Neurologic Assessment of the Older Adult

A Guide for Nurses

AANN Clinical Practice Guideline Series

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Contents

Preface

To meet its members' needs for educational tools, the American Association of Neuroscience Nurses (AANN) has created a series of guides to patient care called the AANN Clinical Practice Guideline Series. Each guide has been developed using current literature and is built upon evidence-based practice.

Older adults frequently present with a primary complaint that is neurologic in origin, and neurologic disorders are the primary cause of disability in older adults. These disorders account for 50% of disability in people over 65 years of age and for more than 90% of serious dependency (Drachman, Long, & Swearer, 1994). As a result, the personal and societal impact of neurologic diseases and disorders in older adults is significant.

The purpose of this document is to assist registered nurses, patient care units, and institutions in providing safe and effective care to older adults with neurologic conditions. Whether the older adult is experiencing an acute neurologic event or a chronic disabling condition, nurses are pivotal in assessment, treatment, and continuing care. Resources and recommendations for practice should enable nurses to provide an optimal assessment of the older adult in order to inform best practice.

Adherence to these guidelines is voluntary, and the ultimate determination about their application must be made by the practitioner in light of the circumstances presented by a particular patient. This guide is an essential resource for nurses who are providing care to older adults with a neurologic condition. It is intended not to replace formal learning but to augment the knowledge of clinicians and provide a readily available reference tool.

Nursing and AANN are indebted to the volunteers who have devoted their time and expertise to this valuable resource, which was created for those who are committed to excellence in geriatric neuroscience patient care.

I. Introduction

A. Purpose

The purpose of this guide is to assist registered nurses, patient care units, and institutions in providing safe and effective care to older adults with neurologic conditions. *Older adult* has been defined in most studies as a person whose age is equal to or greater than 65 years. However, this definition has been used more for convenience than for its biological relevance. For the purposes of this guideline, *older adult* will be defined as 65 years and older; however, the individual practitioner should note that this age is not absolute because chronological age does not equal biological age. Aging is a multifactorial process involving the genetic, behavioral, and pathological factors that make each person unique. The goal of the guideline is to provide background on the biology of aging in the nervous system and to consider its implications for initial and ongoing neurologic assessment of the older adult, stressing the difference between this assessment and that of the younger adult.

B. Rationale for Guideline

Older adults commonly present with problems that are neurologic in origin, including dizziness, pain, sleep disturbances, and problems with balance. In addition, neurologic disorders are the primary cause of disability in older adults. These disorders account for 50% of disability in people over 65 years of age and for more than 90% of serious dependency (Drachman et al., 1994). The personal and societal impact of neurologic diseases and disorders in older adults is therefore significant. Older adults experience certain neurologic disorders at higher rates than their younger counterparts. For example, in 1999 the rate of traumatic brain injury in the general population was 60.6/100,000, but for people over 65, the rate was 155.9/100,000 (Langlois et al., 2003). In 2002, 71% of the patients discharged from the hospital with a first-listed diagnosis of stroke were 65 years and older (American Heart Association, 2006). If current trends in aging of the U.S. population continue, the number of nurses who will care for an elderly patient who requires an age-appropriate neurologic assessment, regardless of clinical setting, will increase. Nurses must be prepared to assess this complex and growing population.

Recently, a recategorization of older adults has emerged: the young old are 65–74; the old are 75–84; and the oldest old are 85 and older. The prevalence of many neurologic diseases (e.g., Alzheimer's disease and stroke) increases significantly within these categories, with the oldest old having the highest rate (Alzheimer's Association, 2007; Centers for Disease Control and Prevention, 2007). In addition, outcomes (e.g., mortality) from various neurologic conditions (e.g., traumatic brain injury) are significantly poorer (that is, are associated with higher mortality) within these age categories (Thompson et al., 2007). The neuroscience nurse must understand the potential differences in risk and care needs of older adults.

C. Assessment of Scientific Evidence

A review of the published literature from January 1982 to November 2006 was conducted using Medline/PubMed, CINAHL, and Biosys and the following search terms: *older adult, geriatric, elder, senior, assessment, test, motor, cognition, sensation, pain, cranial nerve, nervous system,* and *neurological.* Monographs, textbooks, and review articles were also consulted. Studies not directly pertaining to neurologic assessment or not written in English were excluded from further evaluation. Selected articles fulfilled the following criterion: *older adult* was defined as a person ≥65 years.

For the AANN Clinical Practice Guideline Series, data quality is classified as follows:

- Class I: Randomized control trial without significant limitations or metaanalysis
- Class II: Randomized control trial with important limitations (e.g., methodological flaws or inconsistent results), observational studies (e.g., cohort or case-control)
- Class III: Qualitative studies, case study, or series
- Class IV: Evidence from reports of expert committees and/or expert opinion of the guideline panel, standards of care and clinical protocols

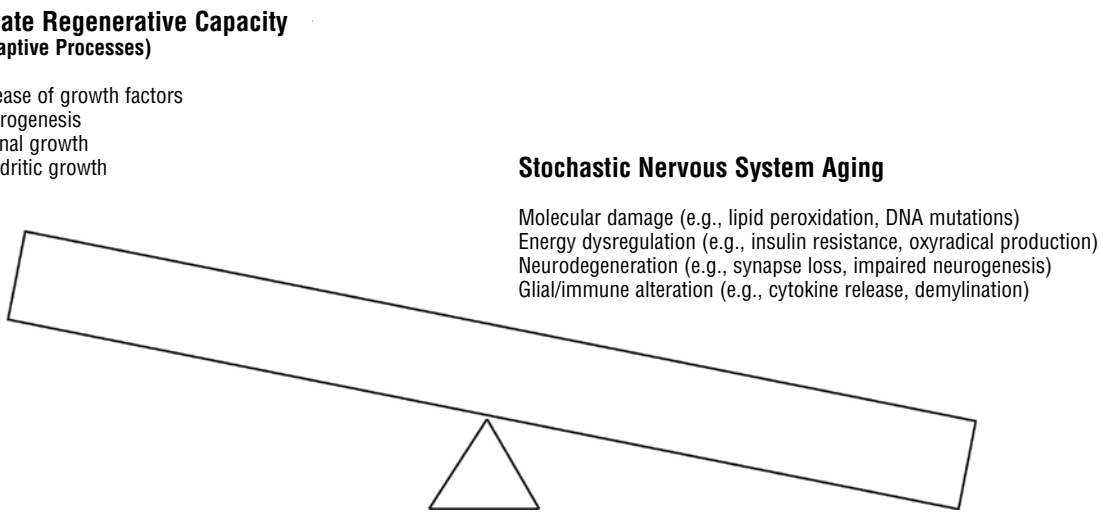
The Clinical Practice Guidelines and recommendations for practice are developed by evaluating available evidence (AANN, 2005, adapted from Guyatt & Rennie, 2002; Melnyk, 2004):

- Level 1 recommendations are supported by class I evidence.
- Level 2 recommendations are supported by class II evidence.
- Level 3 recommendations are supported by class III and IV evidence.

