>
<p><b>Level 4</b> <i>Independently, sensitively, and compassionately delivers medical information and acknowledges uncertainty and conflict</i></p> <p><i>Independently recognizes biases while attempting to proactively minimize communication barriers</i></p>	<ul style="list-style-type: none"> <li>● Compassionately discusses the finding of a brain tumor with a patient as part of the family meeting</li> <li>● Independently recognizes bias towards certain ethnic groups in assuming a limited medical literacy, and in future patient or family conversations, asks questions to assess medical literacy</li> </ul>
<p><b>Level 5</b> <i>Mentors others in the sensitive and compassionate delivery of medical information</i></p>	<ul style="list-style-type: none"> <li>● Leads the sharing of autopsy findings in the face of family anger</li> </ul>

<p><i>Models self-awareness while teaching a contextual approach to minimize communication barriers</i></p>	
<p>Assessment Models or Tools</p>	<ul style="list-style-type: none"> <li>● Direct observation</li> <li>● Self-assessment including self-reflection exercises</li> <li>● Simulation</li> </ul>
<p>Curriculum Mapping</p>	<ul style="list-style-type: none"> <li>●</li> </ul>
<p>Notes or Resources</p>	<ul style="list-style-type: none"> <li>● Dintzis SM. Improving pathologist’s communication skills. <i>AMA J Ethics</i>. 2016;18(8):802-808. <a href="https://journalofethics.ama-assn.org/article/improving-pathologists-communication-skills/2016-08">https://journalofethics.ama-assn.org/article/improving-pathologists-communication-skills/2016-08</a>. 2020.</li> <li>● Dintzis SM, Stetsenko GY, Sitlani CM, et al. Communicating pathology and laboratory errors: anatomic pathologists’ and laboratory medical directors’ attitudes and experiences. <i>Am J Clin Pathol</i>. 2011;135(5):760-765. <a href="https://academic.oup.com/ajcp/article/135/5/760/1766306">https://academic.oup.com/ajcp/article/135/5/760/1766306</a>. 2020.</li> <li>● Laidlaw A, Hart J. Communication skills: an essential component of medical curricula. Part I: Assessment of clinical communication: AMEE Guide No. 51. <i>Med Teach</i>. 2011;33(1):6-8. <a href="https://www.tandfonline.com/doi/full/10.3109/0142159X.2011.531170">https://www.tandfonline.com/doi/full/10.3109/0142159X.2011.531170</a>. 2020.</li> <li>● Makoul G. Essential elements of communication in medical encounters: the Kalamazoo consensus statement. <i>Acad Med</i>. 2001;76(4):390-393. <a href="https://journals.lww.com/academicmedicine/Fulltext/2001/04000/Essential_Elements_of_Communication_in_Medical.21.aspx#pdf-link">https://journals.lww.com/academicmedicine/Fulltext/2001/04000/Essential Elements of Communication in Medical.21.aspx#pdf-link</a>. 2020.</li> <li>● Makoul G. The SEGUE Framework for teaching and assessing communication skills. <i>Patient Educ Couns</i>. 2001;45(1):23-34. <a href="https://www.sciencedirect.com/science/article/abs/pii/S0738399101001367?via%3Dihub">https://www.sciencedirect.com/science/article/abs/pii/S0738399101001367?via%3Dihub</a>. 2020.</li> <li>● Symons AB, Swanson A, McGuigan D, Orrange S, Akl EA. A tool for self-assessment of communication skills and professionalism in residents. <i>BMC Med Educ</i>. 2009;9:1. <a href="https://bmcmmededuc.biomedcentral.com/articles/10.1186/1472-6920-9-1">https://bmcmmededuc.biomedcentral.com/articles/10.1186/1472-6920-9-1</a>. 2020.</li> </ul>

