ISSN: 2469-570X

Virdi RK et al. Int J Stem Cell Res Ther 2025, 11:080
DOI: 10.23937/2469-570X/1410080
Volume 11 | Issue 1
Open Access

International Journal of Stem Cell Research & Therapy

ORIGINAL ARTICLE

Outcomes of Allogeneic Hematopoietic Stem Cell Transplantation in Elderly Patients (≥ 70 Years) with Hematologic Malignancies: A Community Center Experience

Ravjot Kaur Virdi, DO, MPH[1]* and Jacob D. Bitran, MD[2]

[1]*Internal Medicine, Advocate Lutheran General Hospital, USA*

[2]*Hematology & Oncology, Oncology Specialists SC, USA*

***Corresponding author:** Ravjot Kaur Virdi, DO, MPH, Internal Medicine, Advocate Lutheran General Hospital, 1775 Dempster St, Park Ridge, IL 60068, USA, Tel: 847-318-2800, Fax: 847-318-2966

Abstract

Background: Many hematologic malignancies, including leukemia (AML/CML), myelodysplastic syndrome (MDS), and aplastic anemia, predominantly affect older adults. Allogeneic hematopoietic stem cell transplantation (AHSCT) offers a potential cure for intermediate- to high-risk disease. However, it is infrequently offered to patients older than 70 due to concerns about tolerability.

Methods: With advancements in graft-versus-host disease (GVHD) management and reduced-intensity conditioning regimens, we conducted a retrospective study of patients ≥ 70 years of age who underwent AHSCT at Advocate Lutheran General Hospital from 2019 to 2024. A total of 31 patients were identified, with a median age of 72. Among them, 20 had AML/CML, 8 had MDS, and 2 had aplastic anemia.

Results: Relapse-free survival (RFS) rates at 100 days, one year, two years, and three years were 70.71%, 41.67%, 35.26%, and 35.26% respectively. Overall mortality was attributed to three primary causes: sepsis (35%), GVHD (35%), and relapse (30%). The 100-day treatment-related mortality rate was 29%, with causes of death including relapse (3 cases), GVHD (1 case), and sepsis (5 cases). Further analysis of pre-transplant bone marrow pathology, cytogenetics, and molecular genetic risk factors found no significant differences between survivors and non-survivors or among primary causes of death, suggesting that pre-transplant pathological and genetic risk did not significantly influence the causes of mortality seen at our community center.

Conclusions: AHSCT in elderly patients remains a challenge. Further studies are needed to refine patient selection criteria, identify key demographic and oncologic risk factors, and improve outcomes in this population.

Keywords

Allogeneic hematopoietic stem cell transplantation, Acute myeloid leukemia, Chronic myeloid leukemia, Myelodysplastic syndrome, Aplastic anemia

Abbreviations

AML: Acute Myeloid Leukemia; AHSCT: Allogeneic Hematopoietic Stem Cell Transplantation; CIBMTR: Center for International Blood and Marrow Transplant Research; CML: Chronic Myeloid Leukemia; ELN: European Leukemia Net; FISH: Fluorescence in Situ Hybridization; GVHD: Graft-Versus-Host Disease; KPS: Karnofsky Performance Status; MDS: Myelodysplastic Syndrome; NGS: Next-Generation Sequencing; OS: Overall Survival; RFS: Relapse-Free Survival; SEER: Surveillance, Epidemiology, and End Results; WHO: World Health Organization

Introduction

Many hematologic malignancies, including acute myeloid leukemia (AML), chronic myeloid leukemia (CML), myelodysplastic syndrome (MDS), and aplastic anemia, are primarily a disease of the elderly. According to the Surveillance, Epidemiology, and End Results (SEER) program data, leukemia is most frequently diagnosed amongst individuals aged 65-74, with a median age at diagnosis of 67. These cancers tend to be aggressive, with a five-year relative survival rate of 31.9% across all AML patients. However, in patients over 65, the survival rate drops dramatically to just 11.2% [1].

