

REVIEW

OPEN ACCESS

How do Red Blood Cell Transfusions Impact Quality of Life in Patients with Acute Myeloid Leukemia: A Scoping Review



Check for updates



URNCST Journal
"Research in Earnest"

Amena Zahid, BSc Honours Pharmacology [1]*, Abibah Kromah, BSc Specialization Molecular, Cellular, Development Biology [2], Suhad Alkhatib, BSc Biological Sciences [3]

[1] Department of Pharmacology, University of Alberta, Edmonton, Alberta, Canada T6G 2G5

[2] Department of Biological Sciences, University of Alberta, Edmonton, Alberta, Canada T6G 2G5

[3] Department of Biological Sciences, University of Alberta, Edmonton, Alberta, Canada T6G 2G5

*Corresponding Author: amena1@ualberta.ca

Abstract

This scoping review evaluates the impact of red blood cell (RBC) transfusions on quality of life (QoL) in adults with acute myeloid leukemia (AML) and compares the effect of restrictive versus liberal transfusion thresholds. Literature was searched in PubMed, Web of Science, and the University of Alberta library databases using keywords “blood transfusions,” “quality of life,” and “acute myeloid leukemia.” This review includes studies published between 2015-2025. Ultimately after 103 retrieved literature only two studies met eligibility criteria. The first study found that liberal transfusion thresholds (8-9 g/dL) improved physical QoL, as measured by the EORTC QLQ-C30. The second study suggested that liberal transfusions favoured QoL particularly in the second cycle. It also led to more transfusions and a higher incidence of complications such as infections and thrombotic events. The restrictive cohort in this study showed more symptom-driven transfusions which could indicate that liberal strategies may improve symptom control. Both studies suggest that liberal transfusion thresholds may improve physical symptoms like fatigue, but the trade-off includes an increased risk of complications. Both studies were also limited by their primary focal point of physical aspects of QoL. This led to negligence in psychological and social domains. These findings highlight the need for further research into the emotional, cognitive, and social impacts of RBC transfusions in AML patients. While liberal transfusions may offer some improvement in fatigue and physical QoL, they also pose a higher risk of complications. Larger studies are needed to validate these findings and to better understand the broader impact of RBC transfusions on all aspects of QoL in AML patients.

Keywords: blood transfusions; acute myeloid leukemia; quality of life

Introduction

Blood transfusions are utilized in alleviating the symptoms of anemia, commonly found in individuals with hematological malignancies [1]. About 80-85% of all leukemias in adults are characterized as acute myeloid leukemia (AML) according to the French-British-American group [2]. These individuals often develop anemia as the disease progresses [3] alongside chemotherapy depleting the red blood cell (RBC) count further [4]. The anemia characteristics of AML patients is also distinct from those of other cancers [5]. To manage anemic symptoms, these patients are common recipients of blood transfusions. Research has focused on identifying the most effective hemoglobin threshold for RBC transfusions to reduce bleeding and mortality in this patient population [6]. In comparison to, for example, platelet transfusions which are used for emergency events [7], RBC transfusions

are administered often, sometimes for daily symptoms [8] and thus, are more prevalent in AML treatment.

The risks of RBC transfusions include allergic reactions, transfusion reactions, infection, iron overload [9] and consequently may negatively impact QoL. However, certain blood transfusions have been shown to relieve fatigue symptoms [8].

The effects on QoL with respect to AML, specifically, following blood transfusions in patients is not greatly researched [10]. QoL itself is generally an under-reported topic in randomized clinical research and even more so for cancer research [11].

QoL measurement scales extend beyond including only physical symptoms and measures social and psychological (emotional and cognitive) parameters. For instance, in the literature search, a commonly used scale was found to be

the EORTC QLQ-C30 (European Organization for the Research and Treatment of Cancer Quality of Life) scale, surveying physical symptoms, alongside emotional and social aspects [12].

Thus, we seek to conduct a review on the evidence regarding the impact RBC transfusions have on quality of life in adult patients with AML.

