Neurocognitive Impairment and Dementia: Clinical Principles and Bedside Assessment

Medical Psychiatry: A Comprehensive Update 2025

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Disclosures

- I do not have any relevant financial relationships with any commercial interests.

Goals

- To recognize the value of localization and time course in the process of diagnosing neurocognitive disorders
- To understand distinguishing features of common conditions in the differential diagnoses of: (1) acute/subacute onset cognitive dysfunction; and (2) insidious onset cognitive dysfunction.
- To review the value of differentiating between syndrome, severity and neuropathology in neurodegenerative conditions causing cognitive dysfunction.

“Instant Neurologist”

Localization and Time Course via History and Exam

Onset/Course	**Focal**	**Diffuse**
Acute	Vascular	Metabolic
Subacute	Inflammatory	Inflammatory
Chronic	Tumor	Degenerative

Flaherty, AW (2000) ***The MGH Handbook of Neurology.***

Instant Cognitive Neurologist

Onset/Course	1° Attention/Executive	1° Other Cognitive Domain [Episodic memory, language, visual/spatial, higher somatosensory/motor, social cognition]
Acute/Subacute		
Insidious		

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Acute/Subacute	**Fluctuating**	**Delirium**	Recurrent transient neurological condition*
	Progressive	Rapidly progressive dementia	

*Focal seizure, spreading cortical depression (eg, migraine aura, subarachnoid hemorrhage, CAA), cerebral ischemia

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Acute/Subacute	**Fluctuating**	**Delirium**	Recurrent transient neurological condition
	Progressive	Rapidly progressive dementia	
Insidious	**Static**	**Multifactorial (non-neurological)**	Prior monophasic injury or developmental disorder
	Progressive	**Degenerative and/or Vascular**	**Degenerative ± Vascular**

Distinguishing Subacute Conditions

	Delirium	Rapidly Progressive Dementia	Recurrent Transient Neurological
Level of consciousness	- **More likely fluctuating, with disrupted circadian rhythm**	- Less likely fluctuating	

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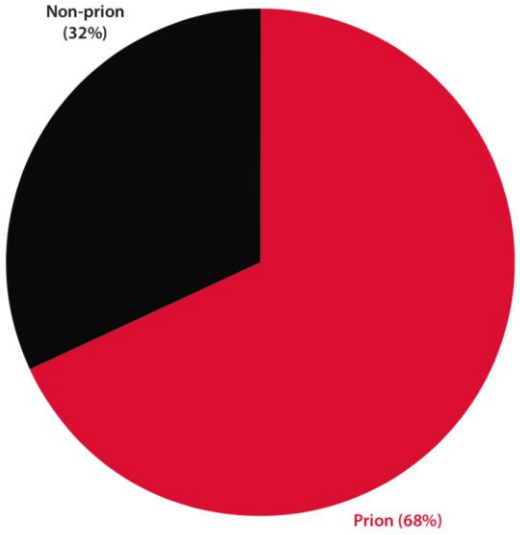
Etiologies	- **Frequently general medical conditions, medications, substance intoxication/ withdrawal** - Less frequently 1° neurological (diffuse or right-hemispheric lesions, focal status epilepticus)	- Autoimmune/inflammatory, prion disease, non-prion degenerative, CNS vascular, infection, neoplasm, toxic/metabolic	- Focal seizures, spreading cortical depression, ischemia

* aphasia, apraxia, alexia, agraphia, acalculia, agnosia, cortical sensory signs, neglect

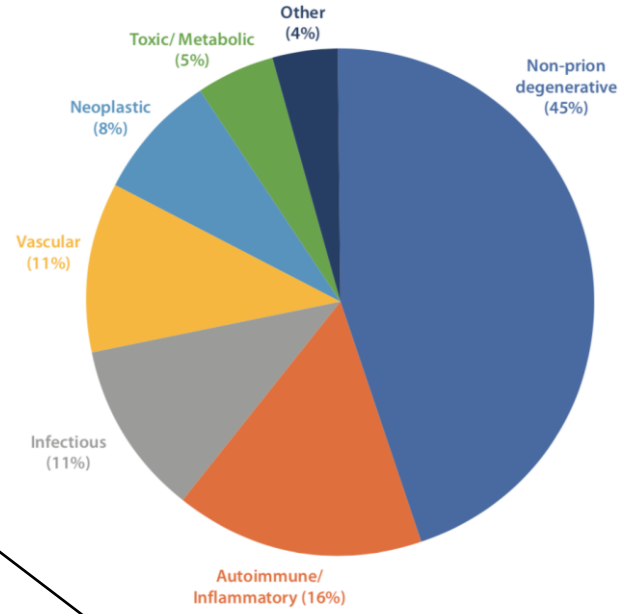
Distinguishing Subacute Conditions

- **Time efficient bedside neurological examination**
  - Establish the level of inattention: know task with varying demands
  - Interpret deficits in other cognitive domains accounting for inattention: language, memory, spatial attention, praxis.
  - Screening examination for cranial nerve, motor, sensory, cerebellar, and gait signs.
- **Contextual and/or extended workup for atypical or unexplained delirium**
  - Structural neuroimaging (head CT, MRI brain)
  - EEG
  - CSF

Rapidly Progressive Dementia



Acute/subacute onset (days, weeks)

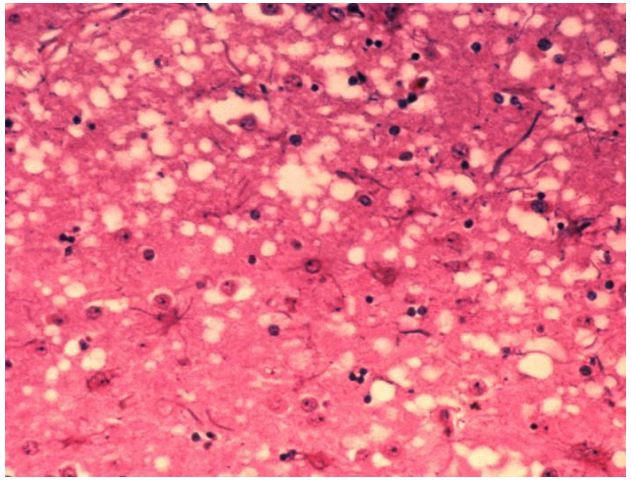


- **Infection**
- **Autoimmune**
- **Toxic / Metabolic**
- **Neoplasm**
- **Other degen.**
- **Vascular**
- **Prion**

1° Central Nervous System Process

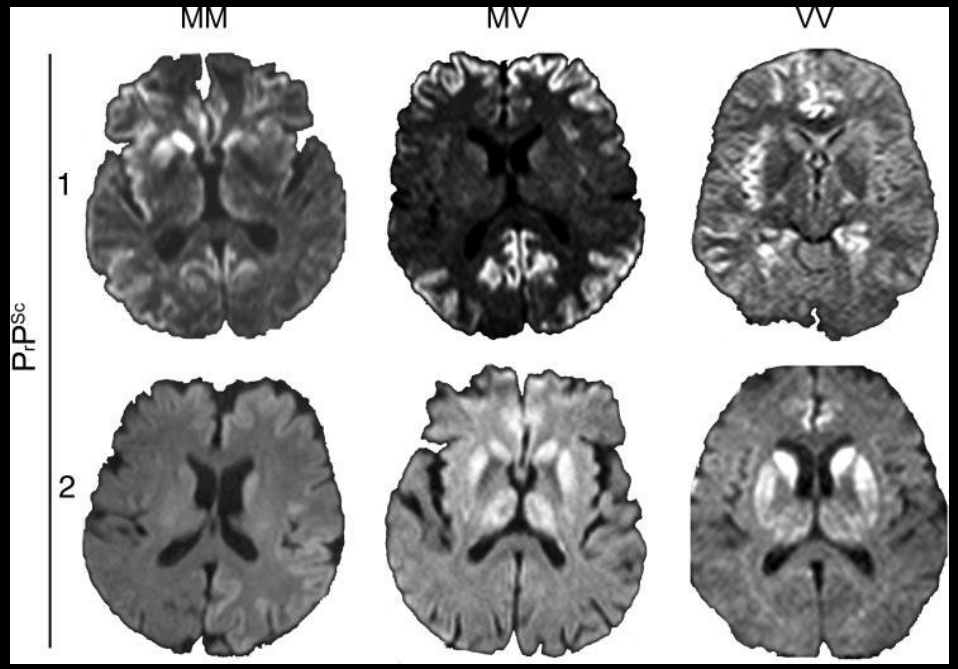
Prion disease

- **Sporadic Creutzfeldt-Jakob disease (sJCD) is the most common; incidence 1-2 per 1,000,000 per year.**
- **Rapidly progressive deterioration in cognition and behavior with higher cortical signs; myoclonus occurs in >90% of cases; pyramidal or extrapyramidal motor signs (>50%), cerebellar signs (>50%) are also common.**
- **Neuropsychiatric features: apathy ➔ akinetic mutism, depression; less commonly euphoria, emotional lability, anxiety, psychotic features.**
- **Molecular variants defined by amino acid at codon 129 of prion protein gene (M or V) and type of pathological prion (1 or 2) influence clinical presentation.**

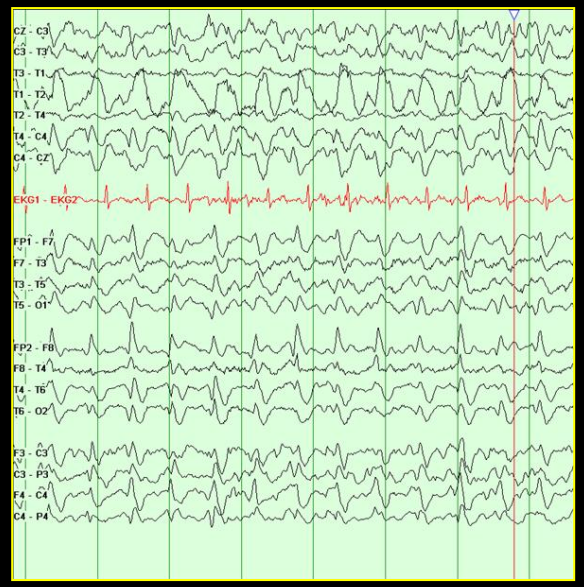


CJD biomarkers

DWI restriction ~90-95% sensitive, ~90-99% specific



Periodic sharp wave complexes ~65% sensitive, ~90% specific



- Real-time quaking-induced conversion (RT-QuIC) assay amplifies detection of PrP(CJD); CSF or olfactory mucosa brushings; sensitivity ~90-96%, specificity ~99-100%
- Supportive but non-specific: elevated CSF 14-3-3 protein; highly elevated CSF total tau

Meissner *Neurology* 2009;72:1994-2001.
Lattanzio Acta Neuropathol 2017;133:559-78