<b>Interpersonal and Communication Skills 2: Interprofessional and Team Communication</b> <b>Overall Intent:</b> To effectively communicate with the health care team (e.g., laboratory team, resident/fellow team, faculty/resident team, interdisciplinary care team, other functioning team in the program), including both inter- and intra-departmental and consultants, in both straightforward and complex situations	
Milestones	Examples
<p><b>Level 1</b> <i>Uses language that values all members of the health care team</i></p> <p><i>Describes the utility of constructive feedback</i></p>	<ul style="list-style-type: none"> <li>● Shows respect in health care team communications through words and actions such as in requests for intra-operative consultation</li> <li>● Uses respectful communication with all clerical and technical staff</li> <li>● Listens to and considers others' points of view, is nonjudgmental and actively engaged, and demonstrates humility</li> </ul>
<p><b>Level 2</b> <i>Communicates information effectively with all health care team members</i></p> <p><i>Solicits feedback on performance as a member of the health care team</i></p>	<ul style="list-style-type: none"> <li>● Uses closed-loop communications by restating frozen section diagnosis and follows up with surgeon</li> <li>● Demonstrates active listening by fully focusing on the speaker</li> <li>● Communicates clearly and concisely in an organized and timely manner during consultant encounters, as well as with the health care team in general</li> <li>● Seeks feedback at sign-out</li> </ul>
<p><b>Level 3</b> <i>Uses active listening to adapt communication style to fit team needs</i></p> <p><i>Integrates feedback from team members to improve communication</i></p>	<ul style="list-style-type: none"> <li>● Adapts communication style to meet the needs of distinct surgical teams</li> <li>● Notifies clinicians when a case will be presented in an upcoming neuromuscular pathology conference per request</li> </ul>
<p><b>Level 4</b> <i>Coordinates recommendations from different members of the health care team to optimize patient care</i></p> <p><i>Communicates feedback and constructive criticism to superiors</i></p>	<ul style="list-style-type: none"> <li>● Synthesizes multiple opinions from consultants to create a case work-up plan</li> <li>● Sets up a meeting with the attending to request more face-to-face time to discuss cases to improve learning</li> </ul>
<p><b>Level 5</b> <i>Models flexible communication strategies that value input from all health care team members, resolving conflict when needed</i></p> <p><i>Facilitates regular health care team-based feedback in complex situations</i></p>	<ul style="list-style-type: none"> <li>● Organizes a team meeting to discuss and resolve conflicting points of view on the best methodology for assessment of co-deletion of chromosome arms 1p/19q</li> </ul>
<p><b>Assessment Models or Tools</b></p>	<ul style="list-style-type: none"> <li>● Direct observation</li> </ul>

	<ul style="list-style-type: none"> <li>● Global assessment</li> <li>● Multi-source feedback</li> <li>● Record or chart review for professionalism and accuracy in written communications</li> <li>● Simulation encounters</li> </ul>
Curriculum Mapping	<ul style="list-style-type: none"> <li>●</li> </ul>
Notes or Resources	<ul style="list-style-type: none"> <li>● Brissette MD, Johnson K, Raciti PM, et al. Perceptions of unprofessional attitudes and behaviors: implications for faculty role modeling and teaching professionalism during pathology residency. <i>Arch Pathol Lab Med</i>. 2017;141:1394-1401. <a href="https://www.archivesofpathology.org/doi/10.5858/arpa.2016-0477-CP">https://www.archivesofpathology.org/doi/10.5858/arpa.2016-0477-CP</a>. 2020.</li> <li>● Conran RM, Powell SZ, Domen RE, et al. Development of professionalism in graduate medical education: a case-based educational approach from the College of American Pathologists' Graduate Medical Education Committee. 2018;5: 2374289518773493. <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6039899/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6039899/</a>. 2020.</li> <li>● Green M, Parrott T, Cook G., Improving your communication skills. <i>BMJ</i>. 2012;344:e357. <a href="https://www.bmj.com/content/344/bmj.e357">https://www.bmj.com/content/344/bmj.e357</a>. 2020.</li> <li>● Henry SG, Holmboe ES, Frankel RM. Evidence-based competencies for improving communication skills in graduate medical education: a review with suggestions for implementation. <i>Med Teach</i>. 2013;35(5):395-403. <a href="https://www.tandfonline.com/doi/full/10.3109/0142159X.2013.769677">https://www.tandfonline.com/doi/full/10.3109/0142159X.2013.769677</a>. 2020.</li> <li>● Nakhleh RE, Myers JL, Allen TC, et al. Consensus statement on effective communication of urgent diagnoses and significant, unexpected diagnoses in surgical pathology and cytopathology from the College of American Pathologists and Association of Directors of Anatomic and Surgical Pathology. <i>Arch Pathol Lab Med</i>. 2012;136(2):148-154. <a href="https://www.archivesofpathology.org/doi/10.5858/arpa.2011-0400-SA?url_ver=Z39.88-2003&amp;rfr_id=ori:rid:crossref.org&amp;rfr_dat=cr_pub%3dpubmed">https://www.archivesofpathology.org/doi/10.5858/arpa.2011-0400-SA?url_ver=Z39.88-2003&amp;rfr_id=ori:rid:crossref.org&amp;rfr_dat=cr_pub%3dpubmed</a>. 2020.</li> <li>● Roth CG, Eldin KW, Padmanabhan V, Freidman EM. Twelve tips for the introduction of emotional intelligence in medical education. <i>Med Teach</i>. 2019;41(7):1-4. <a href="https://www.tandfonline.com/doi/full/10.1080/0142159X.2018.1481499">https://www.tandfonline.com/doi/full/10.1080/0142159X.2018.1481499</a>. 2020.</li> </ul>

