

The Racial Bias of Cancer Treatment Through the Lens of Hematopoietic Cell Transplantation
Access Disparities

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Given the specialized vocabulary of the medical system, the definitions are appearing before the literature review.

Term	Definition
Hematopoietic Cell Transplantation	The replacement of stem cells derived from bone marrow
Bone Marrow	The spongy, soft center of larger bones
Autologous Transplantation	Cells transplanted from another part of the individual's own body
Allogeneic Transplantation	Cells transplanted from a donor whose HCT graft is matched to the recipient
Malignant Diseases	A term used to describe cancer's uncontrollable growth of cells that spread to other systems of the body
Non-Malignant Diseases	A tumor that does not spread to other parts of the body (not cancer)

Introduction

Hematopoietic Cell Transplantation (HCT) is the infusion of healthy stem cells into damaged bone marrow-derived cells (Copelan, 2006). Originally developed 50 years ago, it has since advanced to treat both malignant and non-malignant diseases. The transplantation requires cells either from the patient themselves (autologous) or genetically matched cells from a donor (allogeneic). In recent years, HCT has been primarily used to treat various types of cancer, including leukemia, lymphoma, melanoma, and other immune system diseases (Stem Cell Transplant, 2013). With global demographics indicating that by 2025 there will be more than 20 million cancer cases annually, HCT is increasingly crucial in cancer care (Zugazagoitia et al., 2016). While various therapies within the medical field have increased survival rates, today's

treatments carry significant long-term effects (Cross & Burmester, 2006). In investigating alternative therapies such as bone marrow transplantation, the United States has attempted to cure a greater proportion of the population. However, upon evaluation, it becomes evident that the nature of this method produces a population gap that reinforces instilled racial disparities. This is a relevant issue because, without systemic change, minority ethnicities and races will continue to experience inferior healthcare. These disparities only add to the already existing systemic bias in medical care (Bowser & Bowser, 2000). Thus, evaluating the specific biases and their root causes is crucial in reducing inequities.

Literature Review

Disparities in Medical Care

Racial disparity has historically been highly prevalent among recipients of cancer treatment (Barker et al., 2010). Death rates are higher for certain minority ethnicities, stemming from various factors (Majhail et al., 2011). The United States has historically experienced race as a "social determinant of health" (Majhail, 2011). Additionally, the medical system was built on studies centered around the white European population (Majhail, 2011). Moreover, even if healthcare access and socioeconomic status were held constant, minorities would still receive poorer medical care (Majhail, 2011).

Cancer Bias

The cancer treatment field reflects these same inequities among minority populations (Barker et al., 2010). Evidence highlights that minorities experience a disproportionate number of cancer deaths (Shavers, 2002).

Mortality Rates

Disproportionate mortality rates among ethnicities have previously been attributed to minority populations having less access to effective procedures (Landry, 2021). HCT is highly reputable in cancer treatment; however, it reflects this same phenomenon.

The National Library of Medicine compiles studies that evaluate Asian, Hispanic, and Black ethnicities through data targeting multiple factors of bias. Major conclusions highlight that minorities face a potential discouragement of donors, treatment and transplant failure, and stigmatization from medical professionals (Landry, 2021). The lesser availability of donors can partially explain the elevated mortality rates.

Through the lens of bone marrow cell transplantation, this review investigates the possible barriers that minority races encounter in cancer care. This study is relevant because it examines methods of cancer treatment and different approaches to combating disparities in the treatment process. It is important to analyze this inherently biased treatment to uncover the larger issue that the cancer system ultimately favors certain races.

Hematopoietic Cell Transplantation (HCT) Disparities

Through the lens of HCT, it becomes possible to identify deeply rooted implicit disparity. It is the process by which healthy bone marrow stem cells are transplanted to replace unhealthy

cells that are potentially infected or diseased (Landry, 2021). There are two major types of stem cell transplantation, both of which exhibit racial bias.

Autologous Transplantation

Autologous transplantations use cells that come from the patient's own body. This type is used in cancer treatment after the individual has undergone intensive chemotherapy. Because chemotherapy damages stem cells, doctors perform autologous transplants to remove healthy bone marrow before treatment begins. The cells are then returned to the body after chemotherapy to promote the reproduction of healthy stem cells (Stem Cell Transplant, 2013).

