

# Effective Use and Cost-Evaluation of Erythrocyte Suspension in Surgical Branches of Tertiary Hospital

**Author(s)****Defne Ay Tuncel<sup>1</sup>, Ayşe Yiğit Sönmez<sup>2</sup>****Affiliation(s)**<sup>1</sup>Health Sciences University Türkiye, Adana City Training and Research Hospital, Clinic of Pediatrics, Division of Pediatric Hematology and Oncology, Adana, Türkiye<sup>2</sup>Yüreğir State Hospital, Clinic of Obstetrics and Gynecology, Adana, Türkiye**Article Information****Article Type:** Original Article**Article Group:** Pediatric Hematology**Received:** 05.05.2024**Accepted:** 03.09.2024**Epub:** 19.09.2024**Available Online:** 30.09.2024

**Cite this article as:** Tuncel DA, Yiğit Sönmez A. Effective Use and Cost-Evaluation of Erythrocyte Suspension in Surgical Branches of Tertiary Hospital. J Pediatr Acad. 2024; 5: 93-98

## Abstract

Blood has been accepted as the basic symbol of life from the past to the present. Transfusion is the transfer of blood and blood components to a patient due to various health problems. The present study aimed to evaluate the effective use and cost of erythrocyte suspension in surgical branches in a tertiary hospital. In this study, the use and cost-effective evaluation of erythrocyte suspension, a blood component, after surgical intervention in brain and nerve diseases surgery, orthopedics and traumatology, general surgery, gynecology and obstetrics, and organ transplantation clinics between 01/01/2023 and 31/12/2023 were retrospectively evaluated. Because blood products are provided as voluntary donations, their appropriate use will help reduce hospital and patient costs. We believe that strict compliance with national and international standards and guidelines, quality management, and good clinical practices, as well as ensuring continuity of training on these issues, will enable more efficient product acquisition and decrease blood component disposal in all blood services units.

**Keywords:** Erythrocyte suspension, transfusion, surgical clinics, cost, disposal

## Introduction

Blood has been accepted as the basic symbol of life from the past to the present. Transfusion is the transfer of blood and blood components to a patient due to various health problems. The present study aimed to evaluate the effective use and cost of erythrocyte suspension in surgical branches in a tertiary hospital.

## Material and Methods

In this study, the use and cost-effective evaluation of erythrocyte suspension, a blood component, after surgical intervention in brain and nerve diseases surgery, orthopedics and traumatology, general surgery, gynecology and obstetrics, and organ transplantation clinics between 01/01/2023 and 31/12/2023 were retrospectively



**Correspondence:** Defne Ay Tuncel, Health Sciences University Türkiye, Adana City Training and Research Hospital, Clinic of Pediatrics, Division of Pediatric Hematology and Oncology, Adana, Türkiye  
**E-mail:** defneayinan@gmail.com **ORCID:** 0000-0002-1262-8271

evaluated. Because the hospital serves as a transfusion center, blood products are supplied by the Turkish Red Crescent. The cross-matching technique is used, which is one of the eligibility criteria for erythrocyte suspension prepared for the patient.

Social Security Institution Community on Healthcare Practices (SUT) is a legislative notification that allows the implementation of the state's health-related social policies, pricing, regulations, and containing all other application details. The regulation is regulated within the framework of Social Security Institution (SGK) law no. 5502, law no. 5510, and the General Health Insurance Procedures Regulation. Payment principles for all transactions made at health centers are regulated according to these codes. Therefore, knowing SUT disease, procedure, and surgery codes, transaction scores, and pricing, and reporting and pricing transactions completely in line with these codes are very important in terms of both recording the work done and preventing disposals.

The cross-match value of the SUT updated by the SGK on 19/10/2023 was 75. The Turkish lira (TL) equivalent of the SUT is 29.64 TL. The cost of erythrocyte suspension provided by the Red Crescent is 1519 TL for 1 unit. The study protocol was approved by the Adana City Training and Research Hospital Clinical Research Ethics Committee (decision no: 1484 date: 01.07.2021). This study does not require informed consent in terms of method; it is a retrospective study.

