

**Duke**Medicine

Division of Cellular Therapy

DOCUMENT NUMBER: ABMT-COLL-001 JA1**DOCUMENT TITLE:**Calculating Extracorporeal Whole Blood Volume (ECV), Red Cell Volume (RCV), and Blood Loss
JA1**DOCUMENT NOTES:****Document Information****Revision:** 06**Vault:** ABMT-Collections-rel**Status:** Release**Document Type:** Collections**Date Information****Creation Date:** 10 Jan 2018**Release Date:** 08 Oct 2018**Effective Date:** 08 Oct 2018**Expiration Date:****Control Information****Author:** MC363**Owner:** MC363**Previous Number:** ABMT-COLL-001 JA1 Rev 05 **Change Number:** ABMT-CCR-183

ABMT-COLL-001 JA1

CALCULATING EXTRACORPOREAL WHOLE BLOOD VOLUME (ECV), RED CELL VOLUME (RCV), AND BLOOD LOSS

1 PURPOSE

- 1.1 To describe the procedure for calculating extracorporeal blood volume (ECV), red cell volume (RCV), and blood loss.

2 INTRODUCTION

- 2.1 The maximum extracorporeal blood volume (ECV) is calculated to estimate the percentage of the patient or donor blood in the extracorporeal circuit during leukapheresis. To minimize the risk of hypovolemia, the estimate of the %ECV and %RCV should not exceed 15%.
- 2.2 RCV can be calculated if a patient has a low hematocrit (<30%) and low body weight (<45kg). Red blood cells can be transfused prior to apheresis if the %RCV is greater than 15%.
- 2.3 Calculation or estimate of Blood Loss is required if there is any blood leak in the apheresis system or if blood cannot be returned following apheresis. The volume of blood loss will be used to determine if apheresis can be safely continued using a new apheresis system or machine on the day of collection.

3 SCOPE AND RESPONSIBILITIES

- 3.1 This procedure applies to the management of extracorporeal blood volume during apheresis.
- 3.2 The apheresis nurse is responsible for obtaining the TBV and calculating maximum ECV (and RCV if appropriate). The apheresis nurse is responsible for reporting any %ECV, and %RCV that are above 15% to the ABMT Clinic physician. The apheresis nurse is responsible for calculating total blood loss, and reporting this to the ABMT Clinic attending physician. The apheresis nurse and ABMT Clinic attending physician are responsible for the patient's care during leukapheresis.

4 DEFINITIONS/ACRONYMS

- 4.1 ECV Extracorporeal volume
- 4.2 RCV Red blood cell volume
- 4.3 TBV Total blood volume
- 4.4 ABMT Adult Blood and Marrow Transplant
- 4.5 WBC White blood cell
- 4.6 Kg kilogram
- 4.7 Cm centimeter

5 MATERIALS

5.1 NA

6 EQUIPMENT

6.1 NA

7 SAFETY

7.1 NA

8 PROCEDURE

8.1 The patient's total blood volume (TBV) will be automatically calculated by Optia after entering the patient's sex (male, female), height (centimeters) and weight (kilograms) when prompted to enter these values at the end of Optia Prime mode.

8.1.1 *Example:* Female, 167.6 cm, 68 kg

Optia calculated TBV = 4111 cc

8.1.2 An estimated total blood volume (TBV) can be manually calculated as follows:

8.1.2.1 Male TBV = 70cc whole blood/kg x body weight (kg)

Example: Male, 105kg

$$70\text{cc} \times 105\text{kg} = 7350\text{cc TBV}$$

8.1.2.2 Female TBV = 65cc whole blood x body weight (kg)

Example: Female, 68 kg

$$65\text{cc/kg} \times 68\text{ kg} = 4420\text{cc TBV}$$

8.2 Maximum Extracorporeal Volume is the maximum amount of patient's blood volume allowed in the extracorporeal circuit.

8.2.1 To calculate, multiply patient's TBV x 0.15.

8.2.1.1 0.15 = 15% of the patient's whole blood volume.

Example: Patient's TBV (4111cc) x 0.15 = 616cc Maximum Extracorporeal Volume.

8.3 % Extracorporeal Volume (%ECV) is the percentage of the patient's blood volume in the extracorporeal circuit.

NOTE: This should not be greater than 15%.

8.3.1 To calculate, divide Optia ECV of 293cc (the estimated extracorporeal blood volume of the Optia WBC set (253cc) + blood warmer tubing (40cc), by the patient's TBV.

Example: Optia ECV (293), patient's TBV (4111cc)

$$293 \div 4111 = .071 \text{ \%ECV } (0.71 \times 100\% = 7.1\%)$$

8.4 Patient's Red Cell Volume (RCV) is the estimated amount of red cells a patient has based on their TBV and hematocrit.

8.4.1 To calculate, multiply the patient's TBV x patient's hematocrit.

Example: Patient's TBV (4111cc), Patient's HCT (.28)

$$4111\text{cc} \times .28 = 1151\text{cc Patient's RCV}$$

8.5 %RCV is the percentage of patient red blood cells in the extracorporeal circuit

8.5.1 To calculate, divide Optia RCV estimate of 117cc by patient RCV

8.5.1.1 *Example:* Optia RCV (117cc) ÷, Patient RCV (1151cc)

$$117 \div 1151 = .10 \text{ (multiply } 0.10 \times 100 = 10\%)$$

8.6 %ECV and/or %RCV \geq 15%:

8.6.1 Each patient's % of ECV and RCV, based on the Optia system volume, sex, body weight, total blood volume and hematocrit, will be different. If the patient's %ECV and/or %RCV is \geq 15%, they may exhibit signs of hypovolemia: hypotension, tachycardia, dizziness, and diaphoresis.

8.6.2 Notify the ABMT Clinic attending physician to determine if the patient will require a transfusion or fluid bolus, prior to leukapheresis, to increase circulating volume. Anemic patients may require a blood transfusion to increase not only circulating volume, but red cell volume as well. Blood transfusion can be given during leukapheresis.

8.6.3 A bolus of normal saline can be given prior to and at any time during RUN.

8.7 Blood Loss is any blood loss due to leak or machine malfunction occurring during RUN.

8.7.1 To calculate Blood Loss (without rinse back) at the time of RUN termination:

8.7.1.1 Add: (1) Blood volume loss + (2) Volume of collection bag.

8.7.1.1.1 Blood volume loss = 293cc (extracorporeal volume of Optia WBC set and blood warmer tubing) + WBC collect volume.

8.7.2 Record Blood Loss on Leukapheresis Run Sheet, under Volume Out, in the labeled space.

9 RELATED DOCUMENTS/FORMS

9.1 ABMT-COLL-019 FRM1 Optia CMNC Run Sheet

10 REFERENCES

10.1 AABB Technical Manual, Current Edition.

10.2 Terumo Spectra Optia Operator's Manual, Current edition

11 REVISION HISTORY

Revision No.	Author	Description of Change(s)
06	M. Christen	4.4: Changed ABMT Adult Bone Marrow Transplant to Adult Blood and Marrow Transplant 8.1.1: Removed Spectra added Optia 8.5: Removed Spectra and added Optia

Signature Manifest**Document Number:** ABMT-COLL-001 JA1**Revision:** 06**Title:** Calculating Extracorporeal Whole Blood Volume (ECV), Red Cell Volume (RCV), and Blood Loss JA1

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ABMT-COLL-001 JA1 Calculating Extracorporeal Whole Blood Volume (ECV), RCV, and Blood Loss**Author**

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