Methods

Search Strategy

The protocol used for this study was the PRISMA-ScR (scoping review) guidelines [13], which contains 20 items to follow while conducting a scoping review. The literature search was conducted using the University of Alberta library general database, Web-of-Science, and PubMed databases. The general database extracts sources from 300 commonly used databases. The following keywords were used to find articles: blood transfusions AND quality of life AND acute myeloid leukemia. As well, blood transfusions AND quality of life AND hematological malignancies. The keywords were also rearranged, for example blood transfusions AND acute myeloid leukemia AND quality of life. The search items were limited to the 'scholarly journals'. Literature was restricted to 2015-2025 for all databases used in the paper. The language was selected as 'English' and resources were retrieved from 'All Databases.' All pages of results were reviewed with each combination of keywords. In PubMed, the advanced search tool was used with 'blood transfusions' as the search item and 'acute myeloid leukemia' and 'quality of life' added as queries. The sources were filtered to include 'full text' as the text availability, and the article type as inclusive of the following: review, randomized control trial (RCT), clinical trial and systematic review. The Web of Science Database was accessed through the institution (University of Alberta) with the same time range and the source type was limited to 'Article' and 'Control Trial.' The most recent search was conducted on March 13, 2025.

Source Selection

In the screening process, only titles that included the keywords were considered. We assessed the following criteria:

1. QoL measures inclusive of physical, cognitive and social symptoms
2. Blood transfusions administered as an intervention
3. Acute myeloid leukemia diagnosis
4. AML QoL outcomes separately reported if other cancer types are included
5. Adults

After screening and evaluating eligibility of sources, two studies were included in this review.

Using an electronic database and external source search, 103 citations were included. The titles, keywords, abstract and/or introduction of these sources were read and 90 out of the 103 were excluded. The remaining 13 were investigated further, specifically for which the introduction and full length text was read to evaluate how well they complemented the eligibility parameters. 5 sources were excluded as they did not address specifically acute myeloid leukemia when measuring hematological malignancies. 3 sources were excluded as they did specifically assess red blood cell transfusion under cancer care and 3 others were excluded as they did not address RBC transfusions as an independent variable but measured it alongside QoL. All selected studies were successfully retrieved, amounting to 2 studies for inclusion in this review. The format for the flowchart depicted in [Figure 1](#) detailing methods for selecting the source were also retrieved from the PRISMA-ScR guidelines [13].

Data Items

We collected data on the geographical locations of the studies - for the studies that listed it, the amount of blood transfusion administered, the demographic characteristics of the patient population (age) and the independent and comparative scores on the QoL scales (EORTC scale amongst others). An assumption was made regarding the data was the classification of adults as above 18 years of age.

Data Charting

The data for both sources was jointly charted by two reviewers and confirmation using the full texts of both sources at hand was conducted by one reviewer. Extraction included the objectives and questions each study addressed, authorial information, inclusion and exclusion criteria, information extracted from the QoL tools used in the study. Both reviewers compiled these characteristics individually but all reviewers also collaborated when questions or uncertainties arose. The confirmation of characteristics stated was conducted largely by a third reviewer alongside slight collaboration with the other reviewers.

Critical Appraisal

A critical appraisal was not conducted for this source as hindrances to the credibility of the data is discussed within the paper. Furthermore, the type of data being collected is incompatible with a control group and utilizes biases such as recall bias and selection bias. This lack of a control group and present biases would invalidate the source's credibility if a critical appraisal was conducted. Moreover, the articles are from a reputable source (Journal of Palliative Medicine) ensuring that it was highly reviewed and assessed for quality.