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		1° Attention/Executive	1° Other Cognitive Domain
Insidious	**Static**	**Multifactorial (non-neurological)**	Prior monophasic injury or developmental disorder
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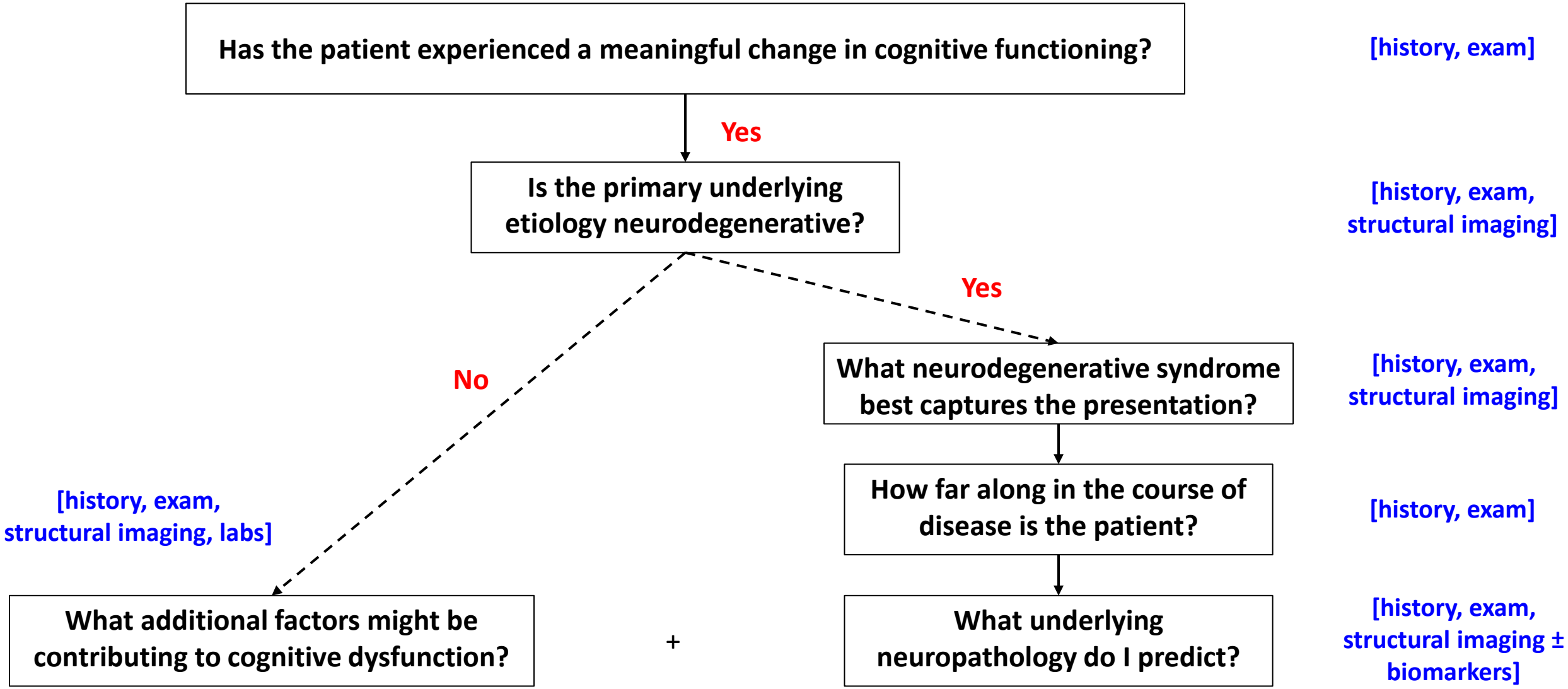
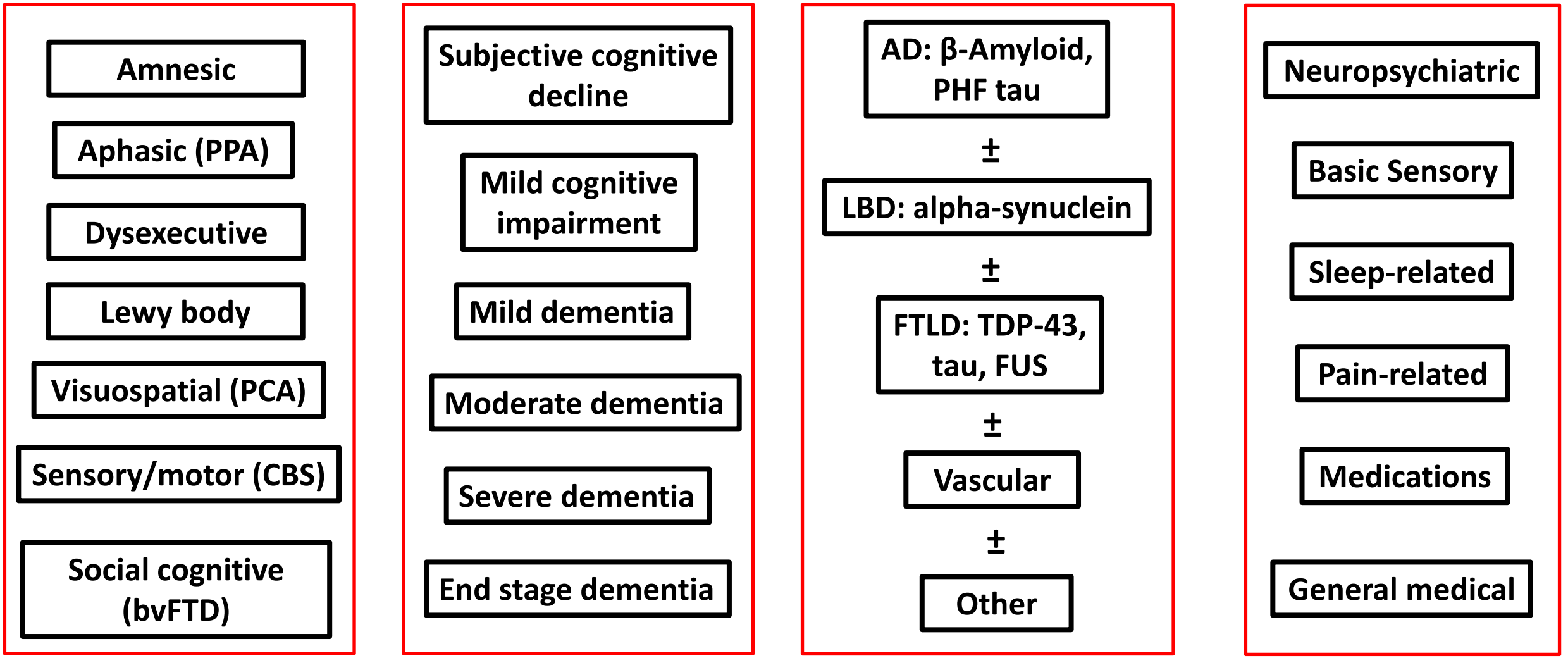
Initial Assessment: Questions



Formulation: Degenerative Cognitive Disorders



Syndrome *Stage* *Neuropathology* *Contributing Factors*

Initial Assessment: Questions

Has the patient experienced a meaningful change in cognitive functioning?

Is the cognitive profile characteristic of a neurodegenerative syndrome?

Is the time course gradually progressive?

Are there additional features suggestive of a neurodegenerative syndrome and/or evidence of non-degenerative factors contributing to cognitive dysfunction?

Is there biomarker evidence to suggest a neurodegenerative condition and/or non-degenerative factors?

History
Cognitive Exam

Pertinent ROS
Elemental neuro exam

Laboratory evaluation
Structural MRI or CT
Additional studies as indicated

Is the primary underlying etiology neurodegenerative?

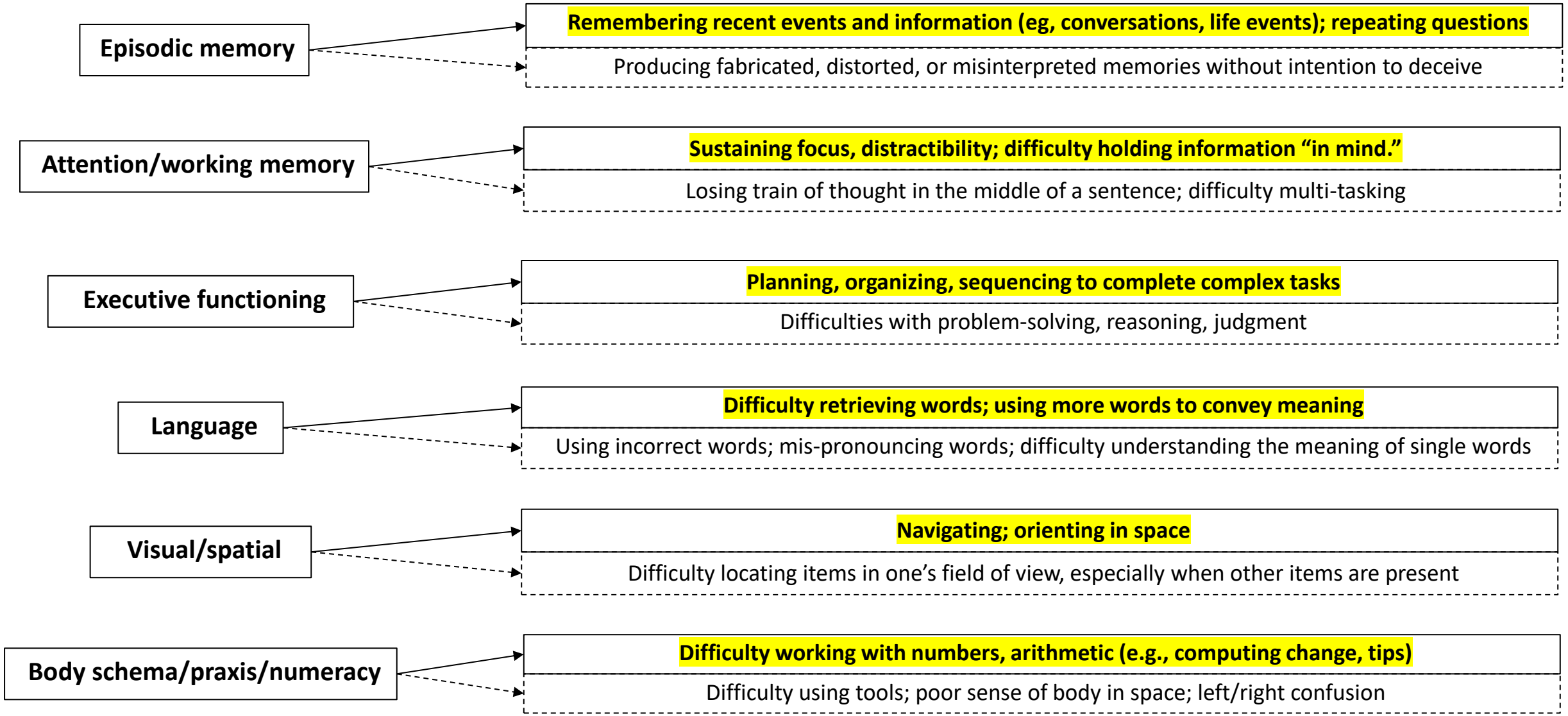
History: Process

- **Assess source reliability, comfort (patient, informant); optimize setting**
- **Localize based on symptoms**
  - Develop and refine an understanding of how reported symptoms relate to cognitive processes and domains
  - Obtain examples; clarify; recognize patterns
- **Manage time proactively**
  - Allocate sufficient time (typically 60 ± 15 minutes for initial history and exam)
  - Open-ended → directed questioning
  - Stay organized, prioritize
  - Use validated questionnaires where appropriate
  - Obtain information from EMR, where available
  - Parallel processing: examination; preliminary cognitive profile, plan

