

# Management of Temozolomide Toxicity by Nurse Practitioners in Neuro-Oncology

Hanneke Zwinkels, RN, MA, ANP, Krista Roon, MD, Frank J.F. Jeurissen, MD, Martin J.B. Taphoorn, MD, Wim C.J. Hop, PhD, and Charles J. Vecht, MD

**P**atients with gliomas are confronted with a disease with a poor prognosis and hardly any chance of cure. Median survival of such patients depends on a number of independent prognostic factors, including age, neurologic condition, cognitive function, tumor type, and tumor size. Clinically, patients may suffer from headache, seizures, poor cognition, and focal symptoms such as aphasia, hemiparesis, or hemianopia. Standard treatment of high-grade gliomas has consisted of resection or biopsy of the tumor, followed by radiotherapy (Kristiansen et al., 1981), even for older adult patients (Keime-Guibert et al., 2007). Treatment of glioblastoma multiforme (GBM), the most frequently occurring primary malignant brain tumor, with temozolomide (TMZ) with concomitant radiotherapy in the adjuvant setting has improved outcomes (Stupp et al., 2005). Efficacy of TMZ also has been demonstrated for recurrent low- and high-grade gliomas (Chang et al., 2004; van den Bent et al., 2003). For GBM, the two-year survival rate after surgery and radiotherapy plus TMZ is 26%, and 10% following radiotherapy without TMZ (Stupp et al.). Despite an initially good tumor response to TMZ, tumor progression may occur during treatment and often after a period of stable disease following therapy. TMZ is a novel oral alkylating agent with remarkable efficacy in patients with gliomas and a favorable toxicity profile (Taphoorn et al., 2005). Treatment with TMZ employing different types of administration is increasing steadily based on its generally good tolerability and few side effects (Wick et al., 2007).

With increasing use of more intensive therapies, oncology nurses can play a key role in management. This implies patient education, symptom management, and monitoring of the side effects of chemotherapy (Bedell, 2003; Crighton, 2004; Hartigan, 2003; Hollywood & Semple, 2001; Houston, 1997). In the authors' outpatient clinic for patients with brain tumors, this has led to an active role for the nurse practitioner (NP) in

**Purpose/Objectives:** To investigate the toxicity of temozolomide (TMZ) in patients with brain tumors and appropriate nursing interventions.

**Design:** Explorative analysis of prospective data.

**Setting:** A TMZ clinic led by a nurse practitioner (NP).

**Sample:** Group A (n = 71) received a standard dose of TMZ daily for five days 200 mg/m<sup>2</sup> every four weeks; group B (n = 19) received a dose-intense schedule of TMZ daily for 21 days 75 mg/m<sup>2</sup> every four weeks.

**Methods:** Toxicities were scored according to National Cancer Institute Common Terminology Criteria, and results in the two groups were compared.

**Main Research Variables:** Thrombopenia, neutropenia, and lymphopenia; nausea and vomiting; and NP interventions.

**Findings:** Of observed toxicities during six cycles, grade 3–4 thrombopenia was seen most frequently in group A. Neutropenia and subsequent interventions occurred more frequently in group A than in group B. Subsequent interventions consisted of dose delays and reductions. When patients were treated for a longer duration of time with TMZ, grade 3–4 lymphopenia occurred significantly more often in group B, necessitating *Pneumocystis carinii* pneumonia prophylaxis.

**Conclusions:** Degree of toxicity using a 5-day 200 mg/m<sup>2</sup> or 21-day 75 mg/m<sup>2</sup> schedule every four weeks was similar to that found in other studies.

**Implications for Nursing:** Through awareness of toxicity in relation to knowledge of brain tumors, NPs can become more effective in active management of TMZ toxicity.

neuro-oncology to monitor TMZ toxicity and to initiate therapeutic interventions to help patients cope with TMZ toxicity.

## Background

In the Netherlands, the NP is a relatively new role. Re-allocation of tasks and responsibilities between nurses and physicians at university hospitals was the conceptual basis of the development of training and education