D. Background

1. Two main frameworks for aging are relevant to neurologic changes: the genetic theory and the stochastic theory.
   a. In the genetic theory of aging, the inevitability of death is linked to cellular senescence (aging) by the studies in which somatic cells have a defined life cycle (Hayflick, 1974, 1976). The number of neurons at birth is near maximal, and that number slowly decreases over time, primarily because of apoptosis (programmed cell death), which is due to

Figure 1. The balance of neurologic changes with aging



Note. The figure was constructed using information from "Modification of brain aging and neurodegenerative disorders by genes, diet, and behavior," by M. P. Mattson, S. L. Chan, and W. Duan, 2002, *Physiology Reviews, 82*(3), 637–672.

aging or disease. In adulthood, new neurons are produced only in specific parts of the hippocampus (dentate gyrus) and lateral ventricles (subventricular zone) (Eriksson et al., 1998; Taupin & Gage, 2002). The exact function of these newborn neurons is unclear.

The production of new neurons (neurogenesis) is thought to be influenced by numerous factors, including the reduction of growth factors with age. In addition, certain clinical conditions that may have increased in prevalence with age, such as depression and decreased physical activity, reduce the growth of new neurons.

This reduction in new neuronal growth may reduce the ability of the older adult to recover from neurologic insults such as stroke and brain injury either as well as or as quickly as a younger person does. It is generally thought that a 40% neuronal loss is required for failure of the nervous system. The genetic theory of aging is also important in the development of several neurologic diseases, including Huntington's, Parkinson's, and Alzheimer's diseases, all of which display a strong coupling between genotype and phenotype (Mattson, Chan, & Duan, 2002; Mobbs & Rowe, 2001).

b. In stochastic theories of aging, various factors such as molecular damage from accumulation of free radicals, intrinsic "wear and tear," change in gene expression over time, genetic damage, and mitochondrial dysfunction play a role in causing progressive neurodegeneration, or a loss of neurons with time (Carey, 2003; Mattson et al., 2002; Mobbs, 2006). This neurodegeneration occurs in concert with the limited innate regenerative capacity of the nervous system to respond to the aging process (see **Figure 1**). However, the development of neurodegenerative disorders may be triggered by genetic tendencies or environmental factors (Mattson et al.).

2. Changes with aging
   a. Neuroanatomical changes with aging
      (1) Neuronal shrinkage and neuronal loss with aging translate to a loss of brain volume. It has been thought that, between 20 and 90 years of age, the brain loses an average of 5%–10% of its weight (Mobbs, 2006), but this percentage is currently being questioned because newer techniques use more accurate measurement methods and have not shown the same degree of loss.
         (a) Loss of brain weight is greatest in the white matter (Resnick, Pham, Kraut, Zonderman, & Davatzikos, 2003), and the greatest loss with aging occurs in the frontal lobes. This loss has implications for memory changes that occur with aging.
         (b) Men lose more brain volume in all brain regions than women (Coffey et al., 1998; Resnick et al., 2000).
      (2) Modest loss of synapses, the connections between neurons, occurs (Dekaban, 1978; Scheibel, Lindsay, Tomiyasu, & Scheibel, 1975), resulting in increased response time.

(3) Expansion of the dendritic tree in response to loss of synapses occurs (Dekaban, 1978; Timiras, 2003b).
(4) A reduction in reactive synaptogenesis, the axonal sprouting in reaction to loss of a neuron, is seen (Cotman, 1999).
(5) Structural deterioration of microglia, the cells responsible for cell-mediated immune response in the central nervous system (CNS) (Streit, 2006), may result in decreased ability to respond to infection, injury, or inflammation.
(6) Unclear changes occur in glia, cells that provide support and nutrition. Older studies (Beach, Walker, & McGeer, 1989; Terry, DeTeresa, & Hansen, 1987) have reported increased gliosis in older adults, particularly at bilateral ventricles and the frontotemporal cortex. A newer study that used improved measurement techniques (stereology) reported no difference in the number of neocortical glia (Pakkenberg et al., 2003).
(7) Increased ventricular size is seen, with lateral ventricles greater than the third ventricle. Ventricular size increases with loss of brain volume. Ventricular volume increases by about 3% per year (Love, 2006). These changes may be seen on computed tomography (CT) or magnetic resonance imaging (MRI) scans. Normal-pressure hydrocephalus is a disorder commonly associated with advanced age.
(8) Amyloid infiltrates in pial and penetrating vessels are seen. Cerebral amyloidosis may begin in the 70s and increases with age; changes correlate with amyloid deposits in the cardiovascular system (Kemper, 1994), which may place the older adult at increased risk for intracerebral hemorrhage.
(9) Atherosclerotic changes occur. Mineralization of the blood vessels, mild loss of smooth muscle cells, and hyaline changes are common in parenchymal blood vessels of the brain and spinal cord, and vascular compliance decreases (Love, 2006).
(10) Neurofibrillary tangles in the hippocampus are not a consistent feature of normal aging (Love, 2006). They are primarily associated with the development of Alzheimer's disease.
(11) Melanin pigment changes in locus ceruleus occur. Pigment increases until age 60; a subsequent decrease is likely due to pigment cell loss (Mann & Yates, 1974), which may be related to the sleep changes seen with aging.
(12) Loss of the total number of motor units in the spinal cord (Love, 2006) may result in decreased reflex activity and sarcopenia (loss of muscle mass and strength) seen with aging.
(13) Deposits of lipofuscin, ubiquin, and α-Beta plaque are normal aging changes depending on amount and location (Love, 2006).

