

NATIONAL JEWISH CENTER  
FOR IMMUNOLOGY  
AND RESPIRATORY MEDICINE

# CHRONIC ILLNESS AND COGNITIVE IMPAIRMENT

by Elizabeth Kozora, Ph.D.

Memory loss. Noncompliance with medication. Impaired motor skills. Sudden onset of depression with no apparent precursor. When these kinds of complaints come from chronically ill patients or their families, disease-related cognitive impairment is a real possibility — even if the disease does not directly affect the central nervous system (CNS). Investigating cognitive deficits and affective disorders in chronically ill patients is the role of the neuropsychology staff at National Jewish, a staff that is evaluating a growing number of inpatient and outpatient groups.

Neuropsychology, a systematic behavioral approach to evaluating human brain function, can be used to investigate CNS involvement of medical diseases by assessing a patient's cognitive, emotional, and behavioral functioning. It uses a variety of standardized tests to characterize and quantify the nature of higher cortical functioning.

Typically, neuropsychology has been applied to disorders that directly affect CNS activity, such as seizure disorders, head injuries, and dementia.

However, the application of clinical neuropsychology has expanded to non-neurological diseases, including diseases of the lungs and immune system. Brain function can be affected both by non-neurological disease activity and by treatment regimens, such as steroid treatment.

Today, neuropsychologists are discovering more subtle CNS effects of many chronic illnesses. For patients who do not demonstrate overt cognitive impairment, neuropsychological

evaluation may uncover subclinical impairment. This information aids in diagnosis, prognosis, and disease management.

Generally, information from neuropsychological evaluation can help the patient and his or her health team in the following ways:

- Neuropsychological evaluation gives the patient, family, and health team a clear picture of the patient's cognitive strengths and weaknesses. These strengths and weaknesses can then be considered as the treatment and management plan is developed. For example, neuropsychological information can help in decisions about whether a patient can live alone safely.

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- An understanding of a patient's cerebral functioning may be useful in diagnosing the medical illness and its stage of development. With some diseases, such as systemic lupus erythematosus (SLE), tracking functional brain impairments helps track the progress of the disease.
- Neuropsychological evaluation helps determine if a patient can perform the tasks required by a home or hospital treatment program. If a patient is non-compliant with medication, for example, neuropsychological evaluation may uncover cognitive abnormalities, psychological distress, or other reasons for the noncompliance. This information can then be used to gain the patient's compliance.

An important goal at National Jewish is to assess both the psychological and neuropsychological effects of a medical disorder and

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treat those effects along with the medical condition. National Jewish is also involved in research, helping to expand the medical community's understanding of neuropsychology as it relates to the diseases encountered at this institution.

## Conducting Neuropsychological Tests

In neuropsychological evaluation, a patient is interviewed to gather relevant history, such as any

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history of neurological illness, psychological disorders, or substance abuse. In addition, information regarding academic background, employment history, and basic demographics is gathered to better interpret neuropsychological results. During testing, the patient's level of attention, coop-

eration, and effort are noted and factored into any judgment regarding validity of the test results.

Additionally, a patient who becomes fatigued or is emotionally labile may be tested in several shorter sessions to ensure test validity (a comprehensive battery of tests requires a full day of testing).

Specific areas of neuropsychological functioning which are tested generally include:

- 1) attention (ability to focus on a given task),
- 2) abstract reasoning and problem solving,
- 3) learning and memory of verbal and nonverbal material,
- 4) language functions (for example, oral/written comprehension, verbal fluency, naming ability)
- 5) visuospatial ability (perceiving and judging spatial relationships within visual information), and
- 6) basic sensory and motor function.

In addition, personality tests might be included. These tests help uncover any psychological distress the patient may be experiencing. A more complete understanding of the patient's cerebral functioning is thus obtained.

## Who Is Evaluated?

Neuropsychological testing becomes a part of patient evaluation at National Jewish in two ways primarily. First, neuropsychological screening is a routine part of some programs because of the prevalence of neuropsychological problems in certain patient populations. An example is a special three-week outpatient program at National Jewish for people with emphysema or chronic obstructive pulmonary disease (COPD). Conducted through the

Emphysema/COPD Clinic, the program includes comprehensive patient evaluation and helps patients learn to manage their disease and improve their quality of life. All participants in this program are screened by the psychosocial and neuropsychological staffs.

