Chemotherapy Induced Neutropenia and Increased Risk for Sepsis

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Introduction

Available treatment options for patients diagnosed with cancer include surgery, the administration of chemotherapeutic agents, radiation therapy, or a combination of these modalities. Chemotherapeutic agents are designed to treat cancer in a variety of ways, targeting and destroying the most common and well-known side effects of chemotherapy, including pain, nausea, vomiting, and leukopenia (Oliveira & Wentley, 2015). Among the side effects of chemotherapy are neutropenia and sepsis. As many as 60,000 cancer patients require hospitalization each year due to chemotherapy-induced neutropenia related to standard treatment regimens (North America, 2015). While the criteria defined for neutropenia vary among institutions, neutropenia may typically be defined as an absolute neutrophil count (ANC) less than 1,500 cells per microliter with severe neutropenia defined as ANC less than 500 cells per microliter (White & Yuen, 2013). Neutropenia places oncology patients at an increased risk of contracting infections which may lead to a life-threatening complication known as sepsis. Sepsis is a severe and rapidly changing oncologic emergency requiring urgent medical treatment. Failure to recognize symptoms associated with hematologic disease and neutropenic patients and initiate appropriate medical treatment significantly increases the risk of patient mortality. White and Yuen (2014) identify neutropenic patients in hematopoietic patients with uncontrolled infection were interwined with the severity of neutropenia. Further, the mortality risk in patients with ANC less than 500 cells per microliter is markedly increased. The aim of this research project is to aid in further elucidating hematologic conditions and the pathophysiologic and clinical impact of neutropenia and their importance associated with caring for patients. Knowledge of the pathophysiology induced neutropenia and their increased risk for sepsis.

Underlying Pathophysiology

Bone marrow suppression and subsequent neutropenia significantly increases the possibility of infection which may require hospitalization and administration of preventive and therapeutic antibiotic regimens and vancomycin/ciprofloxacin virals. Vircal and Wentley (2015) recommended that patients with severe acute neutropenia may require at least two weeks prior to the beginning of chemotherapy to assess the infection prevention measures that nurses have in place. Vircal and Wentley (2015) argued high risk for neutropenia include the use of large-diameter catheters for the sharing, use of soft toothbrushes and importance of frequent oral care (at least two times daily). A single oral medication is contraindicated in patients with severe acute neutropenia or those who have had large scale operations and use of urea, urin, and stool may also be collected, aggresive fluid reconstitution will be initiated, and broad spectrum antibiotics will be administered within three hours of presentation to the department (O’Leary, 2014).

The conclusion of inducing catheters should be requested and performed when there is suspicion of catheter related bloodstream infections (Lagrange et al., 2012). Patients with severe neutropenia may experience unamplified or absent due to altered immune response. Fever may not be exhibited by neutropenic patients with a present temperature that is below normal, namely temperatures below 96.8 degrees Fahrenheit (Bow, 2013; O’Leary, 2014).

The patient may also display alterations in vital functions including progression towards sepsis and the process of a systemic inflammatory response. Criteria concerning for the presence of systemic inflammatory response include infectious or non-infectious, temperature, heart rate greater than ninety basal min per min, or a respiratory rate greater than twenty breaths per minute (Bow, 2013; O’Leary, 2014). Additional, patients may rapidly develop systemic inflammatory response which altered mental status, and rigors (Kovach & Standiford, 2012).

Signs and Symptoms

• Patients with neutropenia do not produce a sufficient number of mature neutrophils to maintain an appropriate immune response against microorganism invasion (Vioral, Legrand, & Ybarra, 2014).
• Neutrophils are released into the peripheral blood and stream from the bone marrow as fully mature cells and released throughout the lifespan (Bell-Warmkessel, 2011; Kovach & Standiford, 2012).
• Neutrophils are the first phagocytic cell to arrive at the site of an infection, function to fight against infectious agents, guard against progression of infection, and produce common signs and granules of inflammation (including redness, swelling, and pain) (Kovach & Standiford, 2011; Virlal et al., 2015).

Bone marrow suppression and subsequent neutropenia significantly increases the possibility of infection which may require hospitalization and administration of preventive and therapeutic antibiotic regimens and vancomycin/ciprofloxacin virals. Vircal and Wentley (2015) recommended that patients with severe acute neutropenia may require at least two weeks prior to the beginning of chemotherapy to assess the infection prevention measures that nurses have in place. Vircal and Wentley (2015) noted that nurses are integral in the prevention, identification, treatment, and management of these high mortality complications of immunomodulatory therapies (p. 173). Ensuring these nurses are aware of the understanding of the pathophysiology, process and implications for nursing care further contributes to improvements in the quality of care received by the neutropenic patient.

Conclusion

Neutropenia in patients receiving chemotherapy medications for the treatment of cancer can place patients at risk for potentially life threatening inflammation due to neutropenia, infection of symptoms, and prompt intervention when concerns for infection arise are vital for positive patient outcomes. Vircal and Wentley (2015) noted that “nurses are integral in the prevention, identification, treatment, and management of these high mortality complications of immunomodulatory therapies” (p. 173). Ensuring these nurses are aware of the understanding of the pathophysiology, process and implications for nursing care further contributes to improvements in the quality of care received by the neutropenic patient.

Significance of Pathophysiology

Neutropenia in patients receiving chemotherapeutic medications for the treatment of cancer can place patients at risk for potentially life threatening inflammation due to neutropenia, infection of symptoms, and prompt intervention when concerns for infection arise are vital for positive patient outcomes. Vircal and Wentley (2015) noted that “nurses are integral in the prevention, identification, treatment, and management of these high mortality complications of immunomodulatory therapies” (p. 173). Ensuring these nurses are aware of the understanding of the pathophysiology, process and implications for nursing care further contributes to improvements in the quality of care received by the neutropenic patient.