Validation of an Apheresis Collection Prediction Algorithm for Hematopoietic Progenitor Cells Using the Spectra Optia Cmnc Protocol
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Background: Increased emphasis on cost and productivity in apheresis centers requires proficient and predictable hematopoietic progenitor cell (HPC) collections. The aim of this study was to compare pre and post collection outcomes utilizing a customized prediction algorithm to estimate the number of blood volumes required to achieve a targeted CD34+ cell dose.

Methods: A prediction algorithm was determined by utilizing the collection efficiency from 19 autologous patients with 26 collections on the Spectra Optia CMNC from October 2017 through March 2018. The algorithm was based upon the linear regression of pre-apheresis CD34 counts, the collected CD34 cell dose and blood volumes processed. Validation was performed on 21 HPC collections (18 auto, 3 allo) completed from June 2018 through September 2018. In the analysis, if a patient collected more than one day, the data from each procedure was combined in the analysis. Cohort A included collections prior to implementation of the prediction algorithm and Cohort B included collections after implementation of the prediction algorithm. T-Test statistical analysis was used for variables that were normally distributed and Mann-Whitney statistical analysis was used for variables that were not normally distributed.

Results: Following implementation of the algorithm, the mean number of collections per patient decreased from 1.3 to 1.0 (P=0.003) and mean procedure time decreased from 376 minutes to 305 minutes (P=0.002). In addition, number of liters processed per patient was lower, 24.3 vs. 21.3 (P=0.466) and the product volume decreased from 348ml to 286ml (P=0.011). Product hematocrit, collection efficiency and product CD34+ yield were not significantly different. Pre procedure WBC and hematocrit were similar in each group, but platelet counts were significantly lower in Cohort A, likely due to donors requiring multiple days of collection. All patients engrafted.

Discussion: This analysis demonstrates that using a prediction algorithm can provide great value in the planning of leukapheresis, which may optimize resource utilization and capacity of the unit while maintaining the ability to collect the desired