

Chapter 8

General laboratory tests

José A. Morais

Key points

- The performance of general blood tests is an important step in the diagnostic process to rule out causes of cognitive changes.
- The list of blood tests is comparable to an annual general assessment for health status in mid or late life.
- Specific tests may be added based on findings from the general physical examination.



General background

The selection of blood tests for the average person over the age of 65 with symptoms suggestive of dementia are predominantly based on that person's medical history and, to some degree, on the physical examination. For instance, nearly everyone gets a screening test for hypothyroidism using the Thyroid Stimulating Hormone test, but the finding of a goitre (enlarged thyroid gland on palpation of the neck) during the physical exam may require additional tests such as an ultrasound. Similarly, a murmur heard over the carotid artery usually leads to an ultrasound study.

In guidelines established since 1991, there is a minimal set of blood tests used by most clinicians around the world (Table 1). Over time, guidelines evolve as additional information emerges and the general health of populations evolve. At the time of writing, a major update is expected from a US consensus group led by Drs. Alireza Atri and Brad Dickerson.



There is a need to have an individual approach for each person, rather than having long lists of tests for everyone that add costs without adding clinically meaningful information.

Table 1. General laboratory tests recommended in published guidelines

	Ref 1 1991	Ref 2 1994	Ref 3 1994	Ref 4 1995	Ref 5 1996
CBC	XX	XX	XX	XX	XX
Sed rate				XX	
TSH	XX	XX	XX	XX	XX
T4			XX		XX
Electrolytes	XX	XX	XX	XX	XX
Calcium	XX	XX	XX	XX	XX
BUN		XX	XX	XX	XX
Creatinine		XX	XX	XX	XX
Glycemia	XX	XX	XX		XX
ALT			XX	XX	XX
B12	Added in 1999	XX	XX	XX	XX
Folate		XX			
Syphilis serology		XX	XX	XX	XX
HIV screen				XX	

Survey results

The 1,111 multidisciplinary clinicians who answered the survey were asked which blood tests they ordered most often in an individual's workup presenting with cognitive decline. In order of frequency, they were B12/folate (87%), TSH (87%), hemogram (77%), electrolytes including

calcium (73%), BUN/creatinine (77%), liver enzymes ALT/AST (61%), HbA1C (54%), VDRL (43%) and homocysteine (20%), which can be used to rule out cognitive decline resulting from other causes.