Citation: Virdi RK, Bitran DJ (2025) Outcomes of Allogeneic Hematopoietic Stem Cell Transplantation in Elderly Patients (≥ 70 Years) with Hematologic Malignancies: A Community Center Experience. Int J Stem Cell Res Ther 11:080 doi.org/10.23937/2469-570X/1410080

Accepted: May 02, 2025: **Published:** May 05, 2025

Allogeneic hematopoietic stem cell transplantation (AHSCT) has the potential to cure patients from intermediate-to high-risk disease. However, it is often not pursued in elderly patients due to concerns about increased complication risks, higher prevalence of comorbidities, and presumed reduced tolerance to intensive chemotherapy regimens. The Center for International Blood and Marrow Transplant Research (CIBMTR) 2023 report revealed that amongst all AHSCT recipients in the United States, only 25% were between 65-74 years old, and just 3% were 75 or older [2].

Historically, AHSCT outcomes in patients over 65 have been poor. Prior studies estimate 100-day treatment related mortality rates between 10-20% [3,4]. The three-year overall survival rate is approximately 30% [3,5]. According to CIBMTR data from 2012-2022 in the United States, the primary cause of death within 100 days of transplant included infection (25%), organ failure (24%), primary disease relapse (23%), and graft-versus-host disease (GVHD) (15%). Beyond 100 days, relapse becomes the leading cause of mortality (47%), followed by infection (15%), GVHD (13%), and organ failure (12%) [2].

With advancements in acute and chronic GVHD management and the increased use of reduced-intensity conditioning regimens, which are better tolerated in older adults, we conducted a retrospective study of patients aged 70 years or older who underwent AHSCT at Advocate Lutheran General Hospital (ALGH) from 2019 to 2024.

This study aimed to evaluate relapse-free survival (RFS) and overall survival (OS) at 100 days, one year, two years, and three years. In addition, we identified 100-day treatment-related mortality and the primary causes of death at our community-based transplant center. Given limited data on AHSCT outcomes in patients over 70, this study aims to provide insight into real-world transplantation experiences in a community setting. Our goal is to contribute to the growing body of research on AHSCT in elderly patients, ultimately helping refine patient selection criteria and improve outcomes in this high-risk population.

Materials & Methods

We conducted a retrospective analysis to investigate the outcomes of patients aged 70 years or older who underwent AHSCT at our institution. Eligibility criteria included patients who received a bone marrow transplant between January 1, 2019 and December 31, 2024, and were at least 70 years old at the time of transplantation. Patients lost to follow up were excluded, as their outcomes could not be accurately assessed.

RFS and OS were calculated using Kaplan-Meier actuarial survival curves. Per the National Cancer Institute, RFS is defined as the duration from the completion of treatment to the absence of any signs or symptoms of cancer recurrence. OS is defined as the length of time from the initiation of treatment to patient survival, regardless of disease status.

In addition to survival outcomes, 100-day treatment-related mortality rate and overall causes of mortality were identified. Pre-transplant bone marrow pathology, chromosome analysis, fluorescence in situ hybridization (FISH), and next-generation sequencing (NGS) were also analyzed. Each patient's risk score was classified according to the 2022 World Health Organization (WHO) and European Leukemia Net (ELN) guidelines for favorable, intermediate, and adverse risk categories. Statistical analysis, including unpaired t-test and one-way ANOVA, were performed to assess whether differences in average risk scores between patient groups were statistically significant.

Results

Patient characteristics

A total of 31 patients who underwent AHSCT at our institution between 2019 and 2024 were included in this study. The cohort consisted of 19 men and 12 women, with ages ranging from 70 to 79 (median age: 72). The underlying diagnoses included AML/CML in 20 patients, MDS in 8 patients, and aplastic anemia in 2 patients.

Pre-transplant conditioning regimens varied among patients: 10 received Busulfan/Fludarabine/Cyclophosphamide, 12 received Busulfan/Fludarabine/Anti-Thymocyte Globulin, 7 received Busulfan/Fludarabine/Post-Cyclophosphamide, and 2 received Busulfan/Fludarabine/Thiotepa.