History: Content

- **History of the Present Illness**
  - Cognitive symptoms
  - Usual activities
  - Behavioral/emotional symptoms
  - Sleep/fluctuations
  - Motor/sensory
  - Autonomic/pain
- **Neurological, Psychiatric, Medical and Surgical History**
- **Developmental, Educational, Occupational History**
- **Social History**
- **Family History**

HPI: Cognitive Symptoms



HPI: Usual Activities

Type	Elements/Examples
Advanced ADLs **Compromised in MCI**	**Performance at work** **Participating in group/community activities** **Leisure activities (intellectual, social)**
Instrumental ADLs **Loss of independence in mild dementia**	**Driving** (and other forms of transportation in the community) **Taking prescribed medications** **Managing finances** **Shopping for groceries and completing errands in the community** **Completing household chores, preparing meals** **Using the telephone and computer**
Basic ADLs **Loss of independence in moderate and severe dementia**	**Tending to personal hygiene and grooming** Bathing and/or showering Dressing Toileting Functional mobility Self-feeding

Recommended scale: **Activities of Daily Living Questionnaire** (Johnson et al. *Alzheimer Dis Assoc Disord* 2004;18:223-30)

HPI: Other Features

Behavioral/Emotional Symptoms

Neuropsychiatric Inventory-Questionnaire (Kaufer 2000)

Mood; ability to derive pleasure from usual sources; motivation; anxiety; appetite

False beliefs; bipolar-spectrum symptoms; PTSD-spectrum symptoms; disinhibition, obsessive-compulsive or perseverative behaviors, sympathy/empathy, food behaviors

Sleep/Fluctuations

Mayo Sleep Questionnaire (Boeve 2011)
Mayo Fluctuations Scale (Fermin 2004)

Schedule; insomnia (early, middle, late); snoring/breathing; dream enactment; daytime energy level; napping, dozing; episodes of prolonged staring and/or disorganized speech

Restless legs symptoms; other movements in sleep; vivid dreams

Motor/Sensory

Queen Square Visual Hallucinations Inventory (Williams 2008)

Walking, balance; tremors; fine manual dexterity; basic vision, hearing, smell/taste; visual hallucinations, illusions

Speech, swallowing; handwriting; stiffness; eye movements; episodic muscle contractions; fasciculations; extracampine (presence) hallucinations; motion hallucinations; auditory or tactile hallucinations

Autonomic/Pain

NACC/UDS Autonomic Symptoms Checklist

Orthostatic lightheadedness; constipation, loose stools; urinary frequency, urgency; pain

Rhinorrhea; excessive salivation, sweating; temperature regulation; erectile function

Cognitive Examination: Goals

- Goal of determining whether there are **changes above and beyond those attributable to normal aging**, considering baseline intellect/education.
  1. **Survey major cognitive domains**, testing hypotheses generated from the history (MMSE alone is not sufficient; MoCA, SLUMS, ACE-III may be sufficient in 'typical' cases, particularly if supplemented).
  2. Standard evaluation is geared towards discriminating between common conditions and identifying atypical features, corroborating evidence from history.
  3. Flexible evaluations employed in specific atypical situations (e.g., primary dysfunction in a domain other than memory, attention/executive functioning).
  4. Global scores on selected measures can provide a gauge of severity but should always be considered with functional status.
- Billing possible using Medicare CPT code 96116, neurobehavioral status exam

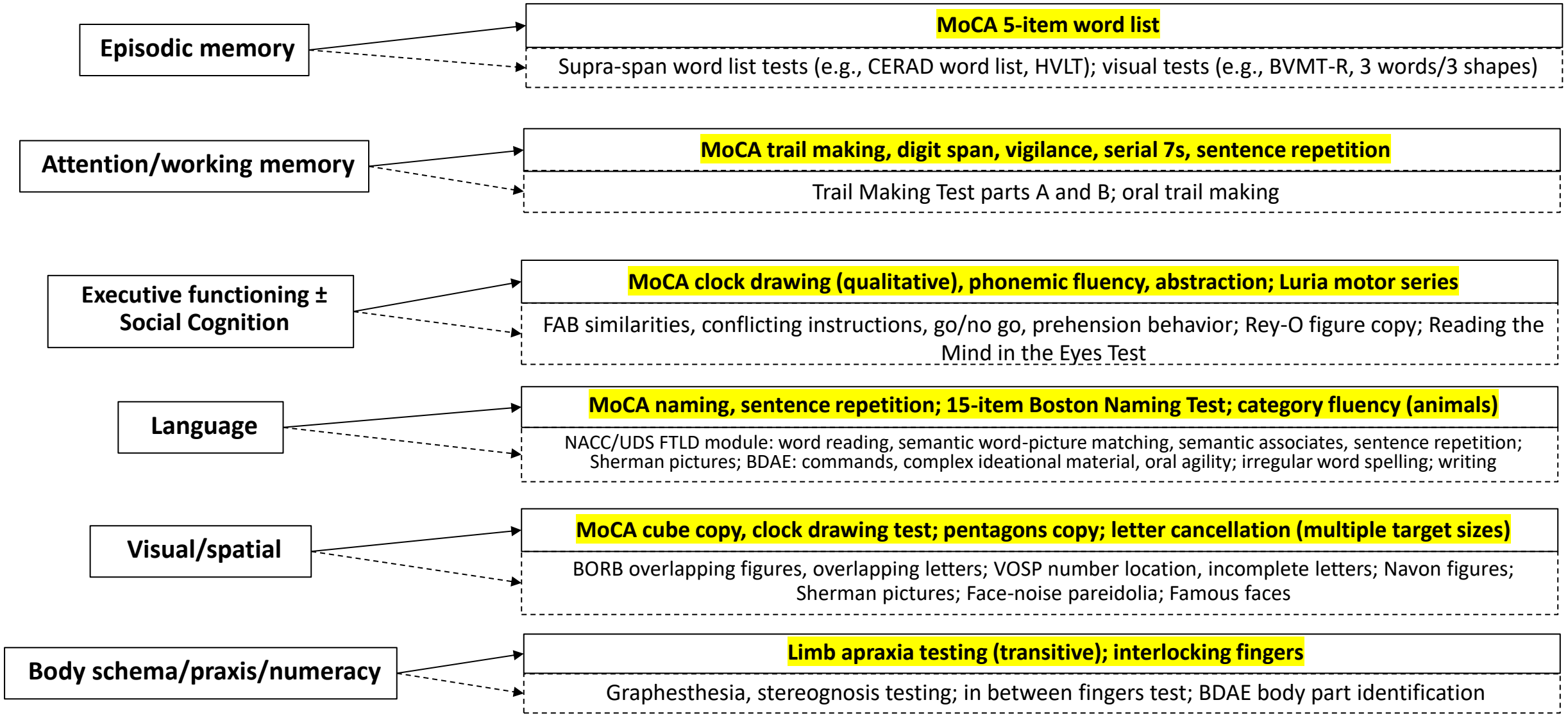
If time doesn't permit a detailed cognitive examination/interpretation, refer to a specialist (e.g., neuropsychologist or cognitive neurologist) for initial assessment.

Brief Cognitive Instruments: Comparison

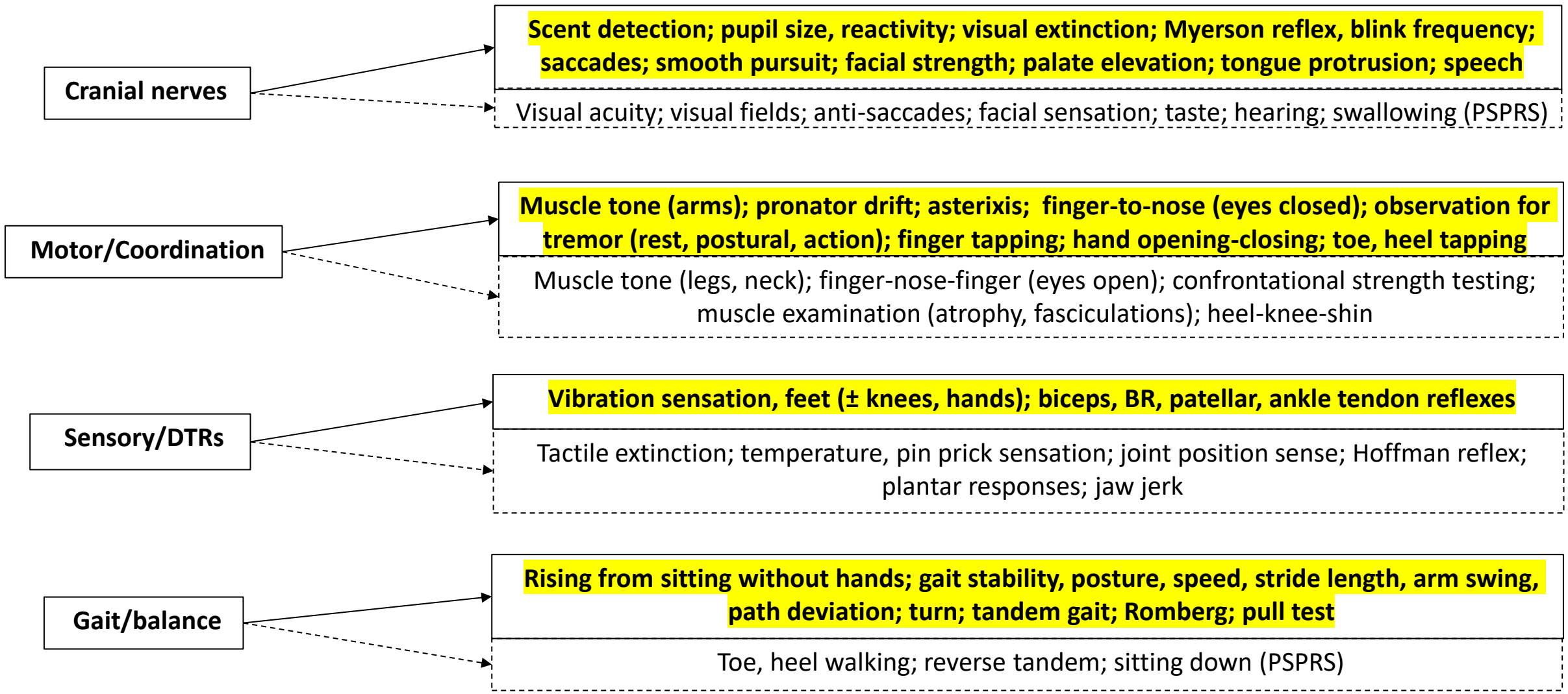
	MoCA	MMSE	ACE-III	SLUMS
Memory	++	+	++	++
Attention/Executive	++	+	+	+
Language	+	+	++	+
Visual/Spatial	++	+	+++	++
Time efficiency	++	+++	+	++
Typical range: MCI*	~18-25	~24-27	~72-86	~21-26
Typical range: Mild dementia*	~15-22	~21-25	~61-82	~11-20