<b>Interpersonal and Communication Skills 3: Communication within Health Care Systems</b> <b>Overall Intent:</b> To effectively communicate using a variety of methods	
Milestones	Examples
<p><b>Level 1</b> <i>Safeguards patient personal health information by communicating through appropriate means as required by institutional policy (e.g., patient safety reports, cell phone/pager usage)</i></p> <p><i>Identifies institutional and departmental structure for communication of issues</i></p>	<ul style="list-style-type: none"> <li>● Identifies when it is acceptable to include protected health information (PHI) in various forms of communication</li> <li>● Identifies key personnel with authority to send PHI via fax</li> </ul>
<p><b>Level 2</b> <i>Selects forms of communication based on context and urgency of the situation</i></p> <p><i>Respectfully communicates concerns about the system</i></p>	<ul style="list-style-type: none"> <li>● Understands need to call a clinician with an urgent result instead of using email</li> <li>● Discusses with laboratory manager sources of error when hand labeling slides</li> </ul>
<p><b>Level 3</b> <i>Communicates while ensuring security of personal health information, with supervision</i></p> <p><i>Uses institutional structure to effectively communicate clear and constructive suggestions to improve the system</i></p>	<ul style="list-style-type: none"> <li>● Uses required institutional encrypted email</li> <li>● Calls a clinician with an urgent result</li> <li>● Notifies Information Technology (IT) about opportunities for improvement in the pathology/EHR interface</li> </ul>
<p><b>Level 4</b> <i>Independently communicates while ensuring security of personal health information</i></p> <p><i>Initiates conversations on difficult subjects with appropriate stakeholders to improve the system</i></p>	<ul style="list-style-type: none"> <li>● Talks directly to a colleague about breakdowns in communication in order to prevent recurrence</li> <li>● Improves methods for communicating case readiness for discussion at multidisciplinary conference</li> </ul>
<p><b>Level 5</b> <i>Guides departmental or institutional communication around policies and procedures regarding the security of personal health information</i></p> <p><i>Facilitates dialogue regarding systems issues among larger community stakeholders (institution, health care system, field)</i></p>	<ul style="list-style-type: none"> <li>● Leads a task force established by the hospital QI committee to develop a plan to improve protection of PHI sent by fax</li> </ul>
<p><b>Assessment Models or Tools</b></p>	<ul style="list-style-type: none"> <li>● Chart review for documented communications</li> </ul>

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	<ul style="list-style-type: none"><li>• Direct observation</li><li>• Multisource feedback</li></ul>
Curriculum Mapping	<ul style="list-style-type: none"><li>•</li></ul>
Notes or Resources	<ul style="list-style-type: none"><li>• Haig KM, Sutton S, Whittington J. SBAR: a shared mental model for improving communication between clinicians. <i>Jt Comm J Qual Patient Saf.</i> 2006;32(3):167-175. <a href="https://www.jointcommissionjournal.com/article/S1553-7250(06)32022-3/fulltext">https://www.jointcommissionjournal.com/article/S1553-7250(06)32022-3/fulltext</a>. 2020.</li></ul>

To help programs transition to the new version of the Milestones, the original Milestones 1.0 have been mapped to the new Milestones 2.0. Below it is indicated where the subcompetencies are similar between versions. These are not exact matches but include some of the same elements. Not all subcompetencies map between versions. Inclusion or exclusion of any subcompetency does not change the educational value or impact on curriculum or assessment.