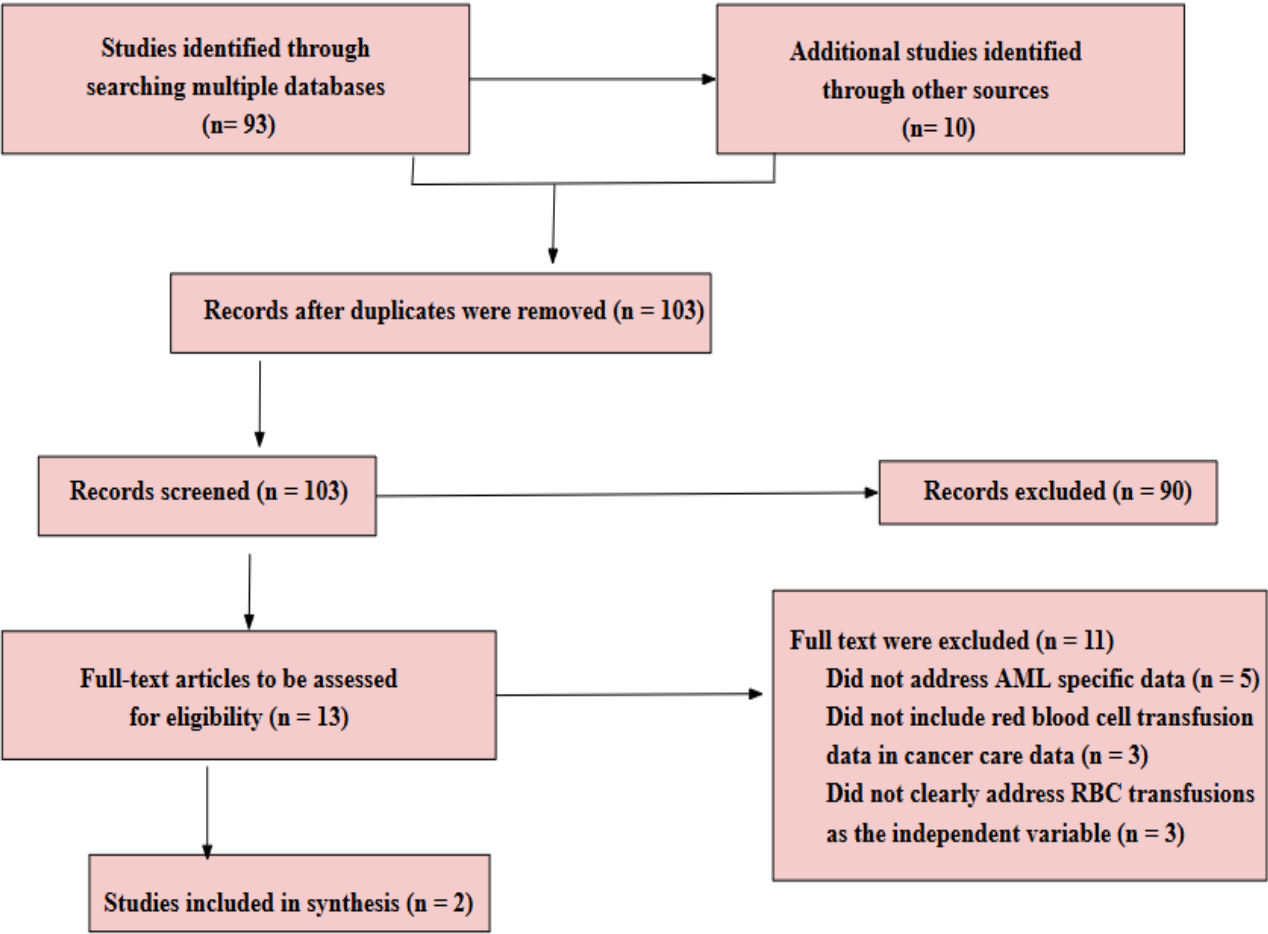


Figure 1. Source Selection Method. Format and structure adapted from example for presenting source selection in PRISMA-ScR guidelines [13]. Figure created using original data and exclusion reasons alongside design modifications by authors in Google Drawings.

Synthesis of Results

The study designs for both sources alongside the settings, patient characteristics were noted. The characteristics of blood transfusion administration, tools used and the details of obtained Quality of life measurements were discussed. This evidence was presented in a narrative format alongside visual representations as tables.

Results

Characteristics of sources

For the first study, which is a systematic review [14], the nature of RBC transfusions administered and what QoL questionnaires were used are presented in [Table 1](#).

The demographics of the surveyed population, study location and setting are described in [Table 1](#) as well and the results corresponding to both restrictive and liberal transfusions are presented in [Table 3](#).