*Most applicable in typical (amnesic) Alzheimer disease

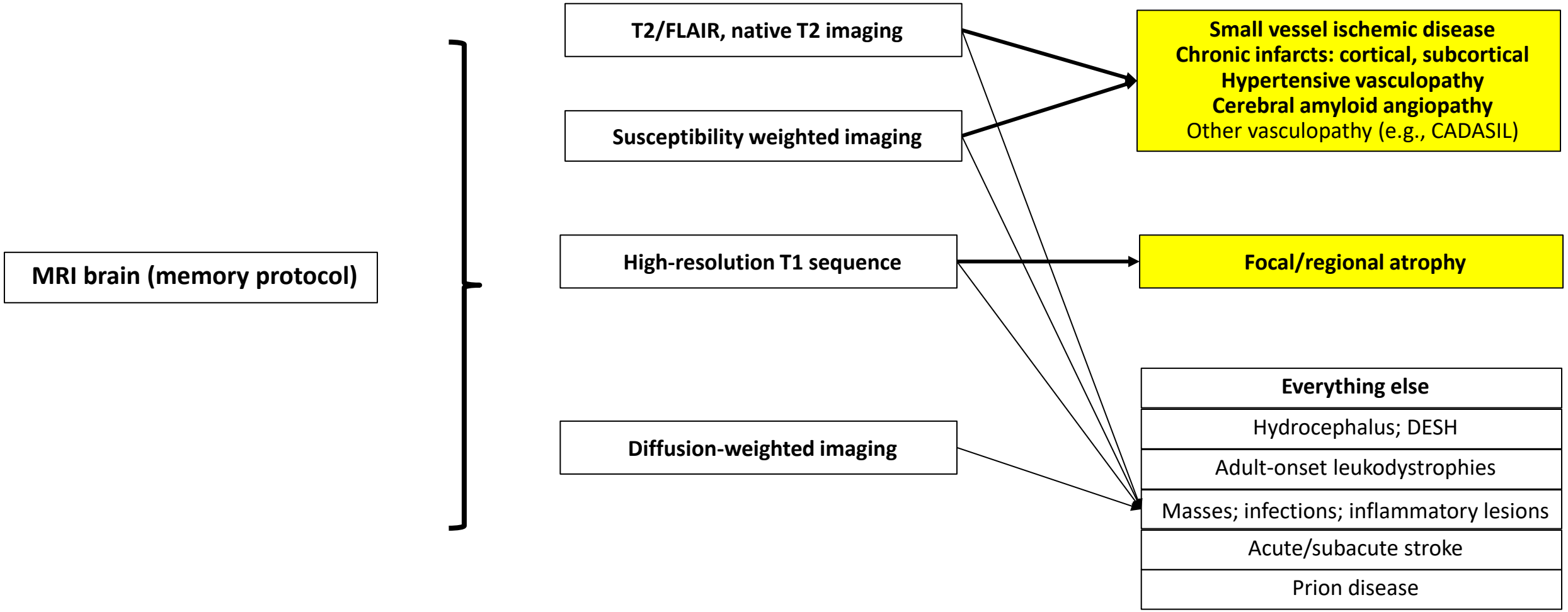
Standard and Flexible Cognitive Examination



General Neurological Examination



Standard Imaging

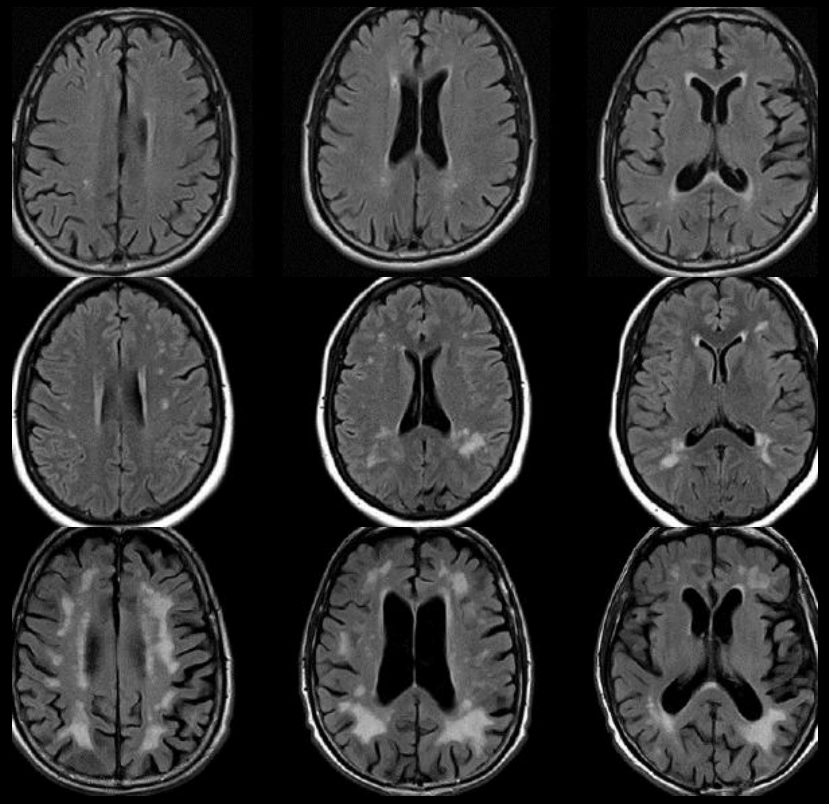


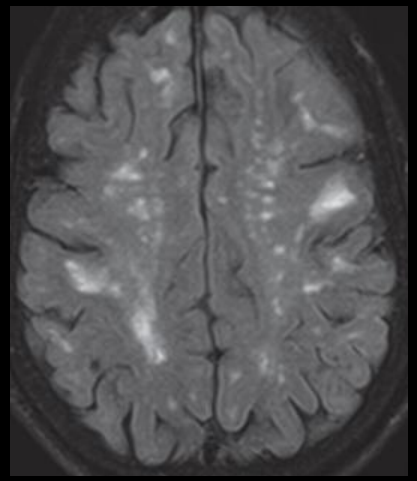
Test hypotheses generated from the history and cognitive examination

Standard Imaging: Vascular Disease

T2/FLAIR hyperintensities

- Location:
  - Small vessel ischemic disease: periventricular (ependymal loss, ischemic demyelination), subcortical (lipohyalinosis), juxtacortical (arteriole atherosclerosis)
  - Cerebral amyloid angiopathy: centrum semiovale
- Severity (Fazekas Scale):



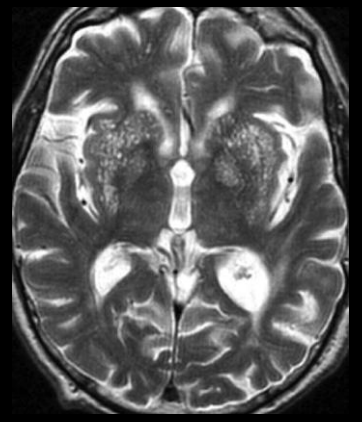


Cerebral amyloid angiopathy

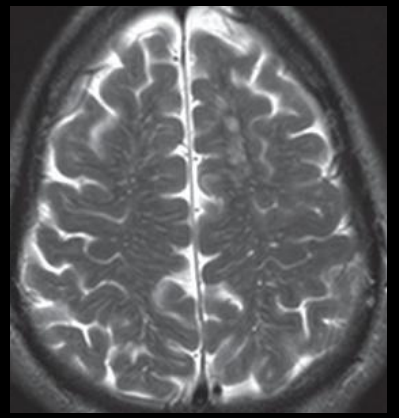
Charidimou *Lancet Neurol* 2022

Dilated perivascular spaces

- Hypertensive vasculopathy: basal ganglia
- Cerebral amyloid angiopathy: centrum semiovale



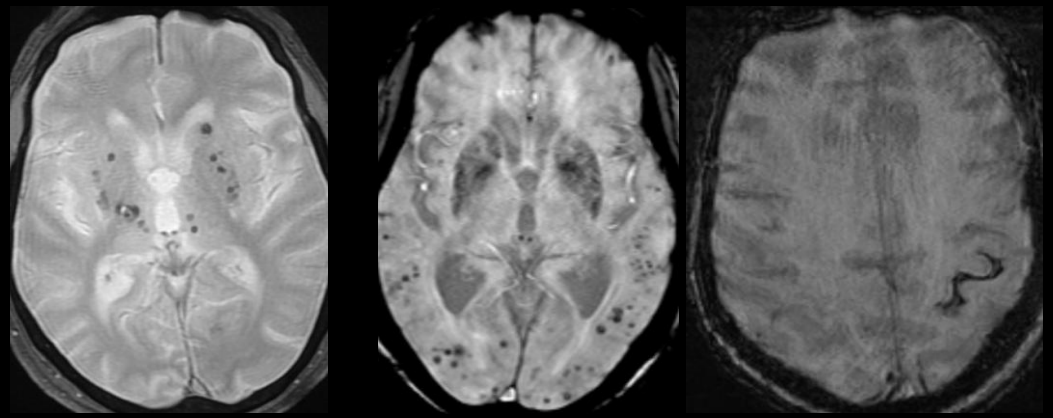
Fergus *Stroke* 2010



Charidimou *Lancet Neurol* 2022

Susceptibility

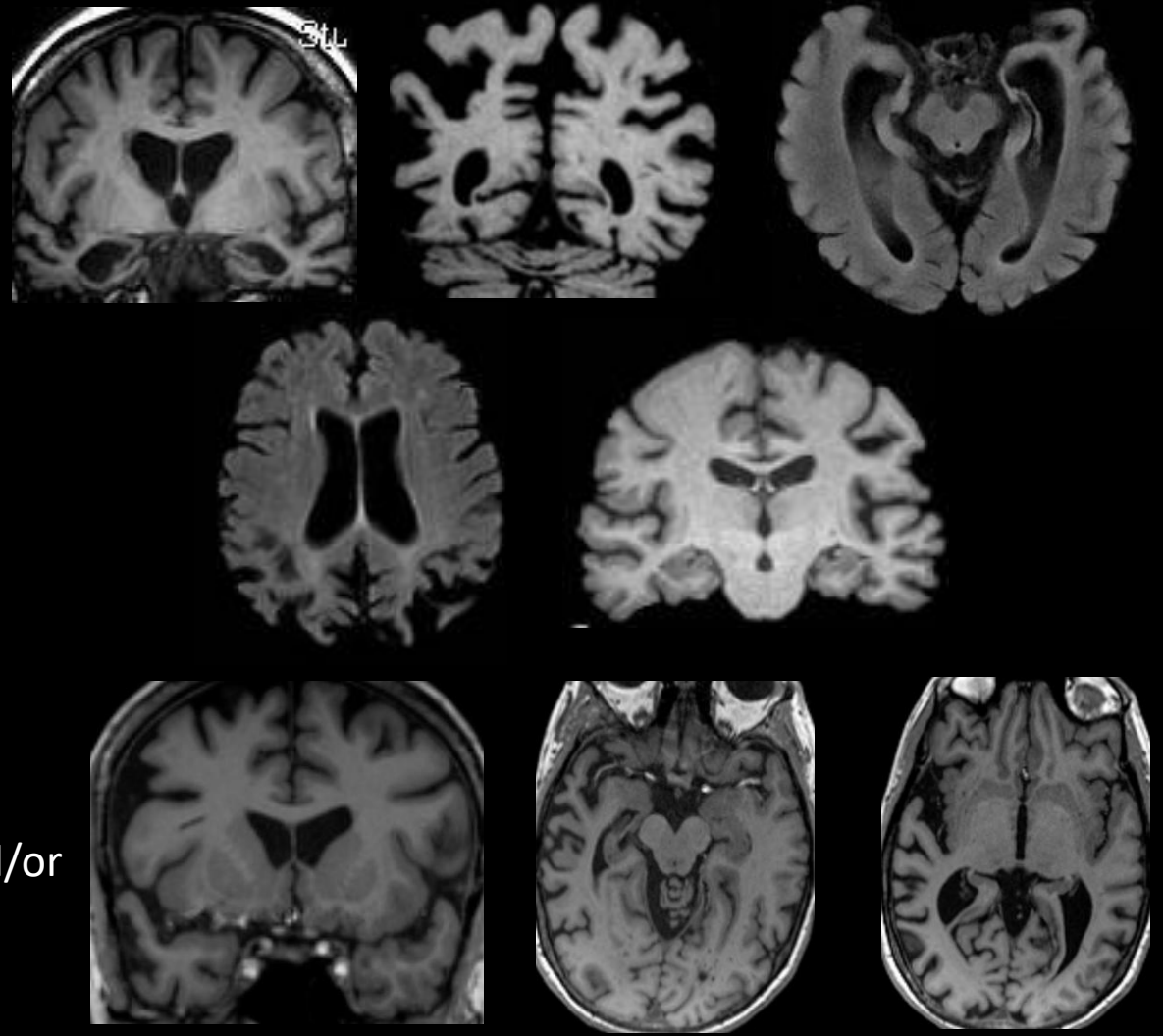
- HTN: subcortical > cortical microhemorrhages
- CAA: cortical microhemorrhages, superficial siderosis