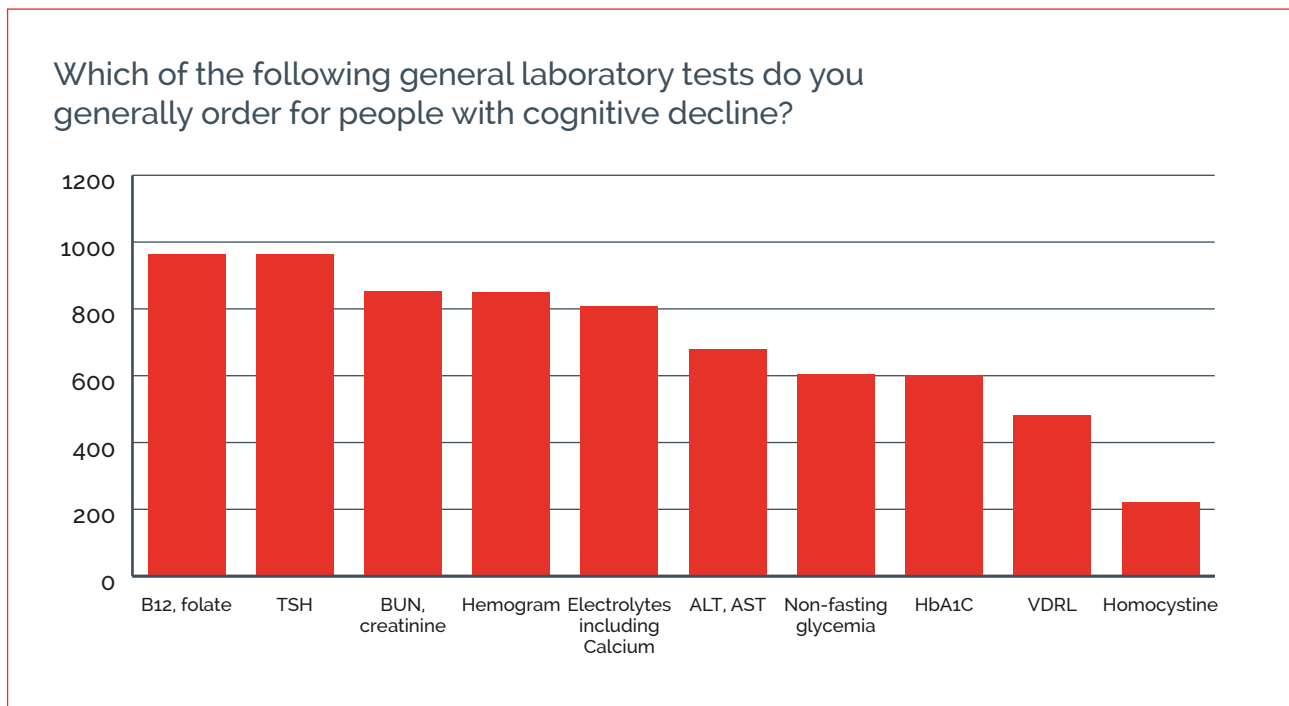


Chart 1. Clinician responses (multiple answers selected).

Expert essay

Routine laboratory tests in the diagnosis of dementia

Lucas Porcello Schilling

Brain Institute of Rio Grande do Sul (Brains), Pontifical Catholic University of Rio Grande do Sul, Porto Alegre, BRAZIL

As discussed in the first part of this World Alzheimer Report, the syndromic diagnosis of dementia is based on clinical criteria, requiring an impairment in at least two cognitive domains and impact on the individual's functionality. Different aetiologies can lead to a clinical picture of dementia, some of which, such as Alzheimer's disease, are related to degenerative processes of the central nervous system. However, there are several other clinical and sometimes potentially reversible causes of cognitive impairment which should be evaluated in an initial assessment for dementia.

Within this scenario, a detailed initial clinical evaluation is essential to attain an accurate clinical diagnosis. The initial assessment seeks also to identify the presence of comorbidities and other risk factors for the development and progression of dementia. There is no evidence-based data that justify carrying out specific routine blood tests; however, most expert opinion recommends a laboratory screening for secondary causes of cognitive decline (1,2).

The performance of blood tests is an important step in the evaluation process, and seeks to rule out clinical causes (metabolic, infectious, vitamin deficiencies and electrolytic abnormalities) that may be associated with an individual's clinical condition. This laboratory screening includes a haematological evaluation, kidney, liver and thyroid function, glucose, electrolyte evaluation, vitamin levels and inflammatory and infectious blood markers (3,4).

The list of specific screening tests includes complete blood count with platelet count, serum creatinine and urea concentration, glucose, glycated haemoglobin, lipid profile, albumin,

liver assessment with transaminases and prothrombin time, electrolyte measurement (sodium, potassium and calcium), thyroid hormones, vitamin B12 and folic acid measurement (in countries without folate flour fortification), erythrocyte sedimentation rate and C-reactive protein. It is also suggested to carry out screening tests for the main infections, especially in people under the age of 60, such as syphilis, HIV and hepatitis B and C (5,6).

The performance of some of those routine blood tests helps to rule out prevalent conditions, such as diabetes mellitus and dyslipidaemia, which can lead to vascular cognitive impairment and worsen neuropathological conditions as Alzheimer's disease. These laboratory tests also allow the identification of important clinical issues that can lead to cognitive decline, such as hepatic and kidney failure. Some others dementia aetiologies are not as prevalent, however, since they can have specific and possibly curative treatment – as neurosyphilis – its inclusion into this initial routine laboratory assessment is justified.

