

NeuroTrace Study Guide

Domain: Domain III – EEG Patterns & Clinical Correlation

Section: Focal vs Generalized EEG Patterns

Style: Classification-focused, applied, exam-oriented

1. Core Principles (Must Know)

Classification by Distribution

- **EEG abnormalities are classified by distribution** (focal vs generalized)
- Distribution is fundamental to interpretation
- Determines localization and etiology
- Guides clinical correlation

Distribution Guides

- **Localization** (where the abnormality is)
- **Etiology** (what causes it)
- **Clinical correlation** (what it means clinically)
- **Treatment decisions** (how to manage it)

Key Principle

- **Distribution is as important as morphology**
- Must classify by distribution before interpreting
- Focal and generalized have different implications
- Correct classification is essential

Practical Application

- Always classify distribution first
 - Use distribution to guide interpretation
 - Understand implications of focal vs generalized
 - Apply localization logic correctly
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2. Focal EEG Abnormalities

Definition

- **Limited to one region or hemisphere**
- Localized to specific brain area
- May be unilateral or asymmetric
- Suggests focal pathology

Common Findings

Focal Slowing

- **Theta or delta activity** over specific region
- Localized to one lobe or hemisphere
- Suggests focal cortical dysfunction
- Often indicates structural pathology

Focal Epileptiform Discharges

- **Spikes or sharp waves** over specific region
- Localized to one area
- Suggests focal cortical irritability
- May guide surgical planning

Focal Attenuation

- **Reduced amplitude** over specific region
- Localized amplitude reduction
- Suggests focal cortical dysfunction
- May indicate structural lesion

Clinical Significance

- **Often indicate structural pathology** (lesion, scar, etc.)
- May guide imaging studies (MRI, CT)
- Important for surgical planning
- Suggests focal epilepsy

ABRET Emphasis

- **Focal slowing strongly suggests cortical dysfunction**
- Must localize accurately
- Focal patterns warrant structural evaluation
- Localization guides clinical management

Common Locations

- **Temporal:** Most common (temporal lobe epilepsy)
 - **Frontal:** Second most common
 - **Parietal/Occipital:** Less common
 - **Rolandic:** Benign rolandic epilepsy (children)
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3. Generalized EEG Abnormalities

Definition

- **Involve both hemispheres simultaneously**
- Bilateral, synchronous (or nearly synchronous)
- Widespread distribution
- Suggests diffuse or systemic process

Common Findings

Generalized Slowing

- **Diffuse theta or delta activity**
- Bilateral, symmetric (or asymmetric)
- Suggests diffuse cortical dysfunction
- Often indicates metabolic or toxic cause

Generalized Spike-and-Wave

- **Bilateral, synchronous spike-and-wave**
- Generalized distribution
- Suggests generalized epilepsy syndromes
- Idiopathic generalized epilepsy (IGE)

Generalized Attenuation

- **Reduced amplitude bilaterally**
- Widespread amplitude reduction
- Suggests diffuse cortical dysfunction
- May indicate severe encephalopathy

Clinical Significance

- **Often reflect diffuse or metabolic processes**
- May indicate systemic causes (metabolic, toxic, infectious)
- Suggests generalized epilepsy syndromes
- Different treatment approach than focal

Common Causes

- **Metabolic:** Hypoglycemia, hepatic encephalopathy
 - **Toxic:** Medications, drugs, toxins
 - **Infectious:** Encephalitis, meningitis
 - **Generalized epilepsy:** IGE syndromes
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4. Asymmetry & Lateralization

Asymmetric Generalized Patterns

Characteristics

- **Bilateral but asymmetric** (one side more prominent)
- Both hemispheres involved but unequally
- Asymmetry may be subtle or marked
- Clinically significant

Clinical Significance

- **May indicate focal dominance** (one side more affected)
- Persistent asymmetry is clinically significant
- May suggest focal onset with secondary generalization
- Important for syndrome classification

Interpretation

- Degree of asymmetry matters
- Persistent asymmetry suggests focal component
- Transient asymmetry may be less significant
- Must correlate with clinical findings

ABRET Trap

- **Symmetry does not equal normality**
- Symmetric patterns can still be abnormal
- Must assess morphology and amplitude, not just symmetry
- Generalized patterns can be symmetric but abnormal

Lateralization Logic

- **Unilateral = focal** (one hemisphere only)
- **Bilateral symmetric = generalized** (both hemispheres equally)
- **Bilateral asymmetric = generalized with focal component** (both hemispheres, one more affected)

- **Degree of asymmetry** guides interpretation
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5. Focal vs Generalized Epilepsy

EEG Pattern	Likely Classification	Clinical Implication
Temporal spikes	Focal epilepsy	Temporal lobe epilepsy, may need imaging
3 Hz spike-and-wave	Generalized epilepsy	Absence epilepsy, IGE syndrome
Diffuse slowing	Global dysfunction	Metabolic, toxic, or diffuse process
Lateralized slowing	Focal lesion	Structural pathology, may need imaging
Frontal spikes	Focal epilepsy	Frontal lobe epilepsy
Generalized polyspikes	Generalized epilepsy	Myoclonic epilepsy, JME

Key Distinctions

Focal Epilepsy

- **Focal EEG patterns** (localized abnormalities)
- **Focal seizure semiology** (localized symptoms)
- **May have structural correlation** (lesion, scar)
- **Surgical candidate** (if medication-resistant)

Generalized Epilepsy

- **Generalized EEG patterns** (bilateral abnormalities)
- **Generalized seizure semiology** (bilateral symptoms)
- **Often idiopathic** (no structural cause)
- **Medical management** (usually not surgical)