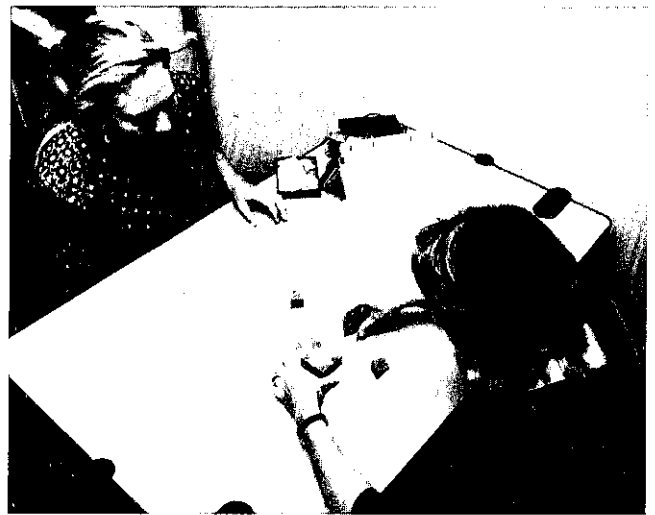
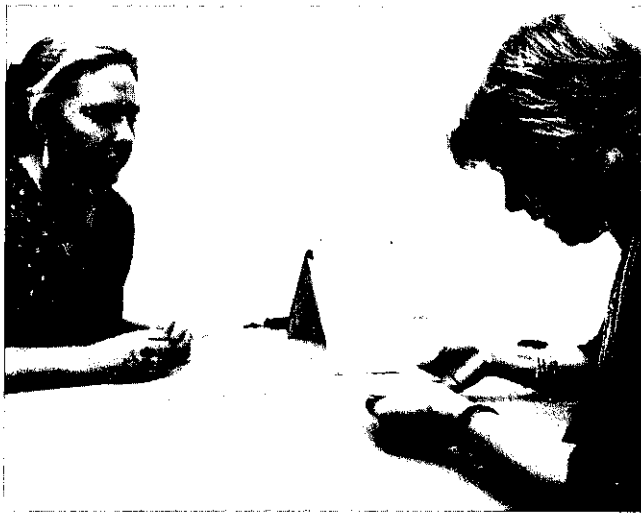
Neuropsychological testing is also prescribed when an attending physician detects cognitive difficulties. One specific scenario that leads to referral occurs if the physician detects inconsistencies in patient histories suggesting subtle cognitive problems. In this case, a comprehensive neuropsychological evaluation may be required to rule out any ongoing CNS disease activity. The physician might also refer patients for extensive batteries to provide baseline information as a way to monitor disease progress. This occurs, for example, with SLE patients, where CNS dysfunction can occur in approximately 50 percent of the patient population.

## COPD Patients

COPD patients represent an older population; and decline in some aspects of cognitive activity is normal, especially after age 70. However, some special attributes of COPD patients have been noted. For example, COPD patients generally perform more poorly on perceptual-motor and reasoning tests than would be expected due to the aging process alone. Some studies also demonstrate a COPD-attributable decline in memory. It is therefore important to test specific cognitive skills in COPD patients, because the patients may appear to be socially intact but have hidden functional deficits that may reduce their overall skills.

Hypoxemia that accompanies COPD frequently creates neuropsychological impairments. The effects of hypoxemia have also been confirmed through reversal of cognitive deficits: COPD patients receiving continuous oxygen treatment have been shown to perform better on cognitive tests than those receiving oxygen only nocturnally.<sup>(1)</sup>

A case history may help illustrate the usefulness of neuropsychological screening for COPD patients. Mrs. C., a 71-year-old retired widow with COPD, came to National Jewish to participate in the three-week Emphysema/COPD Clinic program. She was first diagnosed with emphysema in 1970. During her initial interview with the neuropsychological staff, Mrs. C. complained of memory loss and difficulty in following instructions. As a participant in the three-week program, Mrs. C. received a routine neuropsychological screening battery of tests.



Part of the neuropsychological evaluation using common objects to measure various cognitive skills

Mrs. C. had no history of head injury, substance abuse, or other factors that might lead to cognitive deficits. Through testing, she demonstrated an 80 percent loss of visual material and 42 percent loss of verbal material she had previously learned, confirming her report of memory deficit. Her abstract reasoning abilities were also impaired, suggesting that Mrs. C.'s difficulty in following instructions may be due to deficits in problem solving as well as memory.

Mrs. C. showed evidence of mild depression by endorsing items indicating sadness, discouragement, disappointment in herself, excessive irritability, and lack of interest in others. She also reported symptoms frequently seen in chronically ill patients, such as sleep difficulties, fatigue, poor appetite, and decreased motivation.

To help compensate for her memory loss, Mrs. C. was encouraged to take notes and to use checklists to keep track of such daily requirements as medication and appointments. She was also encouraged to adhere to familiar schedules and routines, a way to minimize demands of new learning and memory. A home visit was recommended to ensure that Mrs. C.'s daily living skills are adequate and safe for a person living alone. Because of her mild depressive symptoms, it was also recommended that Mrs. C. receive continued psychological evaluation and treatment.