The second study [10] evaluating the nature of RBC transfusions administered and questionnaires used specific to the experimental group is presented in [Table 2](#). The demographics of the surveyed population, study location and setting are described in [Table 2](#) as well and the results corresponding to both restrictive and liberal transfusions are presented in [Table 3](#).

Table 1. Study Setting and Participant Demographics Adapted from Pagano et al. [14]. Created by Authors in Google Documents.

An Analysis of Quality of Life and Functional Outcomes as Reported in Randomized Control Trials for Blood Transfusions	
Study Objective	A systematic review; Presents differences in QoL and functional outcomes between the administration restrictive and liberal RBC transfusion thresholds
Population	Adult patients divided into several groups: Hematological malignancies (unspecified geographics)
Setting	Separate randomized control trials where blood transfusions are administered for the aforementioned groups of patients
AML trials Included	Number = 2 Trial 1 = not to be reported as it is identical to the study in Table 2 . Trial 2 = 43 participants
RBC Transfusions	Restrictive vs Liberal Trial 2 Hb thresholds: 7 g/dL vs 9 g/dL
QoL	Tools Utilized: Trial 2: NCIF Scale, Daily - 60 day period

Table 2. Study Setting and Participant Demographics Adapted from Morton et al. [10]. Created by Authors in Google Documents.

Do liberal thresholds for red cell transfusion result in improved quality of life for patients undergoing intensive chemotherapy for acute myeloid leukemia? A randomized crossover feasibility study	
Study Objective	Clinical trial that aims to assess whether a liberal approach to RBC transfusions improves quality of life among AML patients undergoing intensive chemotherapy
Population	Patients who were studied (UK residents) were categorized by several criteria: Age (>18) Sex (Male or other) Ethnic origin (Caucasian, Asian, Hispanic, Black) Eastern cooperation of oncology group performance status “ECOG” (0-4) Cytogenetic category (Not reported, favourable/ standard/ poor risk) AML presentation (first presentation, relapsed) Hemoglobin (g/L) Platelets (x10 ⁹ /L) White cell count (x10 ⁹ /L) Total RBC units in 8 weeks prior to randomisation Received RBC transfusion prior to randomisation (%)
Setting	75 chemotherapy cycles within 2 blood transfusion cycles between May 2017 and August 2018. Randomised groups alternating between treatment groups
Transfusion cycles Included	Number = 75 Cycle 1 - 75 = 43 participants
RBC Transfusions	Restrictive vs Liberal Restrictive = threshold of 70g/L with a target of 71-80g/L of hemoglobin Liberal= threshold of 90g/L with a target of 91-100 g/L of hemoglobin
QoL	Tools Utilized: EORTC QLQ-C30 and EQ-5D-5L, before, during and after each cycle ECOG score and from EQ 5D-5L, daily

Table 3. Quality of Life Outcomes. Created by authors in Google Documents.

QoL Outcomes			
Author	Article Type	Restrictive Threshold	Liberal Threshold
Pagano et al.	Clinical Trial	Trial 2: 4.8 (4-5.2)	Trial 2: 4.5 (3.6 -5)
Morton et al.	Clinical Trial	Cycle 1: 50 (43.9-69.4) Cycle 2: 51.3 (66-70.2)	Cycle 1: 56 (47.8-66) Cycle 2: 63.2 (69.4-71.3)

Synthesis of results

While the systematic review evaluated a total of 23 Randomized Controlled Trials (RCT's), as mentioned in [Table 1](#) alongside AML trials included, 2 trials pertained to AML and thus [Table 3](#) addressed results specific to the AML trials. Trial 1 was not included as it is identical to the RCT adapted from Morton et. al. to prevent double counting of data, thus only data for Trial 2 was reported in the Tables for the systematic review. The NCIF is the National Cancer Institute Fatigue Scale where a higher score is worse [15]. The NCIF scale is utilized in Trial 2 [18] with the study titled “Red blood cell transfusion triggers in acute leukemia: a randomized pilot study.” This study aims to gauge the feasibility of running a larger scale randomized trial with restrictive and liberal transfusion thresholds upon Adult Acute Leukemia Patients admitted for inpatient myelosuppressive chemotherapy. Fatigue and bleeding were measured as secondary outcomes. Fatigue was measured on a fatigue scale, however, the study itself did not mention fatigue under the guise of Quality of Life. As the eligibility criteria and the keyword search looked for ‘Quality of Life’ specifically within the studies, the abovementioned study could not be independently included. However, the systematic review mentioned the results of both AML trials under the guise of ‘Quality of Life.’ Thus, the data for Trial 2 was reported and discussed solely through the systematic review. The systemic review shows that the data is inconclusive with the presence of only two trials. It is suggested that QoL possibly improves with more liberal thresholds of RBC transfusions.