### Statistical Analysis

Only tables reporting on the situation have been created. No statistical analysis was performed.

### Results

The number of erythrocyte suspensions planned to be used for patients and the actual amounts used for patients at each clinic are presented in **Table 1**. As can

be seen, the difference between the planned and used amounts is considerable. Except for the orthopedics and traumatology clinic, below 30% of planned suspensions are used, with the gynecology and obstetrics clinic having the minimum ratio of 12%. In the orthopedics and traumatology clinic, this ratio is 37%, which is still well below the desired level.

**Table 2** lists the reasons for the disposal of blood components in our study. It can be noted that the dominant reason is expiration, which accounts for 92% of all disposals.

### Discussion

In this study, it was determined that the total number of erythrocyte suspensions requested from surgical clinics was 24931 (100%) units, with 5941 (24%) used units and 18990 (76%) unused units. The cost loss is calculated as 1899075 SUT points. It has been determined that the hospital has suffered significant financial losses. Cost studies are important in the literature<sup>1-3</sup>.

Preparing more erythrocyte suspension than necessary causes disposal due to reasons related to the blood component, such as blood component procurement, production, and use, transportation and transfer, storage, storage process, or the component reaching its expiry date before being used for the recipient, or user-related reasons, such as keeping the component released to the service in an inappropriate environment for a long time, wrong indication, or lack of training. The suspension can be disposed of before or after its use<sup>4-6</sup>. In our study, the main reasons for erythrocyte suspension disposal were its expiration date, storage conditions, and damage during transportation and transport, as presented in **Table 2**.

According to the hospital's quality standards, the erythrocyte suspension destruction rate was determined to be below 3%. This rate was calculated as 1.5% from the 2023 disposal data of the transfusion center. This rate can be further reduced by appropriate blood management<sup>7,8</sup>.

**Table 1.** Erythrocyte suspension use and cost evaluation at each clinic

Clinic	Number of requested erythrocyte suspensions for patients	Number of erythrocyte suspensions	Number of erythrocyte suspensions not used for patients	Cost of erythrocyte suspensions for patients (ES*SUT value)	Cost of erythrocyte suspensions not used for patients (ES*SUT value)
Brain and nerve diseases	5904 (100%)	1694 (29%)	4210 (71%)	5904*75	4210*75
Orthopedics and traumatology	3670 (100%)	1369 (37%)	2301 (63%)	3670*75	2301*75
General surgery	4733 (100%)	1361 (29%)	3372 (71%)	4733*75	3372*75
Organ transplantation	1077 (100%)	327 (30%)	750 (70%)	1077*75	750*75
Gynecology and obstetrics	9547 (100%)	1190 (12%)	8357 (88%)	9547*75	8357*75

ES; Erythrocyte suspension, SUT; Social Security Institution Community on Healthcare Practices

**Table 2.** Reasons for blood component disposal

Reason for disposal	Expiration	Explosion	Storage conditions	Due to services	Other	Manufacturing defect	Total
Number of suspensions	711 (92.1%)	23 (3.0%)	21 (2.7%)	8 (1.0%)	9 (1.2%)	0	772 (100%)

Generally, the first cause of disposal in transfusion centers is outdated components, as in our study. In order to reduce the disposal of expired blood components, as stated in the 2016 National Blood and Blood Components Preparation, Use and Quality Assurance Guide, good planning of stock management, accurate determination of the critical stock level, and notification to the regional blood center are necessary. When these precautions are taken, the transfusion center will have a regular stock of ready-to-use blood components, and at the same time, it will be ensured that blood component disposal is minimized and the required blood component is kept ready in case of emergency. In stock management, it is important to act according to the "first in, first out" principle, except for special cases requiring fresh blood components, to follow the expiry date preferably with online systems, to create a good warehouse order and to train personnel accordingly.<sup>9</sup>

Measures can be taken to increase the possibility of using blood components by cross-matching more than one patient (double cross match) for erythrocyte concentrates nearing their expiration date in transfusion center stocks<sup>10,11</sup>.