Standard Imaging: Atrophy

High resolution T1 imaging (e.g., SPGR, MPRAGE); 3d reconstruction

- Typical (amnesic) AD: early atrophy in medial temporal, posterolateral temporal, parietal cortices.
- Atypical (non-amnesic) AD: early atrophy in posterolateral temporal, parietal ± dorsal frontal, occipital cortices
- Atypical, non-AD: early asymmetrical atrophy in frontal and/or temporal lobes



Labs: Non-molecular biomarker

Labs	Utilities/Comments
Standard: Comprehensive metabolic panel, TSH, B12, CBC	**Abnormalities are rarely the principal cause of cognitive dysfunction, but may contribute; note eGFR**
Also pertinent: Hgb A1c, lipid profile, homocysteine, 25-OH vitamin D, PT, PTT	**Consider ordering if recent results not available**
Situation-specific (blood): thiamine; treponemal Abs; HIV 1/2 Ab/Ag; rheumatologic labs; autoimmune encephalopathy panel	**Informed by social history, general medical illness, time course**
Situation-specific (CSF): protein, glucose, cell counts; IgG index, oligoclonal bands; autoimmune encephalopathy panel; cytology, flow cytometry,, IL-10; VDRL, viral PCRs/cultures, bacterial, mycobacterial, fungal stains/cultures, BioFire array; 14-3-3	**Informed by history, time course, associated symptoms/signs; usually conducted inpatient**

Labs: Molecular Biomarker and Genetic

Labs	Utilities/Comments
CSF: Abeta42, total tau, p-tau181*; alpha-synuclein RT-QuIC; IgH gene arrangement, *MYD88* analysis	**Standard of care**; CSF amyloid and tau has comparable diagnostic accuracy to amyloid PET
Plasma p-tau217, Abeta 42/40*	Increasingly used in clinical research; validation for clinical use in progress
Skin biopsy: alpha-synuclein	Useful in Parkinson disease, dementia with Lewy bodies, multiple system atrophy
Apolipoprotein E (*APOE*) genotype	Used for risk stratification for candidates to receive amyloid-lowering immunotherapies; not sensitive or specific for AD
Genetic: Amyloid Precursor Protein (*APP*), Presenilin 1 (*PSEN1*), Presenilin 2 (*PSEN2*) mutations*	Useful when family history suggests an autosomal dominant pattern of inheritance
Genetic: Progranulin (*GRN*), Microtubule-associated protein tau (*MAPT*) mutations; *C9orf72* repeat expansion*	Most common autosomal dominant gene mutations associated with FTLD

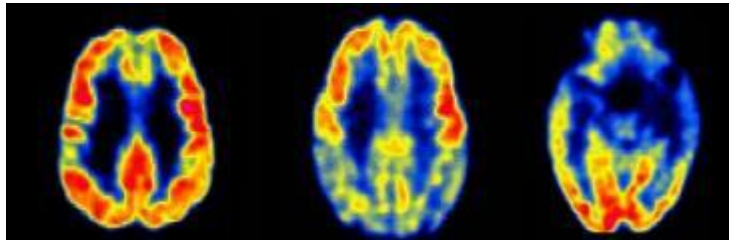
* FDA approved

Appropriate use criteria, CSF AD biomarkers: Shaw *Alzheimers Dement* 2018

Extended Imaging: Neurodegeneration

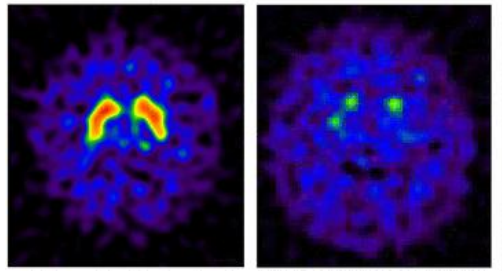
Modalities	Utilities	Limitations
^{18}F-fluorodeoxyglucose (FDG) PET	- Discriminate syndromic FTD, AD, DLB with some predictive value for underlying neuropathology - Discriminate degenerative from non-degenerative cognitive impairment (negative predictive value)	- Lack of molecular specificity - Potential for false-positive results (e.g., asymptomatic *APOE4* carriers) - Variable insurance coverage for non-Medicare patients and indications other than discriminating FTD from AD
^{18}F-fluorodopa PET dopamine transporter (DaT) imaging	- Discriminate degenerative from non-degenerative (e.g., vascular, medication-induced) parkinsonism	- Lack of molecular specificity - Does not discriminate between neurodegenerative conditions causing parkinsonism

FDG-PET



Normal | AD syndromes | FTD syndromes

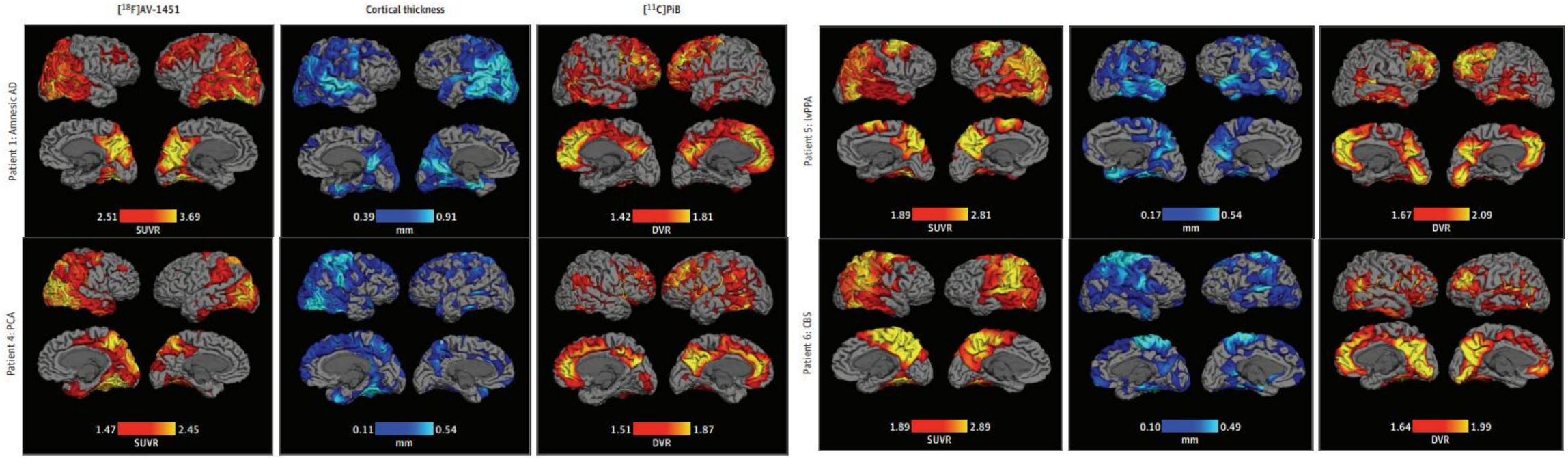
Dopamine transporter imaging



Normal | Degenerative

Extended Imaging: Molecular Pathology

Modalities	Utilities	Limitations
^{18}F-Amyloid PET (florbetapir, florbetaben, flutemetamol)	- Detect fibrillar beta-amyloid with high sensitivity and specificity against neuropathological gold standard). - FDA-approved and covered by Medicare	- Elevated fibrillar beta-amyloid does not equate to a diagnosis of AD (necessary but not sufficient)
^{18}F-Tau PET (Flortaucipir)	- Provides information about not only molecular pathology but also topography, pertinent to disease stage and phenotype. - Substantially elevated uptake in neocortical regions is highly predictive of elevated beta-amyloid.	- FDA-approved but not covered by insurance



Appropriate use criteria, amyloid PET: Johnson *Alzheimers Dement* 2013

Additional Studies, Referrals

Studies, Referrals	Utilities/Comments
Neuropsychology	Establish, clarify cognitive profile; longitudinal time course; time to wait for evaluation is frequently long
Audiology	Hearing correction liberates attention, working memory resources
Ophthalmology, Neuro-ophthalmology	Evaluate basic vision in cases of visual hallucinations, higher visual deficits
Electroencephalogram (EEG): routine, long-term ambulatory	Evaluate paroxysmal symptoms; AD increases risk of focal seizures; useful in Lewy body disorders d/t fluctuations and inattention
Polysomnogram ± Sleep Medicine referral	Evaluate for obstructive sleep apnea; RBD
Electromyogram, nerve conduction studies (EMG/NCV) ± Neuromuscular referral	Evaluate for motor neuron disease
Autonomic testing (Autonomic neurology referral)	Evaluate for dysautonomia
Direct admission to inpatient neurology service	Expedite workup for rapidly progressive dementia

Formulation

History

- Cognitive Symptoms
- Usual Activities
- Behavioral/Emotional symptoms
- Sleep/Fluctuations
- Motor/Sensory
- Autonomic/Pain

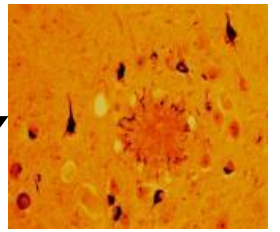
- Exam (cognitive, neuro)
- MRI brain
- Other labs/studies

AD-spectrum:
- Amnesic MCI/dementia
- Posterior cortical atrophy
- Logopenic variant PPA
- Dysexecutive/behavioral AD

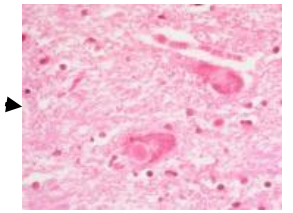
LBD-spectrum:
- MCI/dementia with Lewy bodies
- Parkinson disease with MCI/dementia

FTLD-spectrum:
- Behavioral variant FTD
- Semantic variant PPA
- Nonfluent/agrammatic variant PPA
- Corticobasal syndrome
- PSP syndrome