A more complete neuropsychological evaluation might provide further details of Mrs. C.'s cognitive deficits and lead to more recommendations to improve daily living. Additionally, neurological and neuroradiological evaluation would be strongly sug-

gested in order to rule out the possibility of Mrs. C.'s memory loss being related to any primary CNS disease. Because of age and the possibility of dementia, COPD patients are at particular risk for numerous cognitive deficits. Cognitive retesting in a year would help check the progress of Mrs. C.'s symptoms, update recommendations, and rule out progressive deterioration.

## SLE Patients

SLE, an autoimmune disease capable of attacking any of the body's organ systems, involves the CNS in a significant percentage of those stricken with the disease. Mechanisms behind the illness are not yet well understood. Possible causes of CNS dysfunction in SLE patients include autoantibodies directed at neuronal cells; blood vessel inflammation (vasculitis) in the brain; and blood vessel occlusion or thrombosis in the brain frequently related to anticardiolipin antibodies. SLE can affect any part of the brain, and therefore may create a wide variety of neurological or psychiatric conditions. SLE patients with overt CNS involvement may manifest symptoms ranging from depression and psychosis to seizures and strokes.<sup>(2)</sup>

With or without overt CNS involvement, it is believed that a high percentage of SLE patients suffer from impaired mental functioning. Recent studies

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have suggested that a wide variety of cognitive impairments are caused directly by the disease; related factors, such as medication side effects, psychological distress, or SLE activity in organ systems other than the CNS, appear to make only minor contributions to cerebral impairment.<sup>(2)</sup>

A study we are now conducting at National Jewish and the University of Colorado Health Sciences Center in conjunction with Brian Kotzin, National Jewish staff researcher, is investigating sub-clinical CNS involvement in SLE patients with no overt neurological or psychiatric conditions. The study is focusing on the relationship between serum levels of autoantibodies to ribosomal P (anti-P) and subtle deficits in brain function of SLE patients. A

correlation between anti-P and cognitive deficits or psychological distress may help the health team better determine appropriate disease management measures and serve as a red flag prompting further evaluation and monitoring of the patient.<sup>(3)</sup>

A clinical SLE patient recently evaluated at National Jewish exhibited the kind of mild cerebral deficits being investigated in the

study. Mrs. L., a 40-year-old married woman, was diagnosed with SLE in 1983. In 1986, Mrs. L. was reevaluated and was considered to be in remission for SLE. However, she has continued to experience depressive episodes since then and reports problems with her memory and difficulty following directions. She has also complained of occasional joint and muscle pain and numbness in her lower extremities. A recent reevaluation at National Jewish has concluded that Mrs. L.'s symptoms are consistent with active SLE.

To assess whether cerebral dysfunction is associated with Mrs. L.'s depressive episodes or experiences of memory loss and difficulty in following directions, she was referred for a comprehensive neuropsychological evaluation.

Mrs. L. had no history of head injury, substance abuse, or other factors that might lead to cognitive deficits. In the evaluation, memory tested in the normal range, but she showed mild deficits in auditory concentration and learning of nonverbal information. She also tested below expected levels for logical reasoning, problem solving, and sequential abilities. She did not demonstrate psychological distress or evidence of depression at the time of testing. Therefore, these results were suggestive of very mild cognitive dysfunction.

It was recommended that Mrs. L. receive assistance in complex decision-making, take breaks when working on longer tasks, and be assisted in learning new information. Mrs. L. was also told of the areas in which she tested in the normal range. Emphasizing an individual's areas of strength in the face of a chronic illness can be more critical to their life quality than any other diagnostic information.

Mrs. L. had a long history of severe depressive episodes starting at age 13. Ongoing episodes may be caused by factors unrelated to SLE, effects of SLE

**In many ways, the application of neuropsychology to non-neurological diseases is still in its infancy**

## From the "Center Bibliography"

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on brain function, or psychological adjustment to the diagnosis of SLE. If the cause of Mrs. L.'s depressive episodes can be determined, it may affect decisions about how to manage the episodes. Further psychological and neurological testing may lead to such a determination.

## A Growing Field

In many ways, the application of clinical neuropsychology to non-neurological diseases is still in its infancy. As the medical community becomes more aware of clinical neuropsychology and its application to patients with pulmonary, immunological, and other diseases, a growing patient population is expected to receive neuropsychological evaluations. Increased experience through these evaluations will in turn increase the neuropsychology knowledge base. Ultimately, a broad spectrum of patients will be able to benefit from the growing field and its application to their illnesses.

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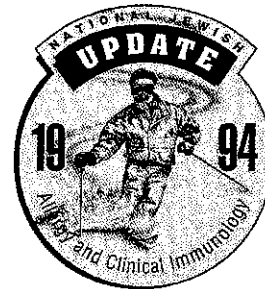
## Faculty:

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