

# Chemotherapy-Related Cognitive Impairment: Neuroimaging, Neuropsychological Testing, and the Neuropsychologist

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Chemotherapy-related cognitive impairment (CRCI) was first described in the 1970s, but significant recognition of CRCI did not emerge with consistency until the late 1990s. Estimates of frequency now range from 17%–75%, and evidence suggests that CRCI, or “chemobrain” as it is referred to in the lay literature, is of significant concern to patients. A variety of potentially associated factors have been identified, including age, education level, intelligence, and social support; anxiety, depression, and fatigue; disease site, stage, and comorbidities; treatment regimen, timing, duration, and concomitant therapies; and hormonal levels, cytokine levels, damage to neural progenitor cells, and the presence of the apolipoprotein E 4 allele. Controversy exists as to the most suitable neurocognitive tests to evaluate this sequela of treatment. Neuroimaging techniques are beginning to reveal affected areas of the brain. A neuropsychologist is essential for the assessment, diagnosis, and recommendation of appropriate management strategies for this patient population. Oncology nurses should be aware of available resources, such as relevant Web sites, support groups, neuropsychologists, and cognitive retraining programs, and provide support for patients concerned about or experiencing CRCI.

**C**hemotherapy-related cognitive impairment (CRCI) occurs in 17%–75% of patients receiving chemotherapy for cancer (Wefel, Lenzi, Theriault, Davis, & Meyers, 2004). CRCI commonly is referred to as “chemobrain” by the lay public and has the potential for significant impact on patients’ quality of life (QOL) (Ahles & Saykin, 2001; Hess & Insel, 2007). This form of cognitive impairment is attributed to standard doses of chemotherapy (as opposed to high-dose or intrathecal regimens) and has only recently been addressed consistently in the literature, although some recognition was published in the 1970s and early 1980s (Silberfarb, 1983; Silberfarb, Philibert, & Levine, 1980; Weiss, Walker & Wienik, 1974). The purpose of this article is to provide a brief historical review, discuss recent literature on neuroimaging and neuropsychological testing, and provide support for the role of neuropsychologists in diagnosis and intervention.

The impact of CRCI typically is subtle and finite. Patients who perceive a deficit in their ability to perform cognitive tasks may score within normal limits on existing measures of cognitive function (Wefel et al., 2004). However, an estimated subset of 17%–35% of patients appears to experience more severe and long-lasting effects (Ahles & Saykin, 2002). The specific domains of cognitive function that may be affected include executive function, information-processing speed, language, motor function, spatial skills, learning, and memory (Jansen, Miaskowski, Dodd, Dowl-

## At a Glance

- ◆ Neuroimaging tests may prove useful in prospective trials to identify areas of the brain affected by standard-dose chemotherapy and provide a rationale for patient self-reports of cognitive impairment despite normal performance on neuro-psychological tests.
- ◆ Current neuropsychologic test batteries are criticized for lack of real-life challenges experienced by cancer survivors.
- ◆ Neuropsychologists are an important component of the multidisciplinary team needed to provide quality cancer care to patients experiencing treatment-related cognitive changes.

ing, & Kramer, 2005a). Patients describe the effects on cognitive function as forgetfulness, absentmindedness, and an inability to focus when performing daily tasks (Hess & Insel, 2007). A variety of potentially associated factors have been identified, including age, education level, intelligence, and social support; anxiety,

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