

# Chemotherapy-Related Change in Cognitive Function: A Conceptual Model

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**Purpose/Objectives:** To develop a conceptual model of chemotherapy-related changes in cognitive function.

**Data Sources:** MEDLINE®, CINAHL®, HealthStar, and PsycINFO® databases.

**Data Synthesis:** Patients undergoing chemotherapy often complain of forgetfulness, absentmindedness, and an inability to focus when performing a variety of daily tasks. Changes in cognitive function have been referred to by the colloquial term “chemo-brain.” The authors conducted an examination of the literature to investigate relationships among concepts and to synthesize current knowledge.

**Conclusions:** Cognitive function, defined as higher-order mental processes, may be altered along two distinct and interacting pathways: (a) the cancer diagnosis, which can lead to anxiety, stress, distress, and depression; and (b) the direct physiologic effects of cancer treatment. The Chemotherapy-Related Change in Cognitive Function conceptual model is informed by a review of literature that illustrates antecedents, moderators, mediators, and consequences that may be relevant to this issue.

**Implications for Nursing:** When a patient presents with cognitive complaints, the problems can be evaluated for intervention when an overall understanding exists of chemotherapy-related cognitive changes based on a conceptual model that continues to be informed through well-conceptualized and well-designed research.

## Key Points . . .

- Changes in cognitive function during chemotherapy are a common complaint and are not well understood.
- Chemotherapy-related changes in cognitive function may be influenced by two distinct yet interacting pathways: the psychosocial impact of cancer diagnosis and the physiologic effects of cancer treatment.
- A conceptual model of Chemotherapy-Related Change in Cognitive Function provides a structure on which future research may be based.
- Research that investigates the mechanisms by which cognition is affected following cancer diagnosis can lead to appropriate interventions that can be used in clinics to improve mental functioning as well as patients' quality of life and overall well-being.

Patients receiving chemotherapy often complain of changes in cognitive function, colloquially referred to as “chemo-brain.” The condition encompasses a variety of complaints, such as forgetfulness, absentmindedness, and an inability to focus when performing daily tasks. Cognitive function, in general, refers to mental processes. More specifically, cognitive function is defined as the higher-order mental processes that involve information processing and that require integrated activity of several areas of the brain. Higher-order mental processes include memory, psychomotor speed, and executive functioning (e.g., planning, concentration, attention, decision making, initiation, task persistence, abstract reasoning) (Matlin, 2003; Mitchell & Phillips, 2007; Sjogren, Olsen, Thomsen, & Dalberg, 2000). Cognitive function does not include lower-order mental processes (e.g., perception, sensation) that are biologically based rather than based on cognitive information processing (Davidson & Downing, 2000). Although lower-order mental processes are required to complete higher-order processes (e.g., the brain must be able to send a signal to the hand to rearrange blocks), the biologic processes are not cognitive function as defined here (Davidson & Downing).

Changes in cognitive function have been identified as a likely consequence of cancer treatment since the 1980s

(Silberfarb, 1983; Silberfarb, Philibert, & Levine, 1980). Chemotherapy also is known to result in a number of adverse effects such as nausea, vomiting, diarrhea, asthenia, fatigue, anorexia, cachexia, and immunosuppression (Aziz & Krouse, 2005); research has only recently begun to acknowledge the impact of cancer therapy beyond those parameters. A number of known psychological and social effects are related to the challenges of confronting potentially terminal illness, sometimes referred to as “the meaning of cancer” based on the meaning of illness (Degner, Hack, O’Neil, & Kristjanson, 2003; Wallberg et al., 2003). The effects include anxiety, depression, and stress and increasingly are being identified and treated. Physiologic and psychosocial factors have been implicated in cognitive function (Cimprich & Ronis, 2001; McCracken & Iverson, 2001; Smith, Redd, Peyser, & Vogl, 1999; van Dam et al., 1998). However, no current standard exists for measurement or assessment of cognitive function in patients with cancer. Because patients experience many physiologic and psychosocial changes following cancer

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