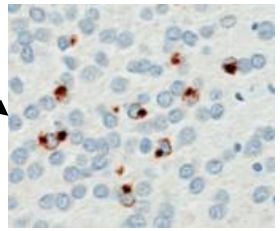
Syndrome



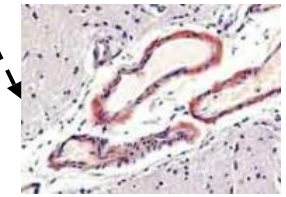
AD



LBD



TDP-43
LATE
FTLD-TDP



Vascular

Avoid conflating terms (e.g., amnesic dementia ≠ AD; DLB ≠ neocortical Lewy bodies)

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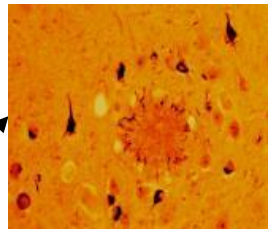
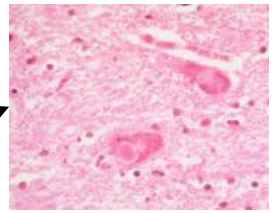
LBD-spectrum:
- MCI/dementia with Lewy bodies
- Parkinson disease with MCI/dementia

FTLD-spectrum:
- Behavioral variant FTD
- Semantic variant PPA
- Nonfluent/agrammatic variant PPA
- Corticobasal syndrome
- PSP syndrome

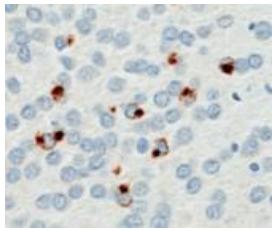
Syndrome



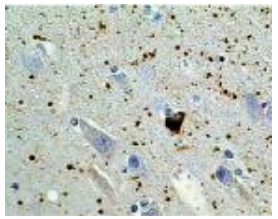
AD



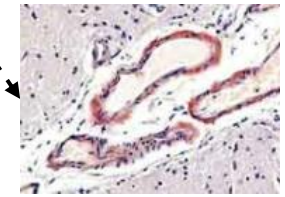
LBD



TDP-43
LATE
FTLD-TDP



FTLD-tau



Vascular

Avoid conflating terms (e.g., amnesic dementia ≠ AD; DLB ≠ neocortical Lewy bodies)

Formulation

History

- Cognitive Symptoms
- Usual Activities
- Behavioral/Emotional symptoms
- Sleep/Fluctuations
- Motor/Sensory
- Autonomic/Pain

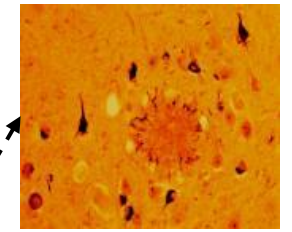
- Exam (cognitive, neuro)
- MRI brain
- Other labs/studies

AD-spectrum:
- **Amnesic MCI/dementia**
- Posterior cortical atrophy
- Logopenic variant PPA
- Dysexecutive/behavioral AD

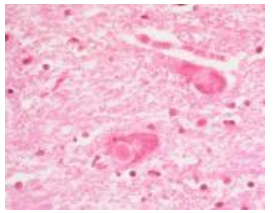
LBD-spectrum:
- **MCI/dementia with Lewy bodies**
- Parkinson disease with MCI/dementia

FTLD-spectrum:
- Behavioral variant FTD
- Semantic variant PPA
- Nonfluent/agrammatic variant PPA
- Corticobasal syndrome
- PSP syndrome

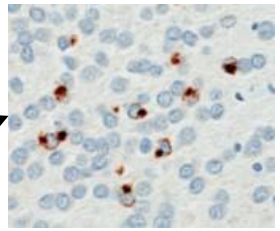
Syndrome



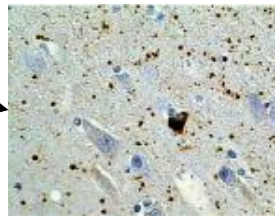
AD



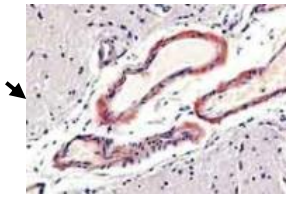
LBD



TDP-43
LATE
FTLD-TDP



FTLD-tau



Vascular

Avoid conflating terms (e.g., amnesic dementia ≠ AD; DLB ≠ neocortical Lewy bodies)

Neuropsychiatric features of common conditions

Alzheimer disease

- **Irritability**
- **Anxiety**
- **Apathy**
- **Depression**
- Paranoia
- Poor insight

Lewy body disease

- **Recurrent formed visual hallucinations‡**
- **Anxiety***
- **Depression***
- **Apathy***
- Systematized delusions*
- Hallucinations in non-visual modalities*

‡ Core clinical feature

* Supportive clinical feature

McKeith *Neurology* 2017

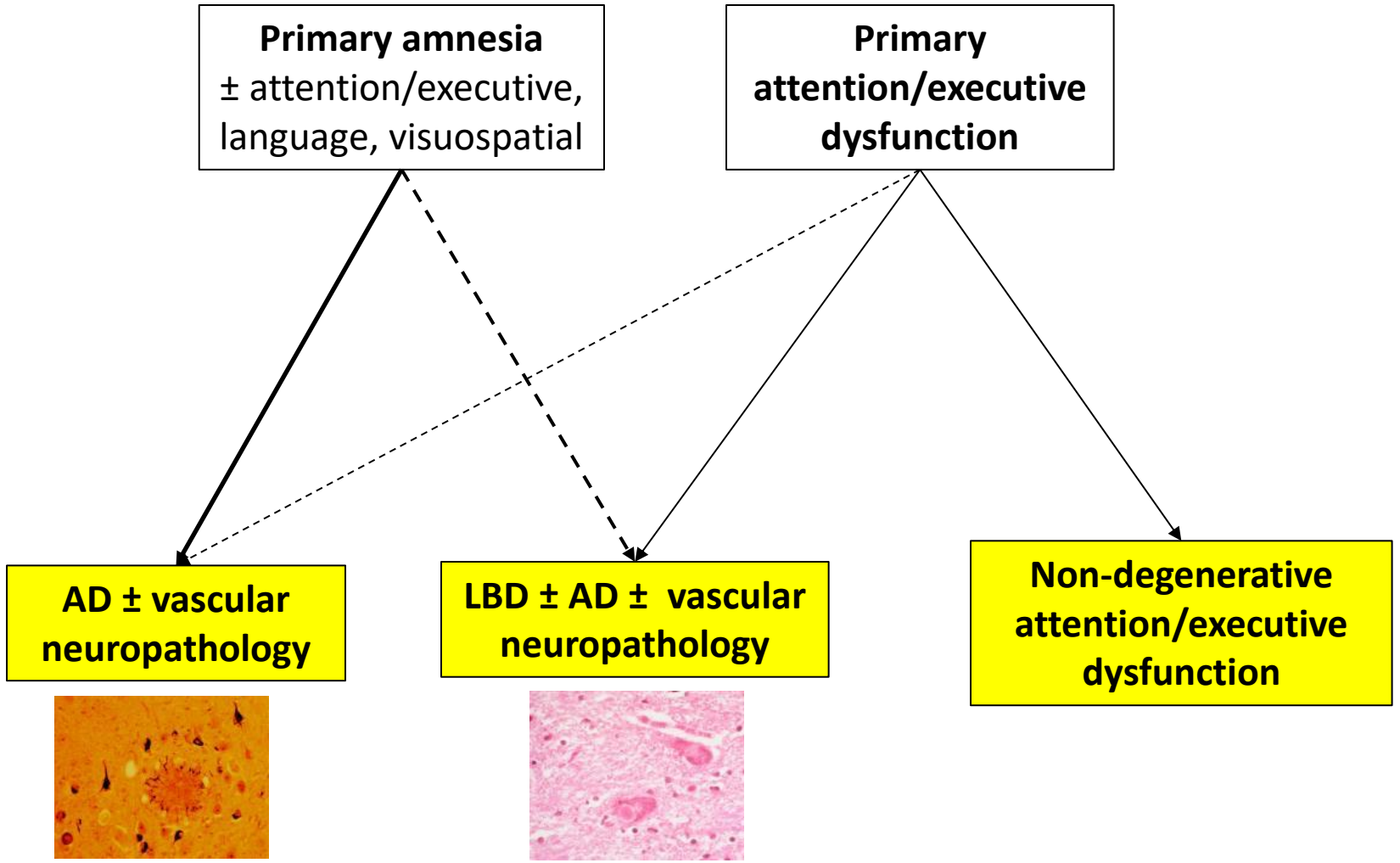
Non-progressive disorders of attention and executive functioning

Stressor

- Psychiatric illness
- General medical illness
- Chronic pain
- Poor sleep
- Medications
- Nutritional deficiency

+ **Aging** ± **Genetic and/or Developmental factors**

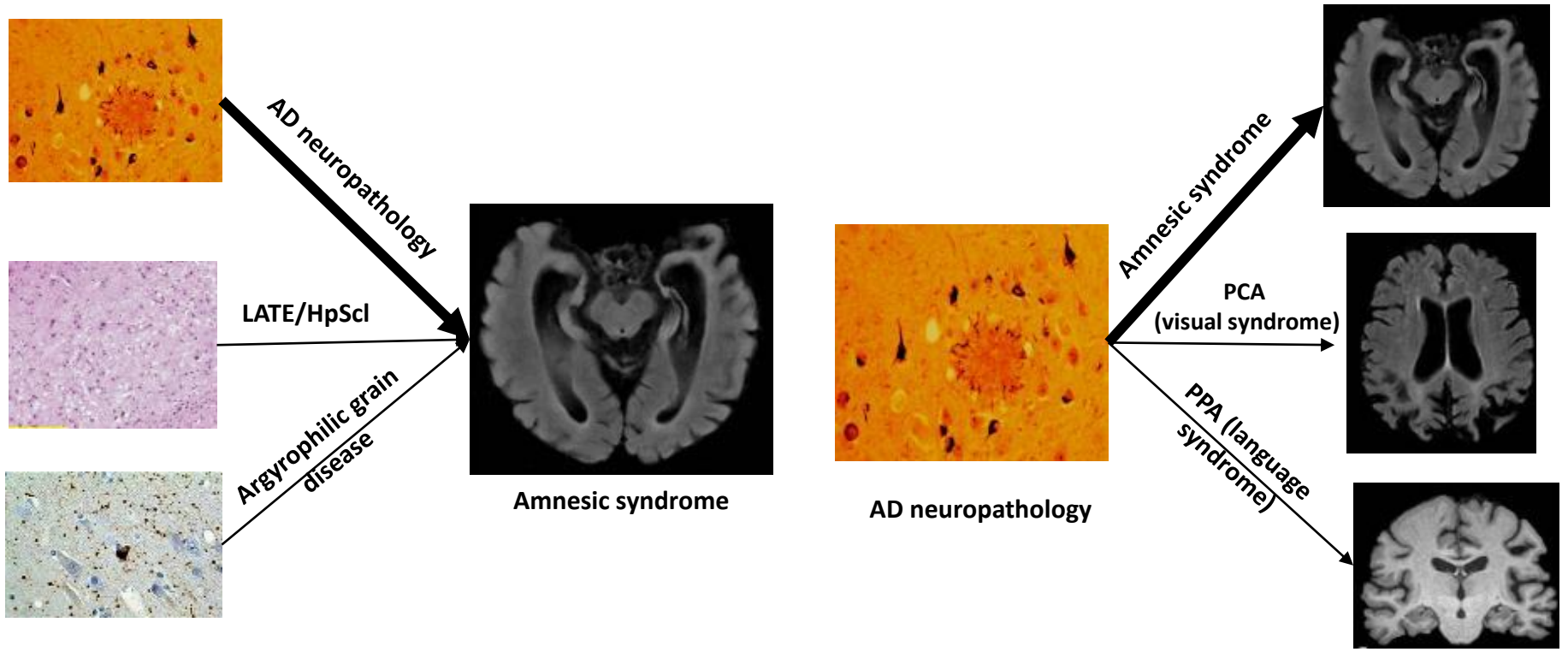
Challenges: Common Conditions



1. **Discriminating amnesia from attention/executive dysfunction**
2. **Discriminating between static and progressive time course**
3. **Variable penetrance of secondary cognitive and associated features**
4. **Non-specificity of associated features**
5. **Occam's razor vs Hickam's dictum**

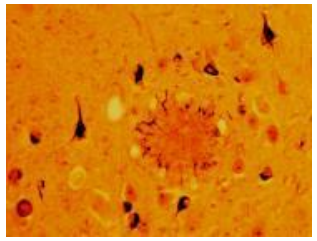
Common pitfall: Conflating syndrome and neuropathology

- **<u>Consequences</u>**:
  - Under-recognition of non-canonical neuropathologies underlying specific syndromes.
  - Under-recognition of non-canonical syndromes associated with specific neuropathologies.

