I. History

Triad symptom	Queries	NPH characteristic
Gait and falls	Onset, course, type Assistive devices used, how long Circumstances surrounding falls Syncope Orthostatic hypotension Arrhythmias Seizure Orthopedic Rheumatologic	Wide base Feet externally rotated Difficulty initiating step "Magnetic" Freezing unresponsive to visual cue Reduced stride, shuffle Posture upright or flexed
Urinary Symptoms Consider urology referral	UMN vs. local pathology Urgency/frequency Retention Reduced stream Leakage, especially with valsalva Delay or confusion in reaching the bathroom	Urinary urgency Frequency
Cognitive symptoms	Consider AD (may be comorbid) unintentional repetition of questions or comments navigational troubles while driving dominant word retrieval difficulties with paraphasias, simple delusions (theft, infidelity), paranoia weight loss Consider FTD stereotypic speech and nonfluency stuttering, echolalia, palilalia socially inappropriate comments and behavior impulsive behavior, rituals and compulsions (esp. food rituals) marked apathy, lack of inititative loss of empathy hyperphagia, weight gain Consider DLB dominant word retrieval difficulties without paraphasias car crashes, trouble using appliances/machinery early complex delusions, infidelity visual hallucinations(early), doubles, imposter, phantom boarder, TV or mirror image real REM sleep behavior disorder dysautonomia longstanding anosmia	Retrieval deficit in memory Executive dysfunction Visual-spatial difficulties

Consider co-morbid and predisposing conditions

oblisher co-morbid and predisposing conditions		
Sleep referral and treat. Re-evaluate when stable		
Hydrocephalus with decompensation		
No further work-up needed. Refer for shunt		
Hydrocephalus.		
No further work-up needed. Refer for shunt		
·		
MRI C-spine on everyone.		
May need cervical decompression before shunt		
Await recovery and recheck in 4 weeks		
Orthostatic hypotension, arrhythmia, syncope		
Dry eyes, dry mouth, altered sweat		
Cold/heat intolerance, constipation, incontinence		
Loss of smell/taste		

Medication issues	
Anticholinergics (Modified Beer's List, Appendix A)	Minimize or switch to one with less cognitive or
Antidopaminergics, sedatives, anti-epileptics	parkinsonian side effects
	Refer back to prescribing physician for alternative
Acetylcholinesterase inhibitors, memantine,	Stable dose for 30 days before work-up.
Parkinson's medications, anti-depressants	Note that patients with hydrocephalus may be
	partially levodopa responsive.
Anticoagulants	Surgery precluded if indication for anticoagulant is
	for artificial valve, recent PE/DVT, other causes
Active alcoholism or drug abuse	Stable sobriety or abstinence required

II. Physical exam

Focused exam and	differential	
Mental status	MoCA as baseline. (Optional)	
	May have retrieval deficit in memory, executive and visuo-spatial dysfunction	
	Amnestic disorder, fluent and nonflulent aphasia, suggest alternative diagnoses	
Affect	May have hypomimia, hypophonia, reduced spontaneous gesture	
	Moria, euphoria, disinhibition, pseudobulbar (IEED) suggest alternative diagnoses	
Extraocular movements	May have diminished upgaze	
	Downward vertical gaze palsy, progressive external ophthalmoplegia, nystagmus	
	suggest alternative diagnoses	
Strength	Lower extremity strength, tone, and function normal if seated or supine	
	Myelopathy, peripheral neuropathy, or hemiparesis suggests alternative diagnoses	
Tremor	May be present in NPH, often less prominent	
Gait	Wide base, feet externally rotated, difficulty initiating step, freezing unresponsive	
	visual cues, festination, reduced stride, shuffling, posture upright or flexed, arm	
	swing maintained or reduced with flexed posture.	
	May be nonambulatory if advanced NPH	
	Assess ability to stand from a seated position with arms crossed. Note number of	
	attempts and/or need for upper body support.	
	Note base, rate, speed, posture, arm and head swing.	
	Note extra steps on turns, festination, difficulty in doorways, response to visual	
	cues with freezing	
	Romberg's. Tandem. Pull test.	
	Narrow base, absent ataxia, ataxia without apraxia, sensory ataxia suggests	
Reflexes	alternative diagnoses. May have hyper-reflexia, clonus, and extensor plantars	
Orthostatics	Presence of orthostatic hypotension suggests alternative diagnosis.	
Orthostatics	Evaluate medications.	
	Consider dysautonomia of DLB, peripheral neuropathy, paraneoplastic disorders	
Rheumatologic	Gout, foot disorders, ulcers, knee and hip joint deformities,	
Kiloullatologic	Kyphosis, scoliosis, flexed forward at waist from lumbar spinal stenosis	
Head circumference	Head circumference (Male>59cm, female>57.5cm) suggests obstructive	
Cervical ROM	hydrocephalus	
	Limitation in cervical ROM, Lhermitte's sign suggest alternative diagnoses	

