Validation of a formula predictive of peripheral blood stem cell yield and successful collection in healthy allogeneic donors

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Background: An efficient mobilization and collection of peripheral blood stem cells (PBSCs) are crucial to optimize engraftment in the recipient. We aim to validate a formula that predicted CD34+ cell yield and to describe variables that correlated with high yield mobilization and collection in healthy donors.

Methods: We retrospectively analyzed clinical and laboratory data from healthy donors who underwent PBSC collection from 2006 to 2015. The predicted number of collected cells was calculated using the following formula: Total number of CD34+ (cells × 10^6/kg) yield = [( peripheral CD34+ cells/μL) × (0.43/recipient body weight (kg)] × total liters processed.

Results: We evaluated 338 collections from 307 allogeneic PBSC donors. The predicted versus the observed number of CD34+ cells/kg collected yielded an r-value of 0.775 (0.726–0.816; p < 0.0001). Overall, 55.7% donors had an acceptable mobilization level. Donors with a body weight <67 kg were less likely to yield a satisfactory CD34+ cell count (OR = 0.44; 95% CI 0.24–0.81), while a white blood cell (WBC) count >40 × 10^9/L (OR = 3.69; 2.11–6.46) and platelet count ≥200 × 10^9/L (OR = 2.09; 1.26–3.47) on the day of collection predicted a good level of mobilization. Predictors of a CD34+ cell yield/kg of ≥4 × 10^6 with only one apheresis session were: circulating CD34+ cells/μL >40 (OR = 16; 6.94–36.93), hemoglobin ≥14 g/dL (OR = 3.40; 1.53–7.57), WBC >40 × 10^9/L (OR = 4.61; 2.10–10.10) on the first collection day, and a positive delta weight between donor and recipient (OR = 3.10; 1.36–7.06).

Abbreviations: Hb, hemoglobin; Htc, hematocrit; CEC, collection efficiency coefficient; G-CSF, granulocyte colony-stimulating factor; IQR, inter-quartile range; PBSC, peripheral blood stem cell; SD, standard deviation; FLT, platelets; WBC, white blood cells.

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Conclusion: The formula for predicting CD34+ cell yield is accurate and suggests the optimal length of time for successful leukapheresis. Validation of the predictors of successful mobilization will help to further refine PBSC leukapheresis procedures.

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