b. Neurochemical changes with aging
(1) A number of neurochemical changes occur with aging, including reductions in a variety of neurotransmitters, reduction in receptor density, lower rates of receptor recovery, and changes in neuromodulatory regulation of receptors (Keck & Lakoski, 2001).
(2) One such reduction involves serotonin (5-HT). Decreases seen in 5-HT with aging may correspond to noncognitive changes in behavior, such as depression and aggression with Alzheimer's, and other changes, such as arousal sleep disturbances (Keck & Lakoski, 2000).
(3) Acetylcholine in the cortex and striatum is also reduced, and markers of GABA, an inhibitory neurotransmitter, are reduced (Palmer & DeKosky, 1998). The fact that lower levels of acetylcholine are associated with memory impairment (Agins & Kelly, 2006) may explain some difficulties that some older adults have with short-term memory and recent memory formation.
(4) N-methyl-D-aspartate (NMDA) and excitatory amino acid (EAA) terminals are preserved (Palmer, 2000; Segovia, Porras, DelArco, & Mora, 2001).
(5) Loss of the dopamine D2 receptor occurs in the striatum only. Decreased levels of dopamine are associated with depression (Agins & Kelly, 2006).
(6) Age-related changes in hormone levels, such as estrogen, alter the way that various neurotransmitters (such as 5-HT) function. In the CNS, estrogen may have neurotrophic effects, increasing the growth and arborization of neurites, dendritic differentiation, and synapse formation (Matsumoto & Arai, 1981; Nishizuka & Arai, 1981). As a result, lowered estrogen levels may result in decreased plasticity.

c. Physiologic changes with aging
(1) Axoplasmic flow, the movement of cellular

Table 1. Cranial nerve alterations

Cranial Nerve	Aging Change	Implication for Assessment	Reference
CN I (olfactory)	Deficits in function	It is important to assess olfactory nerve function in older adults because deficits may lead to nutritional deficits or safety issues.	Larner, 2006
CN II (optic)	Presbyopia	Opacities in lens and vitreous may contribute to impaired visual acuity. Depth and motion perception and contrast sensitivity are reduced.	Larner, 2006
CN III (oculomotor), IV (trochlear), VI (abducens)	Pupils generally smaller (senile miosis)	Reflex responses to light and accommodation become slower. (This decreased size and delayed pupillary reaction to light and accommodation are due not to neurologic changes but to aging changes in the muscles of the sphincter pupillae and elasticity of lens.)	Benassi, D'Alessandro, Gallassi, Morreale, & Lugaresi, 1990; Larner, 2006
	Restricted upward motion	Restricted motion may result in convergence deficit.	
CN V (trigeminal)	Decreased lacrimal secretions	Medications may exacerbate this condition and result in irritation, inflammation, or increased tearing to compensate.	Hobdell et al., 2004; Warnat & Tabloski, 2006
CN VIII (auditory)	Presybycusis and impaired vestibulospinal reflexes	Hearing at higher tones is lost and may cause older adult to respond inappropriately and to be misinterpreted as confused.	Degler, 2004; Larner, 2006
CN VII (facial), IX (glossopharyngeal), X (vagus)	Decrease in number of taste buds	A decreased perception of saltiness, sweetness, sourness, or bitterness may influence nutritional intake.	Hobdell et al., 2004
CN XI (accessory), XII (hypoglossal)	Delay in swallowing (also involves CN V, VII, IX, X)	It is possible for an older adult to experience dysphagia.	Hobdell et al., 2004

components to and from a neuronal cell body through the axonal cytoplasm, decreases (Niewiadomska & Baksalerska-Pazera, 2003). This may contribute to delays in response times.

(2) Decreased cerebral blood flow (CBF) and decrease in cerebral metabolic rate for oxygen ($CbMRO_2$) occurs. There is a greater than 25% reduction in CBF by age 80, with increased cerebrovascular resistance (Meyer, Kawamura, & Terayama, 1994; Obrist, 1979). Declines in local CBF are greater in gray matter than in white matter (Imai et al., 1988).

(3) Decreased protein synthesis occurs, resulting in shrinkage in neuronal cell size and decreases in specific proteins (e.g., neurotransmitters and remyelinization proteins); delays in response may be partially attributable to this (Mobbs, 2006).

(4) Delays in reflex arcs occur (Botwinick, 1975).

(5) Density and absolute number of peripheral nerve fibers change with the segmental demyelination-remyelination process; slowing of response rates and reaction times may occur (Gilmore, 1995).

(6) Delays in complex pathways occur, decreasing processing speed; evoked potentials are prolonged (Gilmore, 1995).

(7) Vibratory sense in toes or ankles may be impaired (Sirven & Mancall, 2002).

(8) Decreases in two-point discrimination and stereognosis with aging have been reported but are not well characterized (Sirven & Mancall, 2002).

(9) Cranial nerve alterations (see **Table 1**).

d. Reduction in proximal strength

(1) The reduction in proximal strength is due largely to age-related sarcopenia (Mobbs, 2006).

(2) Both neurologic and nonneurologic disease states increase this loss (Mobbs, 2006).

e. Reduction in autonomic nervous system responsivity

(1) The loss or decrease in function of a number of baroreceptors results in loss of heart rate or blood pressure variability and an increased risk of syncope (Sirven & Mancall, 2002).

(2) Temperature control may also be reduced (Sirven & Mancall, 2002).

f. Implications for the patient

Chronological age does not equal biological age. Aging is a multifactorial process involving the genetic, behavioral, and pathological factors that make each person unique.

Normal aging of the CNS has tremendous implications for other organ systems and the daily functioning of the patient. An awareness of these interrelationships is critical to conducting an appropriate nursing assessment and planning care. For example, when evaluating gait and muscle strength, the nurse assessing the patient's motor system is also assessing the patient for evidence of sarcopenia, as well as changes in balance, neuronal impulse, and sensation. By assessing cough reflex, which may diminish with age, the nurse is also assessing the patient's ability to protect the respiratory tract. Therefore the neurologic assessment of the older adult is a global assessment of the patient's overall functioning.

Normal aging processes have many implications for the patient. The reduction in new neuronal growth and the deterioration of microglia may reduce the ability of the older adult to recover from an insult to the system such as a stroke either as well or as quickly as a younger person does. The long-term exposure to various environmental agents, alone or together with genetic tendencies, may promote the development of neurodegenerative disorders such as Parkinson's disease. These changes also have implications for the development of short-term (5–30 second) and recent (1 hour–several days) memory formation, which may be impaired in the older adult (Degler, 2004). These changes also have significant implications for patient education strategies that should be incorporated into the care plan for the older adult patient, including teaching new information within familiar contexts for linkage to aid retention; providing additional strategies such as mnemonics to improve recall; endorsing ongoing learning; and matching goals with those of the older adult (Level 3; Degler).

The neurochemical changes that occur with aging, including reductions in neurotransmitters and their receptors, have significant implications for behavioral changes with aging such as sleep disturbances and depression. The majority of older adults experience sleep disturbances, including decreased quality of sleep, changes in sleep-wake cycles, and increased sleep latency. These changes may have a significant impact on the patient's level of alertness and overall ability to function. Depression is the most common mood disorder in older adults and often goes undetected and untreated. As a result, when occurring concomitantly with physical illness, such as stroke, recovery may be lessened or delayed. It is therefore essential that these areas be incorporated into the assessment of the older adult when he or she presents with a neurologic complaint.