Milestones 1.0	Milestones 2.0
PC1: Procedure: Autopsy (General)	PC1: Autopsy
PC2: Procedure: Autopsy (Gross)	PC1: Autopsy
PC3: Procedure: Autopsy (Microscopic and reporting)	PC1: Autopsy PC4: Reporting
PC4: Procedure: Surgical (Gross)	PC2: Neuropathology
PC5: Procedure: Surgical (Microscopic and reporting)	PC2: Neuropathology PC4: Reporting
PC6: Procedure: Intra-operative Consultation	PC3: Intra-Operative Consultation, including Frozen Section
MK1: Diagnostic Knowledge	MK1: Diagnostic Knowledge
MK2: Teaching	MK2: Neuropathology Instruction
No match	MK2: Clinical Reasoning
SBP1: Regulatory	SBP4: Accreditation, Compliance, and Quality
SBP2: Health Care Teams	SBP2: Systems Navigation for Patient-Centered Care ICS2: Interprofessional and Team Communication
SBP3: Lab Management: Resource Utilization (personnel and finance)	PBL1: Evidence Based Practice and Scholarship SBP5: Utilization
PBL1: Evidence-based Utilization	SBP3: Physicians Role in Health Care Systems SBP5: Utilization
PBLI2: Process Improvement and Patient Safety	SBP1: Patient Safety and Quality Improvement
PBLI3: Scholarly Activity	PBL1: Evidence Based Practice and Scholarship
PROF1: Receiving and Providing Feedback	PBLI2: Reflective Practice and Commitment to Personal Growth
PROF2: Accountability, Honesty, and Integrity	PROF1: Professional Behavior and Ethical Principles PROF2: Accountability and Conscientiousness PROF3: Self-Awareness and Help Seeking
PROF3: Cultural Competency	SBP2: Systems Navigation for Patient-Centered Care ICS1: Patient and Family-Centered Communication
No Match	PROF3: Self Awareness and Help-Seeking
ICS1: Communication with Health Care Providers, Families, and Patients	ICS1: Patient and Family-Centered Communication ICS2: Interprofessional and Team Communication
ICS2: Personnel Management and Conflict Resolution	ICS2: Interprofessional and Team Communication

No Match	ICS3: Communication within the Health Care System
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### Available Milestones Resources

*Milestones 2.0: Assessment, Implementation, and Clinical Competency Committees Supplement, 2021* - <https://meridian.allenpress.com/jgme/issue/13/2s>

*Milestones Guidebooks:* <https://www.acgme.org/milestones/resources/>

- *Assessment Guidebook*
- *Clinical Competency Committee Guidebook*
- *Clinical Competency Committee Guidebook Executive Summaries*
- *Implementation Guidebook*
- *Milestones Guidebook*

*Milestones Guidebook for Residents and Fellows:* <https://www.acgme.org/residents-and-fellows/the-acgme-for-residents-and-fellows/>

- *Milestones Guidebook for Residents and Fellows*
- *Milestones Guidebook for Residents and Fellows Presentation*
- *Milestones 2.0 Guide Sheet for Residents and Fellows*

*Milestones Research and Reports:* <https://www.acgme.org/milestones/research/>

- *Milestones National Report*, updated each fall
- *Milestones Predictive Probability Report*, updated each fall
- *Milestones Bibliography*, updated twice each year

*Developing Faculty Competencies in Assessment courses* - <https://www.acgme.org/meetings-and-educational-activities/courses-and-workshops/developing-faculty-competencies-in-assessment/>

Assessment Tool: Direct Observation of Clinical Care (DOCC) - <https://dl.acgme.org/pages/assessment>

Assessment Tool: Teamwork Effectiveness Assessment Module (TEAM) - <https://team.acgme.org/>

Improving Assessment Using Direct Observation Toolkit - <https://dl.acgme.org/pages/acgme-faculty-development-toolkit-improving-assessment-using-direct-observation>

Remediation Toolkit - <https://dl.acgme.org/courses/acgme-remediation-toolkit>

Learn at ACGME has several courses on Assessment and Milestones - <https://dl.acgme.org/>