

Brief Evaluation of Executive Dysfunction: An Essential Refinement in the Assessment of Cognitive Impairment

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WHY: A hospital admission may surface a previously undetected dementia in some older adults. While at home in a familiar environment, patients and family members may fail to recognize subtle, slowly progressive cognitive changes. Such changes however, often become apparent in the unfamiliar, disorienting setting of the hospital provoking family to report "my mother was never like this at home."

This *Try This* recommends assessing executive function for older patients not thought to have dementia prior to hospitalization but where the patient, family or staff feel the patient has not returned to baseline cognitive status at the time of discharge. Particularly when the older patient is alert and verbal and **memory is not obviously impaired**, screening for executive dysfunction can be critical to a safe, realistic treatment and discharge plan. Patients who exhibit executive dysfunction should be referred to their primary care provider, or to a provider with expertise in dementia assessment.

Executive dysfunction defined: Executive function is an interrelated set of abilities that includes cognitive flexibility, concept formation, and self-monitoring. Assessing executive function can help determine a patient's capacity to execute health care decisions and with discharge planning decisions. With impaired executive dysfunction, instrumental activities of daily living (accounting, shopping, medication management, driving) may be beyond the person's capacity even though memory impairment is mild. The person's capacity to exercise command and self-control, and to direct others to provide care, becomes diminished. Executive dysfunction is one element in the DSM-IV criteria for the diagnosis of dementia and occurs in all dementing diseases.

NOTE: Patients with impaired executive function need not have impaired memory.

BEST PRACTICES: Few practitioners are familiar with testing for executive function, yet there are brief valid and reliable instruments. The instruments listed below have good internal consistency, inter-rater reliability and are strongly correlated with the Folstein Mini-Mental Status Exam (MMSE) and with lengthier neuropsychological assessments of executive function:

- Royall's CLOX (clock drawing),
- Controlled Oral Word Association Test, and
- Trail Making Test, oral version.

TARGET POPULATION: Older patients:

- Not thought to have dementia prior to hospitalization but where the patient, family or staff feel the patient has not returned to baseline cognitive status at the time of discharge.
- For whom other screening (e.g., *Try This*: MoCA, Mini-Cog, CAM) reveals no discernable cause for a cognitive impairment.
- For whom cognitive impairment, observed as alterations in memory, use of language and abstract thinking, and spatial sense, persists even when delirium has been identified and treated or ruled out.

VALIDITY AND RELIABILITY: Studies of executive dysfunction suggest that its presence predicts level of care among community residents making the transition to less independent living. And among older adults without dementia who have recovered from a major depressive episode, the presence of executive dysfunction is associated with excess, persistent disability.

STRENGTHS AND LIMITATIONS: The accurate characterization of executive dysfunction is confounded by language, education, and time of assessment. If the patient and examiner do not share a common mother tongue, the Controlled Oral Word Association and the oral version of the Trail Making tests become too difficult. Persons who are educationally disadvantaged may also perform in the impaired range but not be genuinely dysfunctional. Over the course of hospitalization executive dysfunction often improves but may persist at reduced but disabling levels. When executive dysfunction occurs in depression, problem solving psychotherapy may lessen the disability.

MORE ON THE TOPIC:

Best practice information on care of older adults: www.ConsultGerIRN.org.