Normal changes associated with aging—such as reductions in neurotransmitters, reduction in numbers of synapses, demyelinization, impaired vibratory sense in feet, changes in the cranial nerves such as impaired visual acuity along with decreased processing speeds—place the older adult at an overall increased risk for injury. The neurologic assessment is therefore a critical component of the safety assessment of the older adult. In summary, because normal aging within the nervous system has important implications for patients, the registered nurse is in a critical position to determine the care for the older adult through a careful and appropriate neurologic assessment.

II. Neurologic Assessment

A. General Approach

1. Because of decreased processing speed in older adults, nurses should use a calm, ordered approach and allow adequate time for patients to respond to questions and verbal instructions (Level 3; Whitney, Pugh, & Mortimer, 2004).
2. If a patient uses an adaptive device (e.g., hearing aid, glasses, mobility aid), the nurse should ensure the use of the device during assessment if it is available; document if the device is not available or is not functioning (Level 3; Pepper, 2006).
3. Nurses should provide a quiet, nondistracting environment and pace tasks according to the patient's endurance (Level 3; Degler, 2004).
4. Assessment of the patient may include family members or other identified sources of support, who may provide additional information or be involved in planning care (Level 3; Degler, 2004).

B. Global and Functional Assessment

1. Activities of daily living or instrumental activities of daily living; see **Figures 2, 3** (Level 3; Lawton & Brody, 1969; National Institutes of Health, 1987). It may be helpful to remember the following mnemonics: DEATH (dressing, eating, ambulation, toileting, habitus) and SHAFT (shopping, housekeeping, able to use phone, food preparation/finances, transportation).
2. Screen for sleep assessment by asking the older adult the following questions:
   a. Are you satisfied with your sleep?
   b. Does sleep or fatigue interfere with your activities?

Figure 2. Activities of Daily Living (ADL) Scale

In each category, circle the item that most closely describes the person's highest level of functioning and record the score assigned to that level (either 1 or 0) in the blank at the beginning of the category.

A. Toilet	_____
1. Care for self at toilet completely; no incontinence	1
2. Needs to be reminded, or needs help in cleaning self, or has rare (weekly at most) accidents	0
3. Soiling or wetting while asleep more than once a week	0
4. Soiling or wetting while awake more than once a week	0
5. No control of bowels or bladder	0
B. Feeding	_____
1. Eats without assistance	1
2. Eats with minor assistance at meal times and/or with special preparation of food, or help in cleaning up after meals	0
3. Feeds self with moderate assistance and is untidy	0
4. Requires extensive assistance for all meals	0
5. Does not feed self at all and resists efforts of others to feed him or her	0
C. Dressing	_____
1. Dresses, undresses, and selects clothes from own wardrobe	1
2. Dresses and undresses self with minor assistance	0
3. Needs moderate assistance in dressing and selection of clothes	0
4. Needs major assistance in dressing but cooperates with efforts of others to help	0
5. Completely unable to dress self and resists efforts of others to help	0
D. Grooming (neatness, hair, nails, hands, face, clothing)	_____
1. Always neatly dressed and well-groomed without assistance	1
2. Grooms self adequately with occasional minor assistance, e.g., with shaving	0
3. Needs moderate and regular assistance or supervision with grooming	0
4. Needs total grooming care but can remain well-groomed after help from others	0
5. Actively negates all efforts of others to maintain grooming	0
E. Physical Ambulation	_____
1. Goes about grounds or city	1
2. Ambulates within residence on or about one block distant	0
3. Ambulates with assistance of (check one)	
a ( ) another person, b ( ) railing, c ( ) cane, d ( ) walker, e ( ) wheelchair	0
1.__Gets in and out without help. 2.__Needs help getting in and out	
4. Sits unsupported in chair or wheelchair but cannot propel self without help	0
5. Bedridden more than half the time	0
F. Bathing	_____
1. Bathes self (tub, shower, sponge bath) without help	1
2. Bathes self with help getting in and out of tub	0
3. Washes face and hands only but cannot bathe rest of body	0
4. Does not wash self but is cooperative with those who bathe him or her	0
5. Does not try to wash self and resists efforts to keep him or her clean	0

Scoring interpretation: For ADLs, the total score ranges from 0 to 6. In these categories, only the highest level of function receives a 1. These screens are useful for indicating specifically how a person is performing at the present time. When they are also used over time, they serve as documentation of a person's functional improvement or deterioration.

Note. From "Assessment of older people: Self-maintaining and instrumental activities of daily living," by M. P. Lawton and E. M. Brody, 1969, *Gerontologist, 9,* pp. 179–186. Copyright 1969 by the Gerontological Society of America. Reprinted with permission.

Figure 3. Instrumental Activities of Daily Living (IADL) Scale

In each category, circle the item that most closely describes the person's highest level of functioning and record the score assigned to that level (either 1 or 0) in the blank at the beginning of the category.

A. Ability to Use Telephone	____
1. Operates telephone on own initiative; looks up and dials numbers	1
2. Dials a few well-known numbers	1
3. Answers telephone but does not dial	1
4. Does not use telephone at all	0
B. Shopping	____
1. Takes care of all shopping needs independently	1
2. Shops independently for small purchases	0
3. Needs to be accompanied on any shopping trip	0
4. Completely unable to shop	0
C. Food Preparation	____
1. Plans, prepares, and serves adequate meals independently	1
2. Prepares adequate meals if supplied with ingredients	0
3. Heats and serves prepared meals or prepares meals but does not maintain adequate diet	0
4. Needs to have meals prepared and served	0
D. Housekeeping	____
1. Maintains house alone or with occasional assistance (eg, domestic help for heavy work)	1
2. Performs light daily tasks such as dishwashing, bed making	1
3. Performs light daily tasks but cannot maintain acceptable level of cleanliness	1
4. Needs help with all home maintenance tasks	1
5. Does not participate in any housekeeping tasks	0
E. Laundry	____
1. Does personal laundry completely	1
2. Launders small items; rinses socks, stockings, etc.	1
3. All laundry must be done by others	0
F. Mode of Transportation	____
1. Travels independently on public transportation or drives own car	1
2. Arranges own travel via taxi but does not otherwise use public transportation	1
3. Travels on public transportation when assisted or accompanied by another	1
4. Travel limited to taxi or automobile with assistance of another	0
5. Does not travel at all	0
G. Responsibility for Own Medications	____
1. Is responsible for taking medication in correct dosages at correct time	1
2. Takes responsibility if medication is prepared in advance in separate dosages	0
3. Is not capable of dispensing own medication	0
H. Ability to Handle Finances	____
1. Manages financial matters independently (budgets, writes checks, pays rent and bills, goes to bank); collects and keeps track of income	1
2. Manages day-to-day purchases but needs help with banking, major purchases, etc.	1
3. Incapable of handling money	0

Scoring interpretation: For IADLs, the total score ranges from 0 to 8. In some categories, only the highest level of function receives a 1; in others, two or more levels have scores of 1 because each describes competence at some minimal level of function. These screens are useful for indicating specifically how a person is performing at the present time. When they are also used over time, they serve as documentation of a person's functional improvement or deterioration.