Bias

Autologous transplantations have also been found to exhibit disparities. A study covering 27.8% of the entire U.S. population represents every minority group (Costa, Huang, & Hari, 2015). In addition to utilizing data from previous autologous transplantation studies, the study collected information on age, race, and sex. By multiplying the results by a correction factor, the data drew conclusions on the transplantations performed on specific ethnic populations. An in-depth analysis summarizes findings on the effect of race and ethnicity on autologous transplantation outcomes. A racial barrier prevented one in seven patients from receiving the transplantation. Among Hispanics and Asians, approximately half of the potential procedures were unable to occur because of access disparities. The findings also suggest that transplantation serves as a surrogate for tertiary treatments. Thus, the same barriers that prevent minorities from accessing transplantations are also preventing access to other clinical trials, advanced supportive care, novel agents, and expert

consultations — all of which reinforce the greater issue of systemic inequity (Costa, Huang, & Hari, 2015).

Factors

Procedural choices in HCT involve a variety of intertwined factors that may help explain the observed disparities. One such factor is biological — specifically, variability in response to therapy or natural disease history. Patient-level factors are also highly influential and include healthcare-level considerations such as the care process (Costa, Huang, & Hari, 2015).

Patient-Level Factors

Within the care process, patient-level factors include discrimination-related considerations. These consist of provider attitudes and minority biases, preconceived notions regarding minority health and behavior, and greater clinical uncertainty regarding symptoms of minority patients (Costa, Huang, & Hari, 2015).

These factors should ideally represent the only considerations in HCT treatment that detrimentally affect outcomes by race. However, disparities persist in both autologous and allogeneic transplantation.

Under-Utilization

Thomas Joshua, from the University of Georgia, holds a Ph.D. in epidemiology and researches health outcomes among minority populations and immigrants. He published a study that uncovers a key root of autologous HCT bias, examining Multiple Myeloma (MM) and autologous transplantations among both white and Black patients. After a five-year study period,

it was found that while MM is twice as common in Black patients, white patients had 72% higher odds of receiving the transplantation. These lower rates suggest that the disparity is highly correlated with underutilization (Joshua et al., 2010).

Allogeneic Transplantation

Allogeneic transplants use stem cells from another person, called the donor. The patient must be matched with a donor based on their HLA type through various blood tests. The donor's cells are administered to the patient after therapy takes place (Stem Cell Transplant, 2013). A large imbalance exists in the access that minority patients have to a suitable HLA match.

HLA Matching

HLA pairing is based on the histocompatibility complex and the genes linked to chromosomes inherited from haploid pairs. The bone marrow transplantation must be matched to the sibling gene pair when transplanted, or the allografts are likely to be rejected and complications may arise. Patients are matched with donors within the donor registry (Copelan, 2006).

Limited Access

Specific racial and ethnic populations are found to lack access to a disproportionately small number of suitable donors.

Donor Registry

Donors are chosen from the National Marrow Donor Program (NMDP), which has approximately 9 million donors. However, the central issue stems from the lack of diversity in the

donor pool. Navneet Majhail, a researcher in the Department of Medicine, focuses his work on complications of bone marrow transplantation and the policy issues that involve quality of care and disparities within it. His findings explain the issues that result from a lack of donor diversity. White individuals constitute 74% of this donor registry, while Hispanic donors represent 10%, and Black and Asian donors represent 7% each (Majhail, 2011). Because recipients of HCT are more likely to match with a donor of the same race and ethnicity, this underrepresentation creates deeply rooted access disparities. The calculated probability that a white patient will find a match is 0.93, compared to 0.82 for Hispanics, 0.77 for Asians, and 0.58 for Black patients (Majhail, 2011). A corroborating source confirms that 19% of Asian patients, 8% of African patients, and 21% of white Hispanic patients did not receive a suitable graft. While the NMDP has attempted to diversify the donor pool, additional obstacles arose when certain populations were discouraged from becoming donors (Barker et al., 2010).

Discouragement of Donors

The National Marrow Donor Program (NMDP) continues to encounter difficulty matching donors for racial and ethnic minorities. In a study attempting to increase donor registration among minority groups, cultural and psychological barriers were found to prevent people from joining the registry (Switzer et al., 2013).