- Alexopoulos, G.S., Raue, P.J., Kiosses, D.N., Mackin, R.S., Kanellopoulos, D., McCulloch, C., & Areán, P.A. (2011). Problem-solving therapy and supportive therapy in older adults with major depression and executive dysfunction: effect on disability. *Archives of General Psychiatry*, 68(1), 33-41.
- Arean, P.A., Raue, P., Mackin, R.S., Kanellopoulos, D., McCulloch, C., & Alexopoulos, G.S. (2010). Problem-solving therapy and supportive therapy in older adults with major depression and executive dysfunction. *American Journal of Psychiatry*, 167(11), 1391-1398.
- Cooney, L.M., Kennedy, G.J., Hawkin, K.A., & Hurme, S.B. (2004). Who can stay at home: Assessing the capacity to choose to live in the community. *Archives of Internal Medicine*, 164, 357-360.
- Kennedy, G.J., & Smyth, C.A. (2008). How to Try This: Screening older adults for executive dysfunction: An essential refinement in the assessment of cognitive impairment. *American Journal of Nursing*, 108(12), 60-6911.
- Munshi, M.N., Hayes, M., Iwata, I., Lee, Y., & Weinger, K. (Feb 16, 2012). Which aspects of executive dysfunction influence ability to manage diabetes in older adults? *Diabetic Medicine*. doi: 10.1111/j.1464-5491.2012.03606.x. [Epub ahead of print].
- Ricker, J.H., & Axelrod, B.N. (1994). Analysis of an oral paradigm for the trail making test. *Assessment*, 1(1), 47-51.
- Royall, D.R., Cordes, J.A., & Polk, M. (1998). CLOX: An executive clock drawing task. *Journal of Neurology, Neurosurgery, and Psychiatry*, 64(5), 588-594.
- Royall, D.R., Chiodo, L.K., & Polk, M.J. (2005). An empiric approach to level of care determinations: The importance of executive measures. *The Journals of Gerontology. Series A, Biological Sciences and Medical Sciences*, 60(8), 1059-1064.
- Schillerstrom, J.E., Horton, M.S., Schillerstrom, T.L., Earthman, B.S., & Royall, D.R. (2005). Prevalence, course, and risk factors for executive impairment in patients hospitalized on a general medicine service. *Psychosomatics*, 46, 411-417.
- Spreen, F.O., Benton, A.L. (1977). *Manual of instructions for the Neurosensory Center Comprehensive Examination for Aphasia*. Victoria, British Columbia, Canada: University of Victoria.

For complete versions of the CLOX, including a validated Spanish Translation, write to Donald R. Royall MD, Department of Psychiatry, The University of Texas Health Science Center at San Antonio, 7703 Floyd Curl Drive, TX 78284-7792.

Screening Tests of Executive Function

The following brief screening tests of executive function can be administered in the hospital and in the ambulatory setting:

- **Royall's CLOX Clock drawing:** First ask the patient to "Draw me a clock that says 1:45. Set the hands and numbers on the face so that a child could read them." Once the task is complete, draw a clock with a 2 inch diameter, with all the numbers in place, and the hands set at 1:45. Then ask the patient to copy it. An unimpaired person will draw a round figure with the following elements: recognizable circle at least one inch in circumference with all the numbers present and in correct, symmetrical sequence. There will be two hands anchored in the center pointing to the correct time. If any of the above elements are missing the person is possibly impaired. If more than one element is missing the person is probably impaired. Intruded elements such as words or letters indicate impairment. Persons with only executive dysfunction will exhibit errors on the first clock but not the second. Those with both executive function and construction apraxia usually as a result of moderate Alzheimer's disease or stroke will fail both.
- **The Controlled Oral Word Association Test:** With categories beginning with the letter "F", then "A", then "S", the Controlled Oral Word Association Test by Spreen and Benton (1977) requires respondents to fill the category by providing words of 3 or more letters. For example, correct responses to the category cue "F" would include "fish, foul, fact" etc. This test reflects abstract mental operation related to problem solving, sequencing, resisting distractions, intrusions and perseverations. It is considered a "frontal" task as the organization of words by first letter is unfamiliar, and requires conscious, effortful, systematic organization and the filtering of irrelevant information such as natural taxonomic categories. Persons free of executive dysfunction will produce 10 words in each category within one minute.
- **The Trail Making Test, Oral Version:** (Ricker & Axelrod, 1994) requires the subject to count from 1 to 25 and then recite the 26 letters of the alphabet. For testing the subject is asked to pair numbers with letters in sequence e.g. "1-A, 2-B, 3-C, etc." until the pair "13-M" is reached. This version does not make visual scanning or visually guided motor demands. However, the individual is required to keep the number and letter sequences in working memory so as not to lose place. More than 2 errors in 13 pairings are considered impairment.