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c. Does your bed partner or another person notice unusual behavior (e.g., snoring, interrupted breathing, leg movements) in you during sleep?

(Level 3; National Institutes of Health, 1990)

C. Mental Status

1. Orientation (Level 3; Hobdell et al., 2004; Larner, 2006)
2. Memory (Level 2; Craik, Byrd, & Swanson, 1987; Hobdell et al., 2004; Larner, 2006; Salthouse, 2005; Timiras, 2003a)
3. Intellectual performance (Level 2; Compton, Bachman, Brand, & Avet, 2000; Hobdell et al., 2004; Larner, 2006; Wechler, 1981)
4. Thought process
   a. Judgment and problem solving (Level 3; Botwinick, 1975; Drachman et al., 1994; Horn, 1975)
   b. Abstract versus concrete thinking (Level 3; Hobdell et al., 2004; LaRue, 1992; Wecker, Kramer, Wisniewski, Delis, & Kaplan, 2000)
   c. Affect and mood
      (1) Screen for depressive symptoms with the following questions:
         (a) "During the last month have you been bothered by feeling sad, depressed, or hopeless?"
         (b) "During the last month have you often had little interest or pleasure in doing things?"

      These questions have 96% sensitivity for detecting major depression and indicate the need for follow-up with a more comprehensive interview (Level 2; Johnston, Covinsky, & Landefeld, 2005; Steffens et al., 2000).
      (2) Personality traits may become more pronounced or exaggerated with age (Victor & Ropper, 2001).
   d. Attention (Level 2; Carlson, Hasher, Zacks, & Connelly, 1995; Earles, Smith, & Park, 1996; McDowd & Shaw, 2000)
   e. Executive function (Level 2; Raz, Gunning-Dixon, Head, Dupuis, & Acker, 1998; Salthouse, 2005)
      (1) Previously undetected dementia may often be first assessed in patients when they are in settings unfamiliar to them, such as the hospital (Kennedy, 2004).
      (2) Patients with dementia may also experience delirium (Foreman, Mion, Trygstad, & Fletcher, 2003), and it is important to distinguish the various signs and symptoms of dementia, delirium, and depression (for a comparison of the clinical features of delirium, dementia, and depression, go to www.geronurseonline.org/index.cfm?section_id=23&geriatric_topic_id=3&sub_section_id=31&page_id=39&tab=2 and click on the link to a PDF of the Depression Dementia Delirium Table).
      (3) After delirium has been ruled out or treated, best practices for the assessment of executive function in older adults include use of the controlled oral word association test and the oral version of the trail-making test (Level 3; Kennedy, 2004).
      (4) Communication (Level 3; Hobdell et al., 2004)
         (a) Speech patterns
         (b) Reading and writing
      (5) Sensory recognition (Level 3; Hobdell et al., 2004; Sirven & Mancall, 2002)
      (6) Delirium is a perceptual disturbance that develops during a short period of time and tends to fluctuate over time. It is also characterized by an alteration in consciousness, reduced attention, and a change in cognition (American Psychiatric Association, 2000). The incidence in hospitalized older adults is around 20% but may be as high as 60% at discharge and is associated with significantly increased morbidity and mortality (Foreman et al., 2003). It is often unrecognized by healthcare providers; therefore systematic assessment for delirium in high-risk older adults is an important component of care (Level 2; Ely & Inouye, 2001; Ely et al., 2001; McNicoll, Pisani, Ely, Gifford, & Inouye, 2005; Truman & Ely, 2003).
5. Tools
   a. Other tools to assess areas not specified here (e.g., orientation and intellectual performance such as calculation) are the same as those used with younger adults.
   b. Depression
      (1) See above, section II.C.4c, for screen.
      (2) Several full-length scales have been validated for use in older adults to measure for depression. The Geriatric Depression Scale (Yesavage et al., 1983) has been used widely in community, acute, and long-term care settings.
   c. The Mini-Cog™ is a dementia assessment tool that can be given quickly, requires only paper and pencil or pen, and combines the clock-drawing test (CDT) as a distracter with an uncued 3-item recall test. It is relatively

uninfluenced by level of education or language of origin. The test is administered as follows:

(1) Make sure that you have the patient's attention. Instruct the patient to listen carefully to and remember three unrelated words and then to repeat the words back to you (to be sure the patient heard them).

(2) Instruct the patient to draw the face of a clock on either a blank sheet of paper or a sheet on which the clock circle has already been drawn. After the patient puts the numbers on the clock face, ask him or her to draw the hands of the clock to read a specific time (11:10 and 8:20 are most commonly used and are more sensitive than some others). These instructions can be repeated, but no additional instructions should be given. If the patient cannot complete the CDT in ≤3 minutes, move on to the next step.

(3) Ask the patient to repeat the three previously presented words. Give 1 point for each recalled word after the CDT distracter for a total of 3 possible points for recall (range 0–3). Give 2 points for a normal CDT and 0 points for an abnormal CDT. The CDT is considered normal if all numbers are depicted in the correct sequence and position and if the hands readably display the requested time. The recall and CDT scores are added to get the Mini-Cog score. A score of 0–2 indicates a positive screen for dementia (Borson, Scanlan, Brush, Vitaliano, & Dokmak, 2000; Borson, Scanlan, Chen, & Ganguli, 2003; Borson, Scanlan, Watanabe, Tu, & Lessig, 2006). See Appendix. Mini-Cog™.

d. The Mini–Mental State Examination (MMSE) is a widely used and validated 30-item tool to measure cognitive status in adults. Normal function is considered to be a score of >24 out of 30. It can be used both as a screening tool and as a tool for following a patient over time. It has been well validated and is translated into a number of languages (Folstein, Folstein, & McHugh, 1975).

e. The Controlled Oral Word Association Test (Spreen & Benton, 1977) is a measure of executive function and reflects frontal lobe functioning, including abstract thinking, problem solving, ability to sequence, and ability to resist distraction, intrusion, and perseveration. The tester cues the patient to begin with the letter *F,* then *A,* then *S* and provide words of 3 or more letters beginning with that letter. Patients should be able to list 10 words in each category within 1 minute.

f. The oral Trailmaking Test (Ricker & Axelrod, 1994) has the patient pair letters and numbers sequentially until the 13th digit is reached: 1-A, 2-B, and so on. More than two pairing errors is considered impairment.

g. Delirium assessment

(1) For verbal, nonintubated patients, regardless of setting, use the standard Confusion Assessment Method (Level 2; Inouye et al., 1990; McNicoll et al., 2005).