It is very important to emphasise that an individual's clinical history is the key to defining which exams and investigation should be performed. In cases considered atypical or early-onset, further tests may be necessary. If a person has a previous history of any pathology or any symptoms suggestive of other diseases, such as weight loss or characteristics of inflammatory diseases, further investigation with more specific tests would be recommended (7–9).

References

- Knopman DS, DeKosky ST, Cummings JL, Chui H, Corey-Bloom J, Relkin N, et al. Practice parameter: Diagnosis of dementia (an evidence-based review): Report of the quality standards subcommittee of the American Academy of Neurology. *Neurology* [Internet]. 2001 May 8 [cited 2021 Jul 8];56(9):1143–53. <https://pubmed.ncbi.nlm.nih.gov/11342678>
- Nitrini R, Caramelli P, De Campos Bottino CM, Pereira Damascene B, Dozzi Brucki SM, Anghinah R. Diagnosis of Alzheimer's disease in Brazil: Diagnostic criteria and auxiliary tests. Recommendations of the Scientific Department of Cognitive Neurology and Aging of the Brazilian Academy of Neurology [Internet]. Vol. 63, Arquivos de Neuro-Psiquiatria. Academia Brasileira de Neurologia – ABNEURO; 2005 [cited 2021 Jul 8]. p. 713–9. <http://www.scielo.br/j/anp/a/zJ8nq5mDBV8V4hfrqDMVzbx/?lang-pt>
- Van Der Flier WM, Scheltens P. Epidemiology and risk factors of dementia [Internet]. Vol. 76, *Neurology in Practice*. BMJ Publishing Group Ltd; 2005 [cited 2021 Jul 8]. p. v2–7. https://jnnp.bmj.com/content/76/suppl_5/v2
- Hort J, O'Brien JT, Gainotti G, Pirttila T, Popescu BO, Rektorova I, et al. EFNS guidelines for the diagnosis and management of Alzheimer's disease [Internet]. Vol. 17, *European Journal of Neurology*. Eur J Neurol; 2010 [cited 2021 Jul 8]. p. 1236–48. <https://pubmed.ncbi.nlm.nih.gov/20831773>
- Clarfield AM, Bass MJ, Cohen C, Feightner JW, Gauthier S, Patterson C, et al. Assessing dementia: The Canadian consensus [Internet]. Vol. 144, *CMAJ*. Canadian Medical Association; 1991 [cited 2021 Jul 8]. p. 851–3. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1335280>
- Rossor MN. Management of neurological disorders: dementia. *J Neurol Neurosurg Psychiatry* [Internet]. 1994 [cited 2021 Jul 8];57(12):1451. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1073222>
- Practice parameter for diagnosis and evaluation of dementia. (summary statement) Report of the Quality Standards Subcommittee of the American Academy of Neurology. *Neurology* [Internet]. 1994 [cited 2021 Jul 8];44(11):2203–6. <https://pubmed.ncbi.nlm.nih.gov/7969988>
- Corey-Bloom J, Thai LJ, Galasko D, Folstein M, Drachman D, Raskind M, et al. Diagnosis and evaluation of dementia [Internet]. Vol. 45, *Neurology*. Neurology; 1995 [cited 2021 Jul 8]. p. 211–8. <https://pubmed.ncbi.nlm.nih.gov/7854514>
- Geldmacher DS, Whitehouse PJ. Evaluation of Dementia. *N Engl J Med* [Internet]. 1996 Aug [cited 2021 Jul 8];335(5):330–6. <https://pubmed.ncbi.nlm.nih.gov/8663868>

Conclusions

There is a consensus that using laboratory tests as complementary tools to a standard cognitive evaluation is necessary to determine whether there are any treatable medical conditions that may affect cognition.

Basic laboratory tests are most often performed immediately after the initial clinical assessment, and clinically significant findings such as low B12 bring about replacement therapy that may help one component of the dementia pathophysiology.