III. Objective tests

Standard testing		
MRI brain dementia protocol	Evan's ratio, transependymal flow	
	Asymmetric ventricular enlargement relative to the 4 th (aqueductal stenosis)	
	Chiari malformation (hydrocephalus)	
	Degree of atrophy, regional atrophy, micro/macrovascular disease (other dx)	
	Cerebellum or basal ganglia signal change (other dx)	
MRI C-spine	Check for compressive myelopathy; may need cervical decompression first	
B12, folate, TSH, RPR	Treat deficiencies first	
Urinalysis with C/S	Treat infection and re-evaluate	
Urine toxicology	Consider role of drugs if positive screen	
Vitamin D	Treat deficiency. Continue NPH work-up.	
HgbA1C	Attempt strict control of diabetes	
CBC	Rule out anemia, electrolyte abnormalities and hyperparathyroidism	
biochemistry profile		
including ionized and total		
Ca++		
PT/PTT	Needed before LP	

IV. NPH tests

Assessment and Plan		
Identify and treat other problems contributing to gait, cognition, and bladder difficulties		
	eps below. When in doubt, continue with NPH evaluation	
Contact Terry Czaplicki, RN	248-325-3095,	
NPH nurse coordinator (for all steps below)	TCzapli1@hfhs.org	
Tests performed by NPH team	Modified CERAD battery, Trails A and B	
(All done at W. Bloomfield)	MoCA (if not done in the last 30 days)	
	PSP scale (upper extremity and fine motor skills)	
	Neuropsychiatric Inventory (NPI) with caregiver scale	
	Epworth sleepiness scale	
	Urinary incontinence impact scale	
	High volume LP with removal 30-50cc CSF	
	CSF analysis (routine neurology tests)	
	Tau/A-beta recommended; family decides	
	Gaitrite before and after LP	
	Phone call 24h after LP to assess family's informal	
NDU conference	appraisal of any change in gait, cognition, or bladder	
NPH conference	1-3 weeks after LP (to allow for tau/A-beta results)	
	Wednesdays from 4-5pm	
	Videoteleconferencing :	
	Neurosurgery library Main Campus 313-916-4290	
	Neurology conference room W. Bloomfield	
	248-325-2160	
	Telephone conferencing available from any other location.	
	Call in #: 866-809-1451	
	Passcode: 2739829	
	Notify Terry Czaplicki if you wish to participate. Your	
	patient will be discussed at your convenience Results	
	and recommendations summarized in Epic	
Recommendations	Patients and family directed to referring physician for	
	discussion of results	
	If desired, NPH team member will meet with patient and	
	family for discussion of results	
Referrals for shunting/ETV	Referrals will be directed to treating neurosurgeon,	
-	Jason Schwalb, MD, or Ellen Air, MD	
Request for lumbar drainage trial	In complicated cases or if results from high volume LP are	
	equivocal, an inpatient continuous lumbar drainage trial	
	may be requested. The patient will be referred to the	
	admitting neurosurgeon as an outpatient.	
	Terry Czaplicki will coordinate the admission to the Neuro	
	ICU with neurosurgery nurses	

	Results will be shared in the next NPH conference Notify Terry Czaplicki if you wish to participate in the NPH conference discussion
Post shunt/ETV follow-up	Monthly neurosurgery visits and imaging as indicated Comprehensive reassessment once stable Modified CERAD, Trails A and B, MoCA PSP scale NPI with caregiver distress scale Epworth sleepiness scale Urinary incontinence impact scale Gaitrite Neuro exam Medication review
Long term re-evaluation	Annual reassessment recommended through NPH clinic Contact Terry Czaplicki to arrange visit Test battery as above
Acute change in function	Check for medical illness, UTI, OTC or prescription drug side effects CT head for hemorrhage If MRI performed, notify Sally Goldman to arrange for resetting of shunt valve after MRI If no etiology identified, refer to Dr. Schwalb or treating neurosurgeon for evaluation of shunt patency and function