(2) For intubated or nonverbal patients in the intensive care unit (ICU), use the Confusion Assessment Method—Intensive Care Unit (CAM-ICU) for assessment of delirium (Level 2; Ely et al., 2001; McNicoll et al., 2005). Both instruments, when used serially, have good reliability and validity for detecting delirium in older adults.

(3) The NEECHAM confusion scale has also showed high sensitivity and specificity for recognition of delirium both for general hospitalized patients (Neelon, Champagne, McConnel, Carlson, & Funk, 1996) and for ICU patients (Immers, Schuurmans, & van de Bijl, 2005). Benefits of the NEECHAM scale are low patient burden and ease of use in nonintubated patients.

D. Cranial Nerves

1. Assess all CN I–XII (Level 2; Hobdell et al., 2004; Larner, 2006). Diminished hearing, vision, smell, and taste are common in the older adult (D'Amico & Barbarito, 2012).
2. Tools
   a. The Snellen chart and Jaeger card are the most sensitive and specific methods for visual screening (Johnston et al., 2005). The Rosenbaum visual card has also been validated against the Snellen chart assessing near vision; however, it is important to ensure that the card used in the assessment has been properly scaled because many versions are inaccurate and have led to discrepancies in acuity measurements (Horton & Jones, 1997).
   b. The Whisper Test assesses sensitivities and specificities between 70% and 100% (Johnston et al., 2005). Refer to audiometry if functional impairment either is noncorrected or remains with correction following cerumen check.

E. Motor Examination

1. Muscle size, strength, and tone (Level 3; Hobdell et al., 2004; Larner, 2006; Timiras, 2003a)
   a. Coordination (Level 3; Hobdell et al., 2004; Larner, 2006)

(1) Rapid alternating movements
(2) Heel-to-shin test
(3) Romberg Test
(4) Gait

b. Tool: Get Up and Go Test (Level 2; Gunter, White, Hayes, & Snow, 2000; Mathias, Nayak, & Isaacs, 1986; Podsiadlo & Richardson, 1991; Vassallo, Vignaraja, Sharma, Briggs, & Allen, 2004)
(1) Start from sitting in chair, get up, walk 10 feet, turn around, walk back. This test should be performed rapidly and smoothly.
(2) If completion of the test takes >20 seconds, this result is usually associated with another functional impairment and an increased risk of fall (Lyons, 2004).
(3) Assess for
(a) use of hands to stand
(b) stability immediately upon standing up from chair
(c) hesitation on initiation of walking
(d) feet clearing the floor
(e) gait base
(f) truncal control
(g) arm sway
(h) step symmetry, continuity, length, width
(i) use of assistive devices.
(4) This assessment can provide information regarding neurologic disorders such as Parkinson's disease, normal pressure hydrocephalus, cerebellar disease, and stroke, in addition to risk of falling ("Performance-Oriented Assessment of Mobility," 2005).

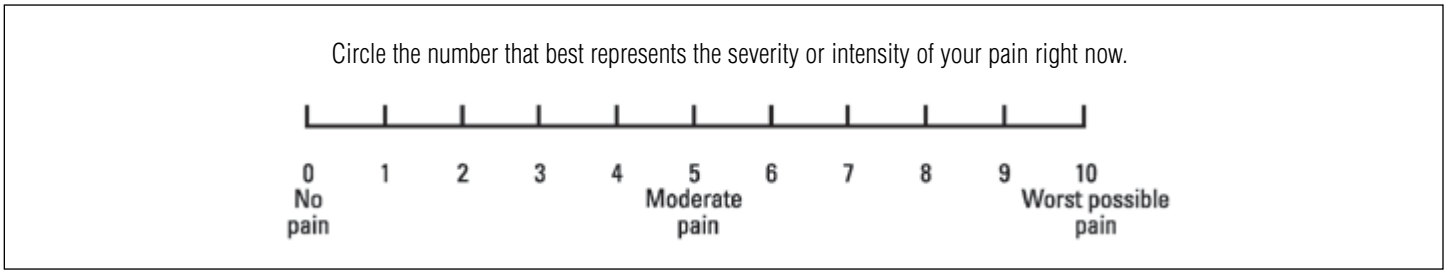
F. Reflexes

1. Superficial (Level 3; Hobdell et al., 2004; Larner, 2006; Sirven & Mancall, 2002): Abdominal reflexes may be diminished or absent (Sirven & Mancall, 2002); however, this condition may be associated with other responses (e.g., number of pregnancies, history of abdominal surgery) rather than an aging-related change.
2. Deep tendon (Level 3; Hobdell et al., 2004; Larner, 2006; Sirven & Mancall, 2002): It is common to see decreased ankle reflexes, but this is due to decreased elasticity in the Achilles tendon rather than change within the nerve or the reflex arc (Sirven & Mancall).
3. Primitive or developmental (Level 2; Huff et al., 1987; Jenkyn et al., 1985): Snout, glabellar, and palmomental reflexes may return.