To assess baseline functional status, the 30-day pre-transplant Karnofsky performance status (KPS) was calculated for all patients. KPS is a widely used oncologic metric that evaluates a patient's ability to tolerate chemotherapy and predicts outcomes based on baseline functional capacity. Lower scores correlate with poorer overall predicted survival [6]. The average KPS score in this cohort was 75%, with a range of 60-90%.

Survival outcomes

Of the 31 patients included in this study, 11 remained alive, while 20 had passed away by December 31, 2024. As shown in figure 1, the RFS rate at 100 days was 70.71%, at one year was 41.67%, at two years was 35.26%, and at three years was 35.26%.

Similarly, the OS rate at 100 days was 70.97% (22/31 patients alive), one year was 41.94% (13/31 patients alive), two years was 35.48% (11/31 patients alive), and three years was 35.48% (11/31 patients alive).

Post-transplant mortality

There were three primary causes of death identified following AHSCT. Of the 20 patients who passed away, 30% (six patients) were due to disease relapse, 35% (seven patients) were due to GVHD, and 35% (seven patients) were due to sepsis.

A total of nine deaths occurred within the first 100 days post-transplant, resulting in a 100-day treatment related mortality rate of 29%. Of these early deaths, three were attributed to relapse, one was due to GVHD, and five were caused by sepsis.

Impact of pre-transplant cytogenetics and molecular genetics on outcomes

Pre-transplant cytogenetics and molecular genetic abnormalities are established prognostic factors in patients undergoing AHSCT. High-risk genetics and the presence of measurable residual disease prior to transplantation are associated with poorer outcomes [5].

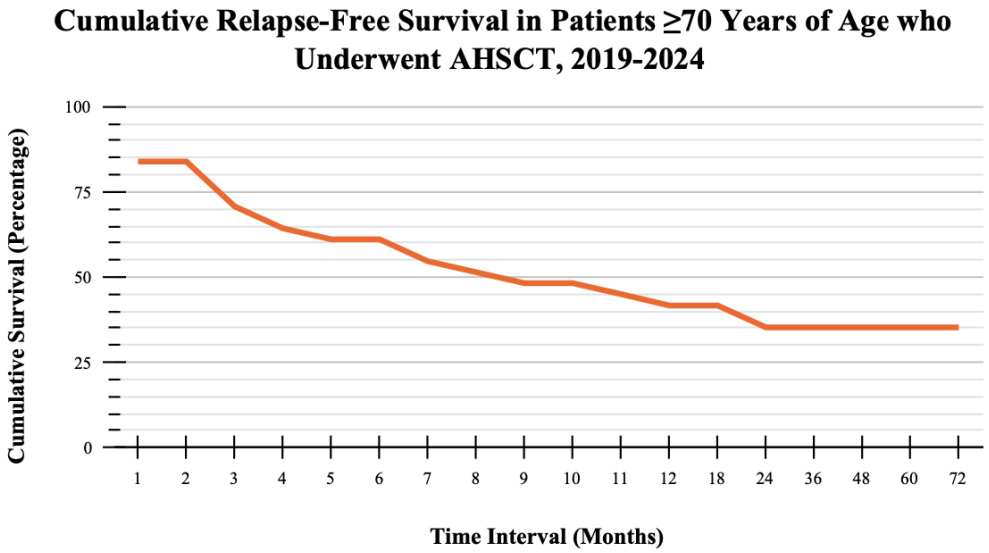

Figure 1: Kaplan-Meier actuarial survival curve depicting cumulative relapse-free survival.

To assess the impact of pre-transplant risk factors, we analyzed bone marrow pathology, chromosome analysis, FISH, and NGS for all patients. A risk score was assigned to each patient based on these findings. The average risk score of the 11 surviving patients was compared to that of the 20 deceased patients. An unpaired t-test was performed, resulting with a p-value of 0.3804 (CI -1.63 to 0.64). This indicated no statistically significant difference in pre-transplant pathological or genetic risk between survivors and non-survivors.

