Malglycemia and Cancer: Introduction to a Conceptual Model

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The annual incidence of cancer worldwide is estimated to reach 17 million by 2020 and 27 million by 2050 (Parkin, Bray, Ferlay, & Pisani, 2005). The lifetime risk of developing any type of cancer for someone born today is more than 40% (Howlader et al., 2011). A complex interplay exists between factors that contribute to the formation and proliferation of malignancies, as well as to treatment complications and decreased survival. A study by Hammer et al. (2009) has shown that malglycemia (abnormal glycemic status) is a risk factor for infection and mortality among patients who received allogeneic hematopoietic cell transplantation (HCT) for hematologic malignancies. Based on those findings, the theoretical associations between malglycemia, malignancy formation (and related treatments), and sequelae throughout the body will be explored.

Malglycemia is defined as any blood glucose (BG) measurement outside of the normal range of 70–125 mg/dl, including hyperglycemia (BG of 126 mg/dl or greater), hypoglycemia (BG of less than 70 mg/dl), and/or increased glycemic variability (standard deviation between BG measurements of 29 mg/dl or greater) (Hammer et al., 2009). Patients with cancer with or without preexisting diabetes may be at increased risk for experiencing malglycemic events during and following treatments for cancer because of older age (Stookey, Pieper, & Cohen, 2004; Vischer et al., 2009), high body mass index (BMI) (Roumen, Blaak, & Corpeleijn, 2009), nutritional imbalances (Butler, Btaiche, & Alaniz, 2005; Jenkins et al., 2002; Martin-Salces, de Paz, Canales, Mesejo, & Hernandez-Navarro, 2008; Sheean & Braunschweig, 2006), low physical activity levels (Katz, 2007; Moien-Afshari et al., 2008), high stress levels (Butler et al., 2005; Godbout & Glaser, 2006; Turina, Christ-Crain, & Polk, 2006), treatment with glucocorticoids (Butler et al., 2005; Mazali, Lalli, Alves-Filho, &

Purpose/Objectives: To introduce a conceptual model detailing the physiologic contributions of malglycemia to cancer formation and increased morbidity and mortality.

Data Sources: A literature search was conducted using the PubMed, CINAHL®, and Cochrane databases, as well as Surveillance, Epidemiology and End Results (SEER) cancer statistics.

Data Synthesis: Multiple complex factors are associated with malignancy formation, proliferation, and outcomes for each individual. The authors present a model, termed the Malglycemia Orbit Model, that is analogous to an atom, centered on a core of individual factors, and surrounded by "orbits" containing cancer and related factors. Highlighted in this model is the role of malglycemia.

Conclusions: Cancer formation and sequelae involve numerous multifaceted factors. One factor not well described or understood within the context of malignancies is glycemic status, most notably how malglycemia impacts cancer formation and risks for adverse outcomes. The atomic-structured malglycemia model describes this process.

Implications for Nursing: Among the many uncontrollable factors that contribute to cancer formation and adverse outcomes, malglycemia is one that is modifiable. Nurses are in a prime position to conduct research to enhance understanding and ultimately improve protocols for better glycemic control and, in effect, better outcomes for individuals with cancer.

Mazzali, 2008; Willi et al., 2002), and treatment with other chemotherapeutic agents or immunosuppressants (Mazali et al., 2008; Ramos-Cebrian, Torregrosa, Gutierrez-Dalmau, Oppenheimer, & Campistol, 2007), as well as from infections themselves (Turina et al., 2006).

Malglycemia also may contribute to the onset of cancer. In a joint statement by the American Cancer Society and the American Diabetes Association, strong epidemiologic evidence suggests that diabetes is a risk factor for certain malignancies including cancers of the