G. Sensory Response

1. Pain assessment: The standard Verbal 0–10 Scale, verbal descriptor scale; simple yes/no (American Geriatrics Society [AGS] Panel on Persistent Pain in Older Persons, 2002; Herr, Decker & Bjoro, 2004; Herr et al., 2006), or the Visual Analog Pain Scale may be used; see **Figure 4** (Level 2; Agency for Healthcare Research and Quality, 1992). If patient has difficulty with verbalization or numeric rating, the Faces Pain Scale—Revised may be useful (Hicks, von Baeyer, Spafford, van Korlaar, & Goodenough, 2001); see **Figure 5.** These tools are discussed below in section II.G.6 (Level 3; AGS Panel on Persistent Pain in Older Persons, 2002).
2. Pain assessment in older adults with severe cognitive impairment or communication difficulty is a particular challenge. Numerous instruments have been developed for assessing these in various populations (e.g., postsurgical patients, Alzheimer's patients) and have been used in limited fashion to date (van Herk, van Dijk, Baar, Tibboel, & de Wit, 2007).
3. Superficial sensations: deep pain, light touch, temperature (Level 3; Larner, 2006)
4. Deep sensations: propriception, vibration (Level 3; Larner, 2006)
5. Cortical discrimination: stereognosis, left-to-right discrimination, graphesthesia, extinction (Level 3; Hobdell et al., 2004)
6. Tools
a. The Visual Analog Pain Scale; see Figure 4. (Agency for Healthcare Research and Quality, 1992).
b. The Faces Pain Scale—Revised; see Figure 5. (Hicks et al., 2001). This tool was able to be used effectively by 60% of older adults with mild to moderate cognitive impairment (Scherder & Bouma, 2000).
c. The Pain Assessment in Advanced Dementia (PAINAD) Scale (Warden, Hurley, & Volicer, 2003) measures 5 items, each rated 0–2: breathing, vocalization, facial expression, body language, and consolability; see **Figure 6.** Although no cutoff score was provided for the PAINAD, lower total scores resulted when analgesia was provided (Lane et al., 2003). A recent review of pain scales for use in older adults with cognitive impairment or communication difficulties recommended that the PAINAD scale was the most feasible scale for clinical practice of all currently available and validated scales (van Herk et al., 2007).
d. The Checklist of Nonverbal Pain Indicators (CNPI) is an observational scale scored while the patient is resting and then during activity (Feldt, 2000). The checklist includes five nonverbal behaviors: nonverbal vocalizations, grimacing, bracing, restlessness, and rubbing the affected area. The last behavior is any verbal complaint of pain. Each pain indicator is scored with 1

Figure 4. The Visual Analog Pain Scale



point if present (maximum score = 6).

e. Behavioral Pain Scale (Payen et al., 2001)
f. Critical-Care Pain Observation Tool (Gelinas, Fillion, Puntillo, Bertrand, & Dupuis, 2005).

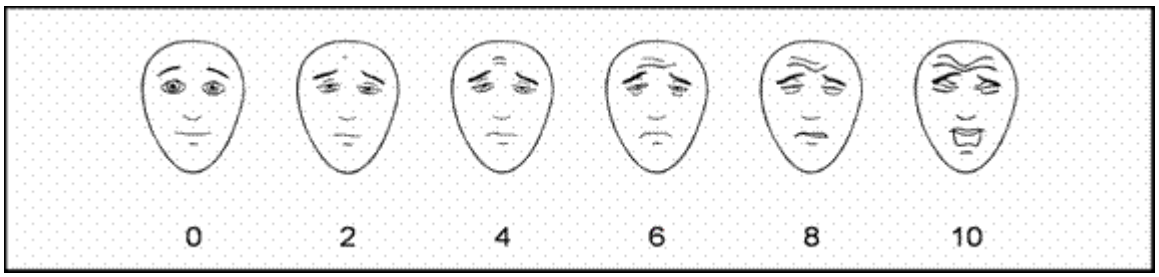
H. Issues That May Affect the Neurologic Exam in the Older Adult

1. Environment: Because of decreased hearing, vision, and tactile sensation with aging, cues in the environment are an important feedback mechanism for older adults. When an older adult experiences a change in environment, such as a new admission to a hospital or care facility or a transfer from one unit to another, his or her performance on neurologic assessment may be negatively affected. Orienting the patient to the environment and planning for other needs, such as providing adequate lighting without glare, visual and auditory clues, and appropriate assistive devices, is critical to maximize the patient's functioning within the environment (Spera, 2004).
2. Opioids: Pharmacokinetics are altered in older adults because of decreased liver and renal function, so opioids may stay in the body longer and increase the risk of nervous system depression. In particular, meperidine should be avoided in older adults because both the active and neurotoxic metabolite, normeperidine, is more likely to accumulate. In addition, drug interactions are more likely because of polypharmacy in older adults (Willens, 2004).
3. Fluid and electrolyte balance: Older adults with fluid and electrolyte imbalances such as dehydration or hypernatremia are at risk for developing changes in their neurologic examination. After these imbalances are corrected, the neurologic examination may improve (Mulvey, 2004).
4. Infection: Sudden onset of confusion or change in the level of consciousness may be the first sign of an infection in older adults, particularly urinary tract infections, which may also increase risk of falls or present with declines in activities of daily living (Degler, 2004; Harkness, 2006).
5. Fatigue: Fatigue may occur with increased or sustained activity; increased frequency of assessment may increase motor fatigue. Provide periods of adequate rest for patients as indicated and pace activities. To promote health, encourage regular activity to the degree that the person is able (Degler, 2004).
6. Pain: Pain may limit range of motion and mobility. To promote flexibility and endurance, encourage regular activity to the degree that the person is able. Pace activities, and medicate for pain per recommendations (Degler, 2004; Willens, 2004).

I. Education

1. Resources for patients and families
   a. National Institutes of Health (http://nihseniorhealth.gov/)
   b. Centers for Disease Control and Prevention, *Healthy Aging* (www.cdc.gov/aging/info.htm)
2. Web sites for professionals

Figure 5. The Faces Pain Scale—Revised



Note. From "Faces Pain Scale—Revised: Toward a common metric in pediatric pain measurement," by C. L. Hicks, C. L. von Baeyer, P. Spafford, I. van Korlaar, and B. Goodenough, 2001, *Pain, 93,* p. 176. Copyright 2001 by the International Association for the Study of Pain. Reprinted with permission.

Figure 6. Pain Assessment in Advanced Dementia Scale

	0	1	2	Score
Breathing, independent of vocalization	Normal	Occasional labored breathing. Short period of hyperventilation.	Noisy labored breathing. Long period of hyperventilation. Cheyne-stokes respirations.	
Negative vocalization	None	Occasional moan or groan. Low-level speech with a negative or disapproving quality.	Repeated troubled calling out. Loud moaning or groaning. Crying.	
Facial expression	Smiling or inexpressive	Sad. Frightened. Frown.	Facial grimacing.	
Body language	Relaxed	Tense. Distressed pacing. Fidgeting.	Rigid. Fists clenched, knees pulled up. Pulling or pushing away. Striking out.	
Consolability	No need to be consoled	Distracted or reassured by voice or touch.	Unable to be consoled, distracted, or reassured.	
				Total:

Note. Reprinted from *Journal of the American Medical Directors Association, 4* (1). V. Warden, A. C. Hurley, & L. Volicer, Development and psychometric evaluation of the Pain Assessment in Advanced Dementia (PAINAD) scale, p. 14, copyright 2003, with permission from American Medical Directors Association.