Similarly, we compared average patient risk scores across the three primary causes of death: relapse, GVHD, and infection. A one-way ANOVA revealed no significant differences in average risk scores among these groups ($F(1.5452, 49.4048) = 0.2659$, $p = 0.7697$), suggesting that pre-transplant pathological and genetic risk did not significantly influence the causes of mortality seen at our community center.

Discussion

In our retrospective analysis of 31 patients with intermediate- to high-risk hematologic malignancies that underwent AHSCT, the three-year RFS was 35.26%, and the OS was 35.48%. These survival outcomes are consistent with findings from prior systematic reviews and meta-analyses.

Post-transplant mortality at our institution mirrored trends observed in CIBMTR data from 2012-2022, with the leading causes of death being sepsis, GVHD, and disease relapse. However, our 100-day mortality rate of 29% exceeded the 10-20% range reported in previous studies. The predominant cause of early mortality was sepsis, accounting for five of the nine early deaths. This highlights a potential area for improvement in post-transplant supportive care, particularly infection prevention strategies at the community level.

Notably, there were no significant differences in pre-transplant bone marrow pathology, cytogenetic profiles, and molecular genetic risk when comparing survivors, non-survivors, and primary causes of death.

Study strengths and limitations

A key strength of this study is its inclusion of a diverse cohort of elderly patients with coexisting comorbidities. In addition, a review of existing literature reveals that few studies have specifically examined AHSCT outcomes in patients over 70 years of age. Several limitations must also be acknowledged. Our sample size was limited, as we are reporting from a single community center regarding a procedure that is infrequently offered to patients over 70. Additionally, not all cytogenetic and molecular genetic data were available for every patient, making it difficult to draw definitive conclusions regarding pre-transplant risk stratification.

Conclusions

In conclusion, our retrospective analysis of 31 patients aged 70 and older who underwent AHSCT revealed a three-year OS rate of 35.48%, aligning with findings from previous studies. Post-transplant mortality was primarily attributed to sepsis (35%), GVHD (35%), and disease relapse (30%).

While AHSCT in elderly patients presents significant challenges, age alone should not be the determining factor in assessing transplant eligibility. Research has demonstrated that AHSCT remains a viable treatment option for older adults, particularly with advancements in conditioning regimens and supportive care. Further studies are needed to better define patient selection criteria, identify key demographic and oncologic risk factors, and refine predictive models to optimize outcomes in this population.

Conflict of Interest & Funding Disclosure

None of the authors have any conflicts of interest to disclose related to this study. The authors declare that this research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Statement of Author Contribution

The above-listed authors contributed equally to this work.

References

1. National Cancer Institute 2023 Cancer stat facts: Leukemia. Surveillance, Epidemiology, and End Results Program.
2. Cusatis R, Litovich C, Feng Z, Allbee Johnson M, Kapfhammer M, et al. (2024) Current trends and outcomes in cellular therapy activity in the United States, including prospective patient reported outcomes data collection within the CIBMTR registry. Transplant Cell Ther 30: 917. e1-917.e12.
3. Hsu J, Chen Z, Shore T, Gergis U, Mayer S, et al. (2020) Outcomes of allogeneic stem cell transplant for elderly patients with hematologic malignancies. Biol Blood Marrow Transplant 26: 789-797.
4. Veltri L, Rezvani K, Oran B, Mehta R, Rondon G, et al. (2019) Allotransplants for patients 65 years or older with high-risk acute myeloid leukemia. Biol Blood Marrow Transplant 25: 505-514.
5. Rashidi A, Ebadi M, Colditz GA, DiPersio JF (2015) Allogeneic stem cell transplantation outcomes in elderly patients with acute myeloid leukemia: A systematic review and meta-analysis. Clin Lymphoma Myeloma Leuk 15: S9-S10.
6. Crooks V, Waller S, Smith T, Hahn TJ (1991) The use of the Karnofsky performance scale in determining outcomes and risk in geriatric outpatients. J Gerontol 46: 139-144.