Limited Allogeneic Transplantations

A study comparing the accessibility of both unrelated donor (URD) allogeneic and cord blood (CB) transplantations examined the rate of transplantation for each within different population subgroups. It was immediately evident that the recipients of transplants were

predominantly of European ancestry. While different European ancestries received an average 65% chance of receiving a 10/10 graft, other races witnessed markedly different results. African patients were only 14% likely to receive a graft, and white Hispanic patients were 40% likely. The rate of transplantation was significantly lower for those not of European ancestry. These findings are important because they demonstrate that racial bias does not only affect cancer treatment broadly — there are structural barriers that explicitly prevent certain populations from accessing care. This unavoidable pattern of minority races and ethnicities experiencing injustice in cancer treatment is deeply rooted within the procedures themselves and will not be reduced unless meaningful changes are made to the treatment process.

Conclusion

Summarizing the findings of the literature, it becomes clear that there are unavoidable barriers that minority populations face. Through historic bias and multifactorial accessibility disparities, a significant population gap exists in access to transplantation. On a larger level, hematopoietic cell transplantation serves as a lens that ultimately reveals the implicit bias within cancer treatment and the medical system. Further research should evaluate alternative methods of cancer treatment that do not carry the same allogeneic and autologous inequities that HCT reflects. This study is relevant because, in decreasing disparities within individual treatments, it becomes possible to address the root of instilled systemic bias.

References

- Barker, J. N., Byam, C. E., Kernan, N. A., Lee, S. S., Hawkins, D. S., Tallman, M. S., & Kernan, N. A. (2010). Availability of cord blood extends allogeneic hematopoietic stem cell transplantation to racial and ethnic minorities. *Biology of Blood and Marrow Transplantation*, 16(11), 1541-1548.
- Bowser, R., & Bowser, R. (2000). Race as a proxy for drug bias. *Food and Drug Law Journal*, 55(3), 385-399.
- Copelan, E. A. (2006). Hematopoietic stem-cell transplantation. *New England Journal of Medicine*, 354(17), 1813-1826. <https://doi.org/10.1056/NEJMra052638>
- Costa, L. J., Huang, J. X., & Hari, P. N. (2015). Disparities in utilization of autologous hematopoietic cell transplantation for treatment of multiple myeloma. *Biology of Blood and Marrow Transplantation*, 21(4), 701-706.
- Cross, M., & Burmester, G. R. (2006). Gene therapy for rheumatoid arthritis: Prospects and unresolved issues. *BioDrugs*, 20(1), 19-29.
- Joshua, T. V., Rizzo, J. D., Zhang, M. J., Tobai, H., Diaz, M. A., Ballen, K., ... & Pasquini, M. C. (2010). Access to hematopoietic stem cell transplantation: Effect of race and sex. *Cancer*, 116(14), 3469-3476.
- Landry, C. (2021). Racial disparities in hematopoietic cell transplantation in the United States. *Current Hematologic Malignancy Reports*, 16(4), 321-331.
- Majhail, N. S., Nayyar, S., Santibañez, M. E. B., Murphy, E. A., & Denzen, E. M. (2011). Racial disparities in hematopoietic cell transplantation in the United States. *Bone Marrow Transplantation*, 47(11), 1385-1392.

Shavers, V. L. (2002). Racial/ethnic variation in the anatomy of cancer mortality: Cancer stage, tumor biology, and health behaviors. *Preventive Medicine*, 34(6), 647-654.

Stem Cell Transplant. (2013). American Cancer Society.

<https://www.cancer.org/cancer/managing-cancer/treatment-types/stem-cell-transplant.html>

Switzer, G. E., Bruce, J. G., Myaskovsky, L., DiMatteo, S., Shellmer, D., Defenbaugh, N., ... & Confer, D. L. (2013). Race and ethnicity in decisions about unrelated hematopoietic stem cell donation. *Blood*, 121(8), 1469-1476.

Zugazagoitia, J., Guedes, C., Ponce, S., Ferrer, I., Molina-Pinelo, S., & Paz-Ares, L. (2016). Current challenges in cancer treatment. *Clinical Therapeutics*, 38(7), 1551-1566.