a. The GeroNurseOnline Web site (www.geronurseonline.org/index.cfm?section_id=7), developed through the Nurse Competence in Aging initiative, is the official geriatric nursing Web site of the American Nurses Association (ANA) and the John A. Hartford Foundation Institute for Geriatric Nursing at the New York University College of Nursing. The Web site includes links to the "Try This" Web portal offering protocols and tools that may be useful for further assessment of identified problems in the neurologic assessment of older adults, including the Hearing Loss Screener, the Pittsburgh Sleep Quality Index (PSQI), and the Confusion Assessment Method (CAM). The Web site also includes a search function for common problems such as depression, falls, sleep, delirium, and pain.
b. The University of Iowa Gerontological Nursing Interventions Research Center (GNIRC) Web site (www.nursing.uiowa.edu/about_us/nursing_interventions/index.htm) provides access to the GERONurse listserv.
c. The Geriatric Depression Scale, along with a discussion of the tool and links to translations, is available at www.stanford.edu/~yesavage/GDS.html.
d. The Mini–Mental State Examination Web site (www.minimental.com) offers information on the translation and use of the MMSE.
e. Pain in the Elderly (www.cityofhope.org/prc/elderly.asp).

J. Documentation

The initial neurologic assessment of the older adult should be a comprehensive assessment whenever possible. Positive responses by patients to screening questions, such as the depression screen, should be followed up with further assessment, intervention, and referral for treatment to the appropriate provider (e.g., attending physician, primary care provider, advanced practice nurse, psychiatric liaison) as indicated by agency protocol. Documentation of all assessment findings (positive and negative) and any interventions following assessment is important for continuing care. Following the initial assessment of the older adult with a neurologic condition, the assessment should be repeated with frequency and scope (i.e., limited or comprehensive) as indicated by the setting, acuity, and presentation of the patient (Level 3; Bickley & Hoekelman, 1999).

K. Practice Pearls

1. Aging is associated with normal changes within the CNS and other systems that influence baseline assessment findings in older adults. It is critical that the nurse be aware of these normal changes in addition to the patient's baseline function in order to assess for changes or pathological findings.
2. Because one of the normal changes of aging is slower processing speed, it is important that ample time for response be given to older adults.
3. As sleep quality, pain, and depressive symptoms may significantly influence cognitive and overall functioning in older adults, routine assessment and consideration of these factors are important components of the neurologic assessment.
4. The registered nurse needs to have an awareness of the clinical issues commonly encountered

in older adults that may negatively influence the neurologic exam, including fluid and electrolyte imbalances, opioid analgesia administration, fatigue, environmental changes, pain, infection, and depression. Attention to both the clinical condition of the patient and changes in exam findings (which in some cases may be the first signal of changes in neurologic status) may optimize outcomes.

5. In acute care settings older adults are at particularly high risk for the development of delirium; therefore, the neurologic assessment should include an ongoing assessment with a standardized delirium assessment tool in order to detect this syndrome early. Delirium must be differentiated from dementia, depression, and underlying acute neuropathology.
6. Older adults have an increased risk of falling related to gait disturbances, impaired mobility, and balance issues. They also have an increased risk of harm if a fall occurs in the presence of existing bone disease and coagulopathy or pharmacologically induced bleeding tendencies. Geriatric assessment should routinely include fall risk and harm screening. A number of fall risk assessment tools exist, including the Morse Fall Scale. A strong predictor of fall risk is a history of falling in the past year (Thurman, Stevens, & Rao, 2008; Axer, Axer, Sauer, Witte, & Hagemann, 2010.)
7. It may be beneficial to include family members or other support people in the assessment process in order to validate or gain information or aid in planning care.

L. Areas for Further Research

Further work is needed to validate current normative findings used in older adults. Many of the age-related changes may have been overestimated because of cross-sectional study designs or cohort effect, while longitudinal studies may have underestimated effects because of loss of follow-up. In addition, the need exists for a fully validated measure to assess pain in older adults with severe cognitive impairment. Given that by 2050 the number of individuals with Alzheimer's could range from 11.3 million to 16 million (Alzheimer's Association, 2005), this area holds increasing importance for patient care. Inadequate pain control is associated with a number of adverse events, including the development of delirium, which can complicate care and increase mortality. Because older adults may experience fatigue with frequent testing, it is important to study ways to best incorporate comprehensive neurologic assessment into clinical practice in order to minimize the burden on patients and clinicians. Clinical algorithms need to be developed and validated for commonly presented complaints of older adults, such as dizziness. Last, guidance to support best nursing practice in planning age-appropriate patient care based on specific findings in the neurologic assessment is also needed.

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Appendix. Mini-Cog™

DATE_____ ID_____ AGE____ GENDER M F LOCATION _____ TESTED BY_____

1) **GET THE PATIENT'S ATTENTION, THEN SAY: "I am going to say three words that I want you to remember. The words are**

Banana Sunrise Chair.

Please say them for me now." (Give the patient 3 tries to repeat the words. If unable after 3 tries, go to next item.)

(Fold this page back at the TWO dotted lines BELOW to make a blank space and cover the memory words. Hand the patient a pencil/pen).

2) **SAY ALL THE FOLLOWING PHRASES IN THE ORDER INDICATED: "Please draw a clock in the space below. Start by drawing a large circle."** (When this is done, say) **"Put all the numbers in the circle."** (When done, say) **"Now set the hands to show 11:10 (10 past 11)."** If subject has not finished clock drawing in 3 minutes, discontinue and ask for recall items.

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3) **SAY: "What were the three words I asked you to remember?"**

_____ _____ _____ (Score 1 point for each). 3-Item Recall Score ☐

Score the clock (see below for instructions): Normal clock 2 points; Abnormal clock 0 points — Clock Score ☐

Total Score = 3-item recall plus clock score ☐ ***0, 1, or 2: possible impairment; 3, 4, or 5 suggests no impairment***

CLOCK SCORING

NORMAL CLOCK

A NORMAL CLOCK HAS ALL OF THE FOLLOWING ELEMENTS:

All numbers 1–12, each only once, are present in the correct order and direction (clockwise).

Two hands are present, one pointing to 11 and one pointing to 2.

ANY CLOCK MISSING EITHER OF THESE ELEMENTS IS SCORED ABNORMAL. REFUSAL TO DRAW A CLOCK IS SCORED ABNORMAL.

SOME EXAMPLES OF ABNORMAL CLOCKS (THERE ARE MANY OTHER KINDS)

Abnormal Hands

Missing Number

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