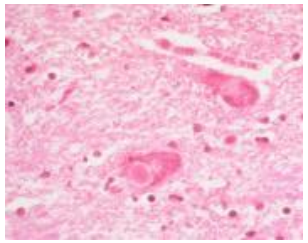


Common pitfall: Assuming a single underlying neuropathology

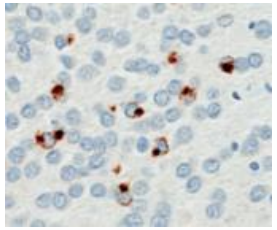
- **Examples:**
  - Diagnosing “vascular dementia” in a patient with high T2/FLAIR burden or primary dysexecutive cognitive profile
  - Diagnosing “AD” or “LBD” in a patient with mixed AD/LBD neuropathology.
- **Basis**:
  - Historical under-recognition of mixed neuropathological diagnoses.
- **Consequences**:
  - Potentially missing prognostic value and/or potential therapeutic implications.



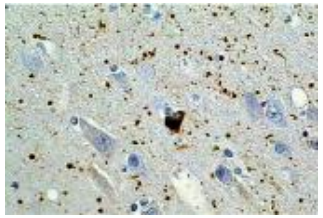
AD
Abeta42, PHF tau



LBD
Alpha-synuclein



TDP-43



FTLD-tau

Vascular disease

Accurate diagnosis provides the foundation for longitudinal care

	SCD/ Preclinical	MCI	Mild dementia	Mod. dementia	Sev. dementia
Symptomatic pharmacotherapy (cognition)	-	+/- (off-label)	+	+	+/-
Disease modifying pharmacotherapy	?	+++	++	-	-
Cognitive rehabilitation therapy	-	++	+	-	-
Compensatory strategies, brain health habits, vascular risk factors	+++	++	+	-	-
Safety	-	+	+++	+++	+
Advance directives/planning	+	+++	+++	++	++
Care arrangements/Caregiver support	-	+	++	+++	+++
Clinical therapeutic research (if interested)	+++	+++	++	-	-

Thank you

- BWH Center for Alzheimer Research and Treatment:
  617-732-8085; BWHmemory@partners.org