The clinical trial utilized the random crossover feasibility approach to analyze whether liberal vs restrictive thresholds of RBC transfusions yielded better QoL outcomes. As [Table 2](#) described the intricacies of the trial, [Table 3](#) relayed the results. Three measures (EORTC QLQ-C30, EQ-5D-5L (Euroqol Scale) [16], ECOG (Eastern Cooperative Oncology Group Scale) [17] were condensed in [Table 3](#). The study suggests that there is an increase in quality of life within the liberal group. This increase is even more pronounced among the second cycle which consisted of patients receiving restrictive transfusions first then liberal transfusions.

Discussion

Summary of Evidence

The objective of this scoping review was to evaluate the impact of red blood cell (RBC) transfusions on quality of life (QoL) in adult patients with acute myeloid leukemia (AML). Both studies compared restrictive and liberal hemoglobin

thresholds for RBC transfusions and assessed their associated QoL outcomes. The key concepts examined included hemoglobin thresholds and the use of tools such as the EORTC QLQ-C30, EQ-5D-5L, and the NCIF fatigue scale for QoL assessment. Study 1 - The systematic review on varying transfusion thresholds [14] - examined restrictive and liberal hemoglobin thresholds ranging from 7 g/dL - 9 g/dL as seen in [Table 1](#). Trial 2, using the NCIF scale, found that patients who received restrictive transfusions had a higher average NCIF score (4.8) compared to those who received liberal transfusions (4.5), suggesting a greater impact of fatigue on daily functioning in the restrictive group, as higher NCIF scores are associated with more severe fatigue. Overall, the results suggest that liberal transfusion thresholds may offer modest improvements in physical aspects of QoL, particularly fatigue. Study 2 - Randomized crossover feasibility study [10] - examined restrictive and liberal hemoglobin thresholds. The study used a randomized crossover design and confirmed the feasibility of maintaining distinct transfusion thresholds. It is significant to note that the study assumes the following: reliability and sensitivity of QoL measures to detect differences between two thresholds, that blood transfusions were maintained within the selected ranges, carryover effects are not significant since patients are their own controls. As observed in [Table 2](#), the restrictive threshold is 70 g/L with a target of 71-80 g/L of hemoglobin, and the liberal threshold is 90 g/L with a target of 91-100 g/L of hemoglobin. Though no significant QoL differences were observed, exploratory results observed in [Table 3](#) slightly favored the liberal arm in the second cycle. Fourteen symptom-driven transfusions in the restrictive arm versus none in the liberal suggest improved symptom control with a liberal strategy. However, the liberal group required more transfusions and showed numerically higher complications (culture-verified infections, thrombotic events and grade 3 or 4 bleeding), indicating a potential trade-off. These adverse outcomes suggest that while liberal transfusions may temporarily alleviate symptoms like fatigue, they may also increase patient risk due to transfusion-related complications.

Limitations

Despite using validated QoL tools, both studies primarily emphasized physical symptoms such as fatigue, while not explicitly addressing psychological and social domains of QoL. For instance, the NCIF scale focuses exclusively on fatigue and does not assess emotional well-being, social support, or cognitive function. This highlights a significant gap in the literature—social and psychological

aspects of transfusion impact in AML patients remain underexplored. Another key limitation of this review is the small number of studies identified. Only two eligible studies met the eligibility criteria, reflecting the broader issue of AML being an under-researched condition, particularly in relation to QoL outcomes. In contrast, more extensive literature was found on broader hematological malignancy categories such as myelodysplastic syndromes (MDS). While these conditions share overlapping treatment considerations, their clinical courses differ, justifying the need for AML-specific research.

