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Assessment of Risk Factors for Developing Iron Overload in Patients with Pediatric Cancer and Bone Marrow Transplant Survivors: A Single Center Retrospective Chart Review

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Background: Pediatric cancer survivors and those with chronic hematologic disorders are at risk for iron overload secondary to frequent transfusion therapy. As this patient population increases in number due to improvement of therapies, it is essential to identify risk factors associated with the development of iron overload. Classifying these risk factors will help improve screening methods and assist in decreasing side effects from iron overload, such as iron deposition resulting in organ damage. Objective: Assessment of risk factors associated with the development of iron overload in pediatric cancer survivors and those who underwent bone marrow transplant. Methods: Retrospective chart review of patients who completed therapy for pediatric malignancy or underwent bone marrow transplant and were screened for iron overload utilizing magnetic resonance imaging (MRI). Iron overload was defined as T2* liver MRI with iron levels of >5mg/g dry weight. Individuals determined to screen positive for iron overload were evaluated for additional demographic and treatment variables, such as race, age at diagnosis, and total transfused blood volume, to assess for risk factors associated with the development of iron overload. Statistical analyses were performed via univariate and multivariate regression models of the variables collected. Results: We report a large cohort of patients with a mean age of 10.6 years who underwent screening T2* liver MRIs. Of 71 patients who underwent liver MRI screening, 89% met criteria for moderately severe iron overload. Blood volume administered (ml) and Non-White Race were found to be statistically significant in association with higher iron content. Mean iron content was 12.9 mg/g in the Non-White group versus 8.8 mg/g in the White group (p=0.0185). For every 100ml/kg increase in the cumulative blood volume transfused, the predicted iron content increased approximately 1 mg/g (p=0.0227); mean transfused blood volume was 340ml/kg among those who met criteria for iron overload versus 224ml/kg among those who did not (p=0.1858). We did not find any correlation between iron content and age at diagnosis, primary diagnosis, BMI at diagnosis, or gender. Conclusions: Iron overload continues to be a risk for pediatric cancer survivors and those who receive chronic transfusions. Our study revealed a statistically significant correlation between increased amount of blood transfusions and development of iron overload; however, no specific quantity of cumulative transfused blood volume was determined to be the threshold for risk. Our study also revealed a statistically significant correlation between Non-White race and the development of iron overload independent of cumulative transfused blood volume. It is possible there are race-based differences in iron metabolism that result in this increased risk. Further studies regarding specific quantities of blood transfusions, assessing physiologic characteristics of the Non-White patient population, and development of iron overload are needed. These findings indicate the importance of continuing to research the development of iron overload in the pediatric cancer and bone marrow transplant population, as well as provide guidance for understanding the risk each unique patient has for developing this complication.

Disclosures No relevant conflicts of interest to declare.

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