- MGH FTD Unit: 617-726-5571; MGHFTDunit@partners.org

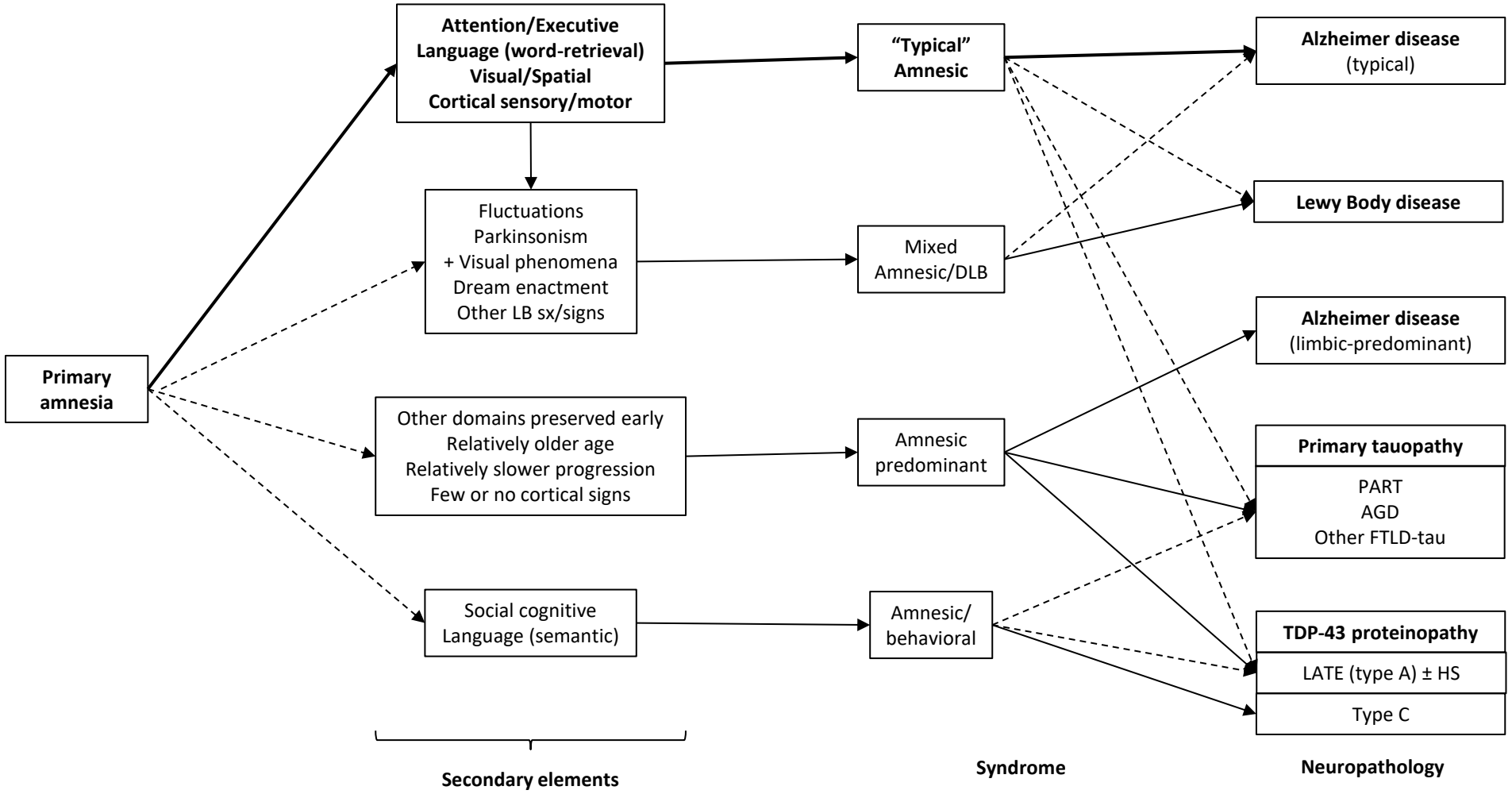
MGH FTD Unit

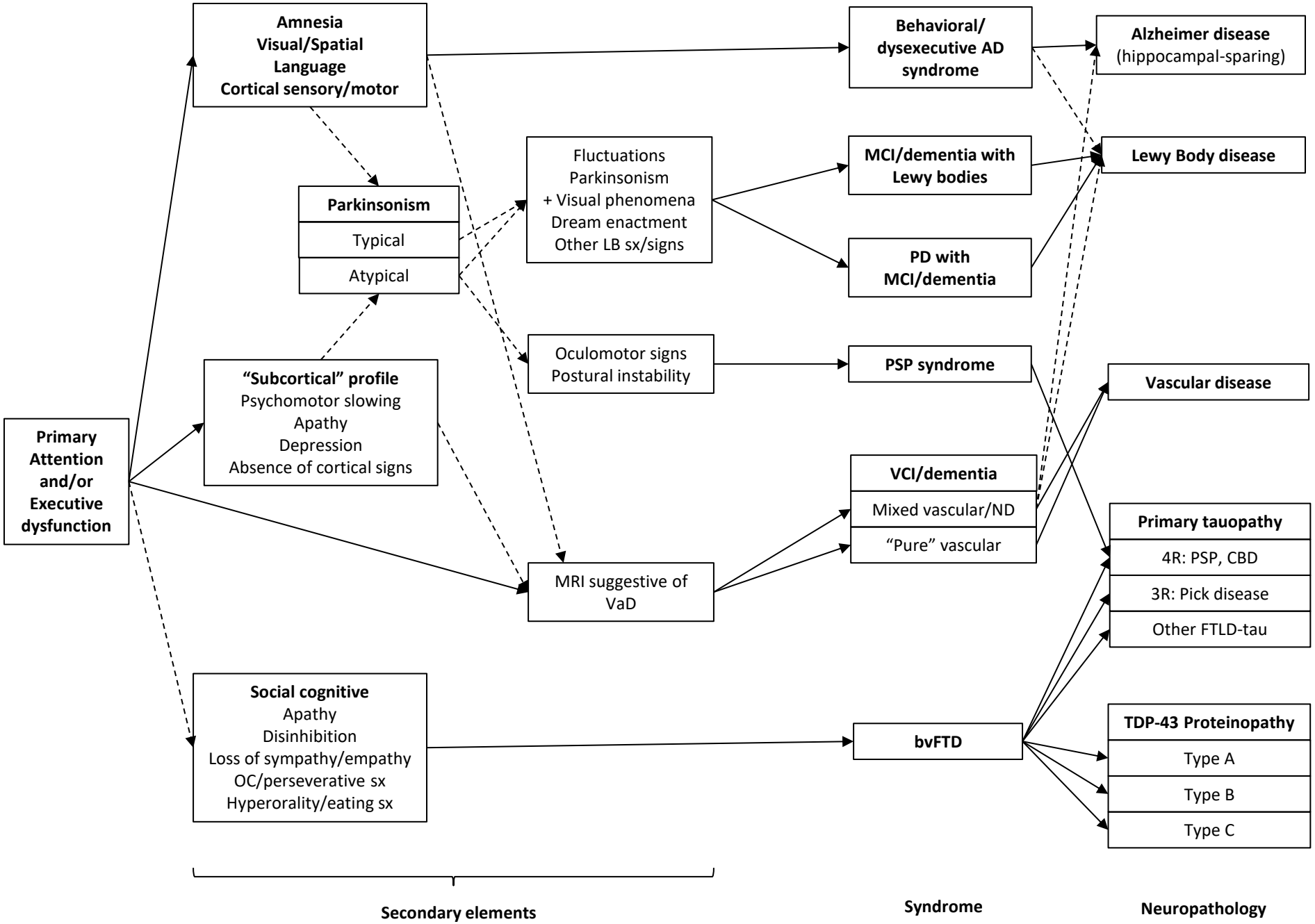
Reference: Diagnostic Criteria

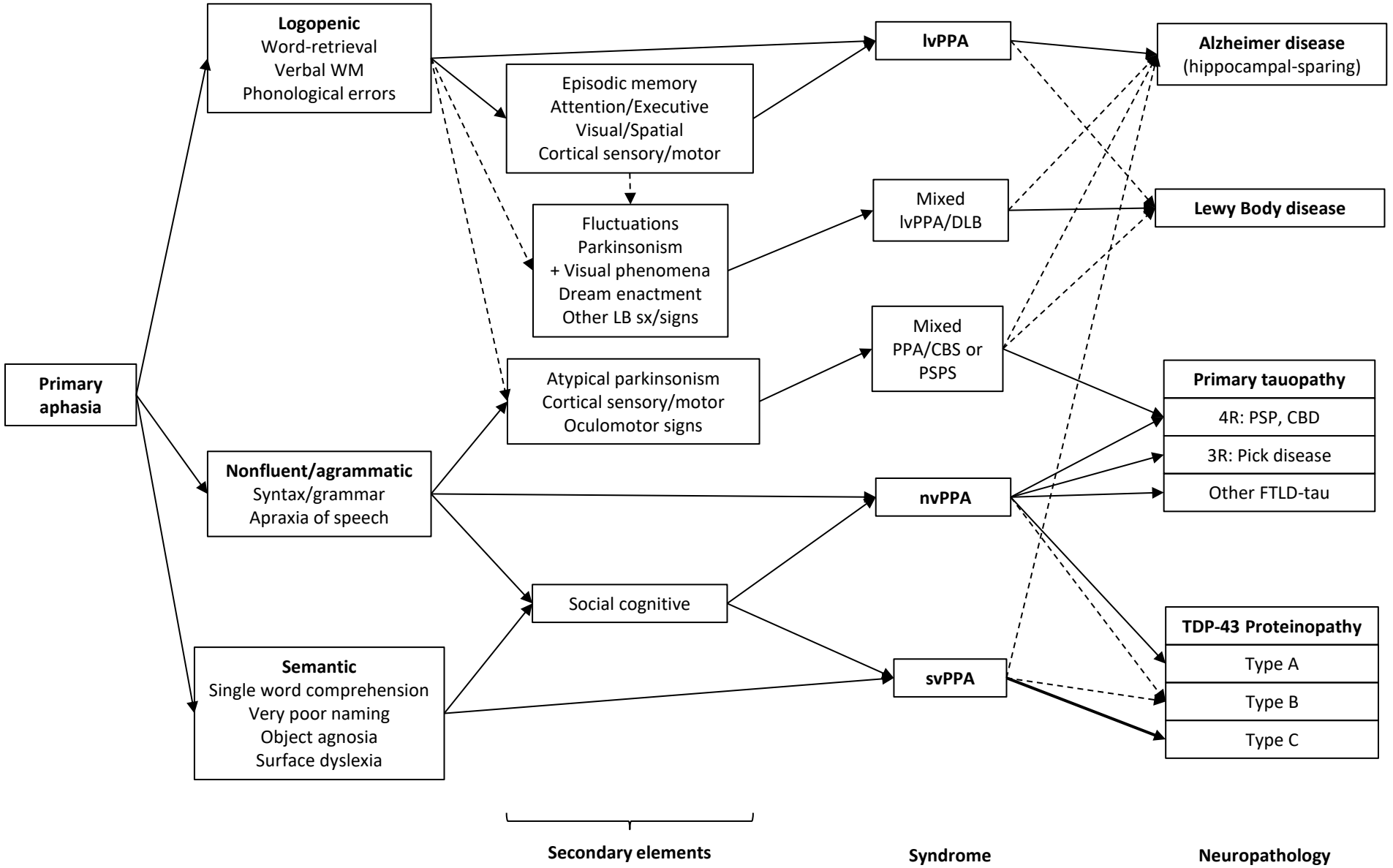
- **Formulation**:
  - Dickerson et al. *CNS Spectrums* 2017;22:439-49.
- **NIA-Alzheimer's Association Diagnostic criteria**:
  - Dementia due to AD: McKhann et al. *Alzheimers Dement* 2011;7:263-9.
  - MCI due to AD: Albert et al. *Alzheimers Dement* 2011;7:270-9.
- **DLB consortium criteria**: McKeith Neurology 2017;89:1-13.
- **Other clinical diagnostic criteria**:
  - PPA: Gorno-Tempini et al. *Neurology* 2011;76:1006-14.
  - PCA: Crutch et al. *Alzheimers Dement* 2017;13:870-84.
  - bvFTD: Rascovsky et al. *Brain* 2011;134:2456-77.
  - Sporadic CJD: Hermann et al. *Lancet Neurol* 2021;20:235-46.

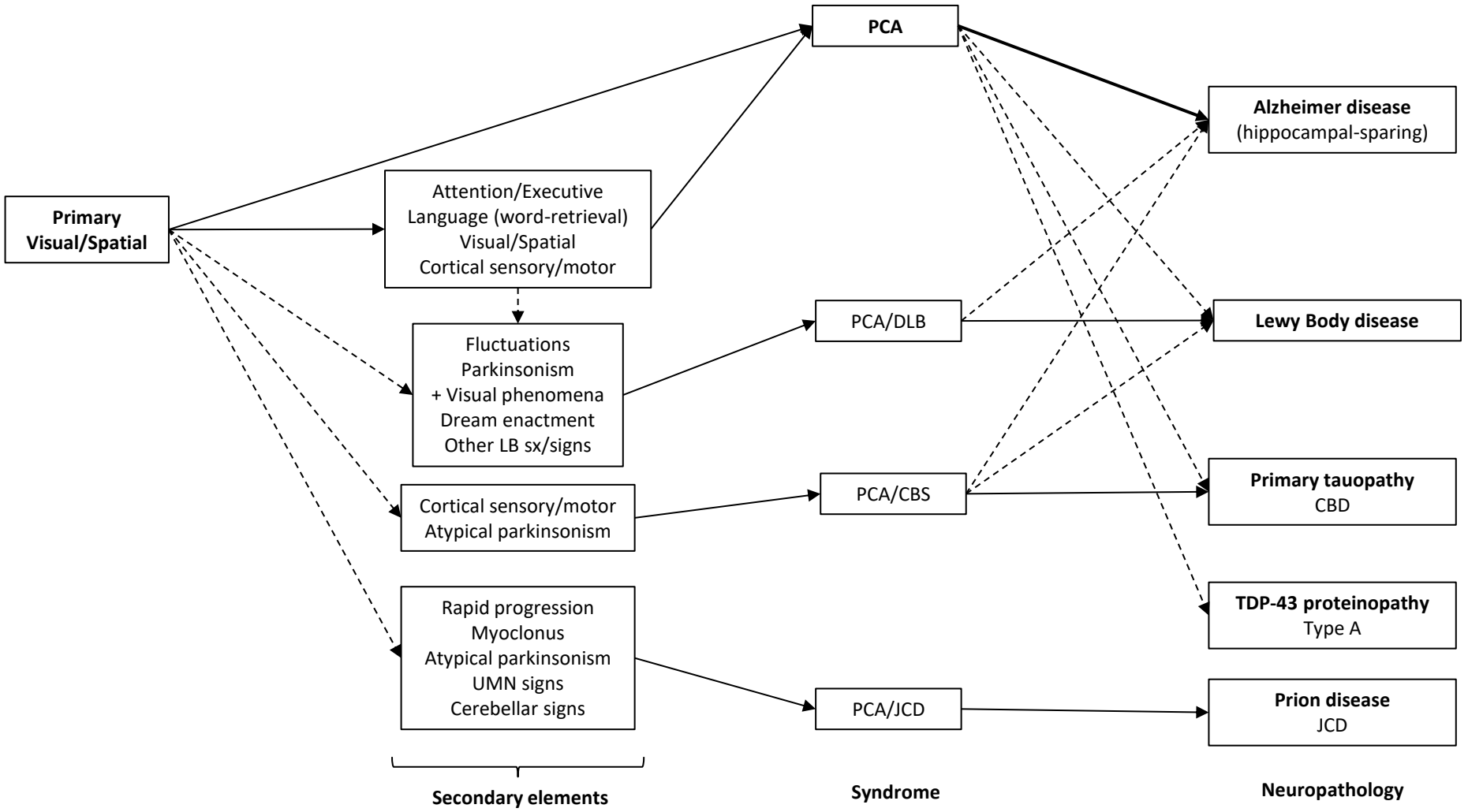
- **Network degeneration**:
  - Seeley et al. *Neuron* 2009;62:42-52.

Syndrome-Pathology Associations




Amnesia
Visual/Spatial
Language
Cortical sensory/motor
Behavioral/
dysexecutive AD
syndrome
Alzheimer disease
(hippocampal-sparing)
Parkinsonism
Typical
Atypical
Fluctuations
Parkinsonism
+ Visual phenomena
Dream enactment
Other LB sx/signs
MCI/dementia with
Lewy bodies
Lewy Body disease
PD with
MCI/dementia
"Subcortical" profile
Psychomotor slowing
Apathy
Depression
Absence of cortical signs
Oculomotor signs
Postural instability
PSP syndrome
Vascular disease
Primary
Attention
and/or
Executive
dysfunction
VCI/dementia
Mixed vascular/ND
"Pure" vascular
MRI suggestive of
VaD
Primary tauopathy
4R: PSP, CBD
3R: Pick disease
Other FTLD-tau
Social cognitive
Apathy
Disinhibition
Loss of sympathy/empathy
OC/perseverative sx
Hyperorality/eating sx
bvFTD
TDP-43 Proteinopathy
Type A
Type B
Type C
Secondary elements
Syndrome
Neuropathology


Primary aphasia
Logopenic
Word-retrieval
Verbal WM
Phonological errors
Nonfluent/agrammatic
Syntax/grammar
Apraxia of speech
Semantic
Single word comprehension
Very poor naming
Object agnosia
Surface dyslexia
Episodic memory
Attention/Executive
Visual/Spatial
Cortical sensory/motor
Fluctuations
Parkinsonism
+ Visual phenomena
Dream enactment
Other LB sx/signs
Atypical parkinsonism
Cortical sensory/motor
Oculomotor signs
Social cognitive
lvPPA
Mixed lvPPA/DLB
Mixed PPA/CBS or PSPS
nvPPA
svPPA
Alzheimer disease
(hippocampal-sparing)
Lewy Body disease
Primary tauopathy
4R: PSP, CBD
3R: Pick disease
Other FTLD-tau
TDP-43 Proteinopathy
Type A
Type B
Type C
Secondary elements
Syndrome
Neuropathology


PCA
Primary
Visual/Spatial
Attention/Executive
Language (word-retrieval)
Visual/Spatial
Cortical sensory/motor
Fluctuations
Parkinsonism
+ Visual phenomena
Dream enactment
Other LB sx/signs
Cortical sensory/motor
Atypical parkinsonism
Rapid progression
Myoclonus
Atypical parkinsonism
UMN signs
Cerebellar signs
PCA/DLB
PCA/CBS
PCA/JCD
Alzheimer disease
(hippocampal-sparing)
Lewy Body disease
Primary tauopathy
CBD
TDP-43 proteinopathy
Type A
Prion disease
JCD
Secondary elements
Syndrome
Neuropathology