More than one cross-match study of erythrocyte suspensions increases personnel testing time. In cross-match tests, which should take approximately 1 hour to complete, this time is doubled. Heat and energy losses are also important in the preparation of erythrocyte suspensions and were not included in this study. We believe that further studies on these subjects will contribute to the literature.

## Results

In parallel with the increase in average life expectancy, the increase in medical interventions and the development of treatment methods, the need for blood and blood products, the sole source of which is humans, has also increased. Because blood products are provided as voluntary donations, their appropriate use will help reduce hospital and patient costs. Employees in all blood service units and blood and blood component users are required to work diligently and carefully to minimize blood component disposal in all processes that involve safe, accurate, and efficient supply, preparation, and use of blood components. We believe that strict compliance with national and international standards and guidelines, quality management, and good clinical practices, as well as ensuring continuity of training on these issues, will enable more efficient product acquisition and decrease blood component disposal in all blood services units.

## Conclusion

The increasing average life expectancy and the increasing use of medical interventions have increased the need for blood products whose sole source is humans.

The correct use of an erythrocyte suspension is cost effective. Ensuring the training of blood bank employees reduces the destruction of blood components.

**Ethical Approval:** The study protocol was approved by the Adana City Training and Research Hospital Clinical Research Ethics Committee (decision no: 1484 date: 01.07.2021).

**Informed Consent:** Retrospective study.

**Author Contributions:** Tuncel DA: Design, Data Collection or Processing, Analysis or Interpretation, Literature Search, Writing.; Yiğit Sönmez A: Design, Data Collection or Processing, Analysis or Interpretation, Literature Search, Writing.

**Conflict of Interest:** The authors declare no conflicts of interest. The authors are responsible for the content and writing of this article.

**Financial Disclosure:** The authors declared that this study received no financial support.

## References

1. Levin JH, Collins L, Adekunle O, et al. Blood product wastage reduction by utilising low-cost, low-impact multimodal physician-to-physician communication initiatives. *Transfus Med*. 2019;29:389-393. [\[CrossRef\]](#)
2. Quality Management System Guide for Blood Service Units, 2016 [Internet]. Available at: [\[CrossRef\]](#)
3. National Standards Guide for Blood Service Units, 2016 [Internet]. Available at: [\[CrossRef\]](#)
4. Collins RA, Wisniewski MK, Waters JH, et al. Effectiveness of multiple initiatives to reduce blood component wastage. *Am J Clin Pathol*. 2015;143:329-335. [\[CrossRef\]](#)
5. Ulusal Kan ve Kan Bileşenleri Hazırlama, Kullanım ve Kalite Güvencesi Rehberi, 2016 [Internet]. Available at: [\[CrossRef\]](#)
6. American Association of Blood Banks. Committee on Standards, and American Association of Blood Banks. Standards Program Committee. Standards for blood banks and transfusion services. Committee on Standards, *American Association of Blood Banks*. 2015. [\[CrossRef\]](#)
7. Cataife G, Pagano MB. How much does a blood transfusion cost? *Transfusion*. 2018;58:833-835. [\[CrossRef\]](#)
8. Shamsasenjan K, Gharehdaghi S, Khalaf-Adeli E, et al. New horizons for reduction of blood use: Patient blood management. *Asian J Transfus Sci*. 2023;17:108-116. [\[CrossRef\]](#)
9. Shander A, Van Aken H, Colomina MJ, et al. Patient blood management in Europe. *Br J Anaesth*. 2012;109:55-68. [\[CrossRef\]](#)
10. Shander A, Hofmann A, Gombotz H, et al. Estimating the cost of blood: past, present, and future directions. *Best Pract Res Clin Anaesthesiol*. 2007;21:271-289. [\[CrossRef\]](#)
11. The cost of blood: multidisciplinary consensus conference for a standard methodology. *Transfus Med Rev*. 2005;19:66-78. [\[CrossRef\]](#)