Conclusions

Overall, findings suggest liberal transfusion strategies may modestly improve physical QoL aspects like fatigue, but evidence is limited by sample size and inconsistent reporting. Larger studies are needed to confirm these effects and to more comprehensively assess emotional, cognitive, and social domains of QoL in AML patients receiving transfusions.

List of Abbreviations

AML: acute myeloid leukemia

QoL: quality of life

RBC transfusion: red blood cell transfusions

MDS: myelodysplastic syndromes

NCIF Scale: National Cancer Institute Fatigue Scale

RCT: randomized control trial

EORTC QLQ-C30: European Organization for Treatment of Cancer (Core Quality of Life Questionnaire)

EQ-5D-5L: Euroqol Scale

Conflicts of Interest

The authors declare that they have no conflicts of interest

Ethics Approval and/or Participant Consent

Ethics approval was not required for this scoping review as only previously published literature was used and original experimentation was not conducted.

Authors' Contributions

AK: Forming the abstract, critical appraisal subsection in the methods section alongside data and synthesis of results for the second study. Also contributed to formatting the final form to be submitted.

SA: Forming the discussion and conclusions section, contributed to confirming data and synthesis of results for both studies, alongside data items and synthesis of results for the methods section.

AZ: Forming the introduction, alongside search items, search strategy, source selection and data charting components of the methods section. As well, contributed to data presentation and synthesis of results for the first included study. Contributed to the final form of the paper. All authors jointly contributed to the formulation of the specific research question and references section, alongside revising the full length of the paper

Acknowledgements

Dimpy Modi - Mentor for the writing and revising Process with and frequent feedback

Funding

This study was not funded.

References

- [1] St. Lezin E, Karafin MS, Bruhn R, Chowdhury D, Qu L, Bialkowski W, et al. Therapeutic impact of red blood cell transfusion on anemic outpatients: the RETRO study. *Transfusion*. 2019 Mar 18. <https://doi.org/10.1111/trf.15249>
- [2] Acute myeloid leukemia [Internet]. [cited 2025 Mar 13]. Available from: <https://www.sciencedirect.com/topics/pharmacology-toxicology-and-pharmaceutical-science/acute-myeloid-leukemia>
- [3] Acute Myeloid Leukemia (AML) [Internet]. Aplastic Anemia & MDS International Foundation. [cited 2025 Mar 13]. Available from: <https://www.aamds.org/diseases/acute-myeloid-leukemia-aml>
- [4] American Cancer Society. Chemotherapy for Acute Myeloid Leukemia (AML) [Internet]. www.cancer.org. 2024. Available from: <https://www.cancer.org/cancer/types/acute-myeloid-leukemia/treating/chemotherapy.html>
- [5] Chen W, Wang H, Hu J. Incidence of myelosuppression in AML is higher compared with that in ALL. *Molecular and Clinical Oncology*. 2024 Oct 18;21(6). <https://doi.org/10.3892/mco.2024.2793>
- [6] Ballo O, Fleckenstein P, Eladly F, Kreisel E, Stratmann J, Seifried E, et al. Reducing the red blood cell transfusion threshold from 8·0 g/dl to 7·0 g/dl in acute myeloid leukaemia patients undergoing induction chemotherapy reduces transfusion rates without adversely affecting patient outcome. *Vox Sanguinis*. 2020 Apr 28;115(7):570-8. <https://doi.org/10.1111/vox.12919>
- [7] Gergi M, Soriano-Pisaturo MA. Palliative Care Issues for Transfusion-Dependent Patients [Internet]. Palliative Care Network of Wisconsin. 2019 March 6. Available from: <https://www.mypcnow.org/fast-fact/palliative-care-issues-for-transfusion-dependent-patients/>
- [8] Bruhn R, Karafin MS, Hilton JF, Kaidarova Z, Spencer BR, Qu L, et al. Early and sustained improvement in fatigue-related quality of life following red blood cell transfusion in outpatients. *Quality of Life Research* [Internet]. 2020 May 7;29(10):2737-44. <http://doi.org/10.1007/s11136-020-02517-2>
- [9] Suddock JT, Crookston KP. Transfusion Reactions [Internet]. National Library of Medicine. StatPearls Publishing; 2023. <https://www.ncbi.nlm.nih.gov/books/NBK482202/>