Clinical Application

- EEG pattern guides epilepsy classification
 - Classification guides treatment decisions
 - Focal patterns warrant imaging
 - Generalized patterns suggest systemic causes
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6. Common ABRET Exam Traps

Trap 1: Misclassifying Asymmetric Generalized Slowing

- **Reality:** Asymmetric generalized is still generalized
- May indicate focal component but is generalized pattern
- Must classify as generalized, note asymmetry
- Asymmetry doesn't make it focal

Trap 2: Overlocalizing Poorly Formed Abnormalities

- **Reality:** Not all abnormalities can be precisely localized
- Some patterns are poorly localized (parietal, deep frontal)
- Don't force localization when unclear
- "Poorly localized" is acceptable classification

Trap 3: Ignoring Montage Effects

- **Reality:** Montage affects apparent distribution
- Must compare across montages before classifying
- Single montage may be misleading
- Always use multiple montages for classification

Trap 4: Forgetting Clinical Context

- **Reality:** Clinical context guides classification
- Focal seizures + focal EEG = focal epilepsy
- Generalized seizures + generalized EEG = generalized epilepsy
- EEG must match clinical presentation

Trap 5: Assuming All Bilateral Patterns are Generalized

- **Reality:** Bilateral doesn't always mean generalized
 - Must assess synchrony and symmetry
 - Bilateral independent = multifocal, not generalized
 - Synchrony distinguishes generalized from multifocal
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7. Clinical Correlation

Focal Patterns Often Warrant Imaging

- **Focal slowing:** Suggests structural lesion, warrants MRI
- **Focal spikes:** May indicate structural pathology, consider imaging
- **Focal attenuation:** Suggests structural lesion, warrants imaging
- **Localization guides imaging** (where to look)

Generalized Patterns Suggest Systemic Causes

- **Generalized slowing:** Metabolic, toxic, infectious causes
- **Generalized spike-and-wave:** Generalized epilepsy syndromes
- **Generalized attenuation:** Severe encephalopathy
- **Systemic evaluation** (labs, metabolic workup)

EEG Findings Must Match Clinical Presentation

- **Focal EEG + focal seizures:** Consistent, supports focal epilepsy
- **Generalized EEG + generalized seizures:** Consistent, supports generalized epilepsy
- **Mismatch:** May indicate secondary generalization or misclassification
- **Always correlate** EEG with clinical findings

Best Practice

- Classify distribution accurately
 - Correlate with clinical presentation
 - Use distribution to guide further evaluation
 - Understand implications of focal vs generalized
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8. Case-Based Example

Scenario

Clinical Setting: Routine EEG for seizure evaluation

EEG Finding: Bilateral slowing, left > right

Clinical History: Focal impaired awareness seizures

Pattern: Diffuse theta/delta, asymmetric, left hemisphere more affected

Interpretation

- **Generalized slowing with focal predominance** (bilateral but asymmetric)
- Both hemispheres involved (generalized)
- Left hemisphere more affected (focal component)
- Suggests focal pathology with contralateral effects

Teaching Point

- **Degree and persistence of asymmetry guide localization**
- Asymmetric generalized suggests focal component
- Must note both distribution (generalized) and asymmetry (focal component)
- Clinical correlation helps interpret significance

ABRET Application

- Given asymmetric pattern → classify as generalized, note asymmetry
 - Understand that asymmetry suggests focal component
 - Know that degree of asymmetry matters
 - Correlate with clinical findings
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9. Exam Readiness Checklist

Use this checklist to verify your understanding:

- ☐ Can classify focal vs generalized patterns (distribution-based)
 - ☐ Can recognize asymmetry (bilateral but unequal)
 - ☐ Can apply localization logic correctly (focal = localized, generalized = bilateral)
 - ☐ Can avoid misclassification (asymmetric generalized is still generalized)
 - ☐ Understand that focal slowing suggests cortical dysfunction
 - ☐ Know that generalized patterns suggest systemic causes
 - ☐ Recognize that asymmetry may indicate focal component
 - ☐ Understand that distribution is as important as morphology
 - ☐ Know that EEG findings must match clinical presentation
 - ☐ Can identify ABRET exam traps related to classification
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10. Internal Cross-Links

Neuroanatomy

- **Neuroanatomy for EEG Localization:** Understanding brain regions helps classify distribution
- **Lobar correlates:** Focal patterns localize to specific lobes
- **Hemispheric lateralization:** Understanding lateralization helps classify

Patterns

- **Epileptiform Discharges:** Focal vs generalized epileptiform patterns
- **Diffuse Slowing:** Generalized slowing patterns

- **Focal Abnormalities:** Focal slowing and epileptiform patterns

Workflow

- **Montages & Referencing:** Montage comparison essential for classification
- **Localization:** Distribution guides localization

Cases

- **Localization cases:** Cases requiring distribution classification
- **Asymmetric patterns:** Cases with asymmetric generalized patterns
- **Focal vs generalized:** Cases teaching classification

Quizzes

- **Pattern classification MCQs:** Questions on focal vs generalized
 - **Distribution interpretation:** Questions on classifying distribution
 - **Asymmetry recognition:** Questions on recognizing asymmetry
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Study Tips

1. **Memorize the distinction:** Focal = localized, Generalized = bilateral
 2. **Learn asymmetry:** Asymmetric generalized suggests focal component
 3. **Practice classification:** Given pattern, classify as focal or generalized
 4. **Understand implications:** Focal = structural, Generalized = systemic
 5. **Remember the principle:** Distribution is as important as morphology
 6. **Know the traps:** Asymmetric generalized, overlocalization, montage effects
 7. **ABRET focus:** Expect questions on distribution classification and asymmetry
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End of Study Guide

For additional practice, complete quiz questions tagged: focal, generalized, asymmetry, localization, distribution