- [10] Morton S, Sekhar M, Smethurst H, Mora A, Hodge RL, Hudson CL, et al. Do liberal thresholds for red cell transfusion result in improved quality of life for patients undergoing intensive chemotherapy for acute myeloid leukemia? A randomized crossover feasibility study. *Haematologica*. 2022 Feb 24;107(6):1474-8. <http://doi.org/10.3324/haematol.2021.279867>
- [11] Hackshaw A. Modern cancer trials still lack information about QoL impacts on patients. *BMJ Oncology*. 2023 Apr;2(1):e000062. <http://doi.org/10.1136/bmjonc-2023-000062>
- [12] Husson O, Rooij BH, Kieffer J, Oerlemans S, Mols F, Aaronson NK, et al. The EORTC QLQ-C30 Summary Score as Prognostic Factor for Survival of Patients with Cancer in the “Real-World”: Results from the Population-Based PROFILES Registry. *The Oncologist*. 2019 Oct 31;25(4). <http://doi.org/10.1634/theoncologist.2019-0348>
- [13] Tricco AC, Lillie E, Zarin W, O’Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Annals of Internal Medicine*. 2018 Sep 4;169(7):467-73. <http://doi.org/10.7326/m18-0850>
- [14] Pagano MB, Dennis JA, Idemudia OM, Stanworth SJ, Carson JL. An analysis of quality of life and functional outcomes as reported in randomized trials for red cell transfusions. *Transfusion*. 2023 Sep 18;63(11):2032-9. <http://doi.org/10.1111/trf.17540>
- [15] National Cancer Institute. Fatigue (PDQ)—Health Professional Version [Internet]. Cancer.gov; 2017. Available from: <https://www.cancer.gov/about-cancer/treatment/side-effects/fatigue/fatigue-hp-pdq>
- [16] EuroQol. EQ-5D-5L [Internet]. 2009. Available from: <https://euroqol.org/information-and-support/euroqol-instruments/eq-5d-5l/>
- [17] ECOG-ACRIN Cancer Research Group. ECOG Performance Status Scale [Internet]. 2022. Available from: <https://ecog-acrin.org/resources/ecog-performance-status/>
- [18] DeZern AE, Williams K, Zahurak M, Hand W, Stephens RS, King KE, et al. Red blood cell transfusion triggers in acute leukemia: a randomized pilot study. *Transfusion*. 2016 May 20;56(7):1750–7. <https://doi.org/10.1111/trf.13658>

Article Information

Managing Editor: Jeremy Y. Ng

Peer Reviewers: Dimpay Modi, Emily Hartung

Article Dates: Received Apr 18 25; Accepted Jul 14 25; Published Oct 22 25

Citation

Please cite this article as follows:

Zahid A. How do red blood cell transfusions impact quality of life in patients with acute myeloid leukemia: A scoping review. *URNCST Journal*. 2025 Oct 22 25: 9(9). <https://urncst.com/index.php/urncst/article/view/902>

DOI Link: <https://doi.org/10.26685/urncst.902>

Copyright

© Amena Zahid, Abibah Kromah, Suhad Alkhatib. (2025). Published first in the Undergraduate Research in Natural and Clinical Science and Technology (URNCST) Journal. This is an open access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work, first published in the Undergraduate Research in Natural and Clinical Science and Technology (URNCST) Journal, is properly cited. The complete bibliographic information, a link to the original publication on <http://www.urncst.com>, as well as this copyright and license information must be included.



URNCST Journal
“Research in Earnest”

Funded by the
Government
of Canada

Canada

Do you research in earnest? Submit your next undergraduate research article to the URNCST Journal!

| Open Access | Peer-Reviewed | Rapid Turnaround Time | International |

| Broad and Multidisciplinary | Indexed | Innovative | Social Media Promoted |

Pre-submission inquiries? Send us an email at info@urncst.com | [Facebook](#), [X](#) and [LinkedIn](#): @URNCST Submit

YOUR manuscript today at <https://www.urncst.com>!