

Acute Myeloid Leukemia

Taylor Mullin^{1*} and Katheryn R Fernandez²

¹Adjunct Faculty, School of Nursing, Capital University, One College and Main, Battelle Hall, Bexley, Ohio, USA

²Associate Professor, School of Nursing, Capital University, Battelle Hall, One College and Main, Bexley, Ohio, USA

***Corresponding Author:** Taylor Mullin, Adjunct Faculty, School of Nursing, Capital University, One College and Main, Battelle Hall, Bexley, Ohio, USA.

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Abstract

Acute myeloid leukemia is the most common form of acute leukemia among the adult population and is responsible for the largest number of deaths due to leukemia per year in the United States. The American Cancer Society's estimates for leukemia in the United States for 2019 are "About 61,780 new cases of leukemia and 22,840 deaths from leukemia, about 21,450 new cases of acute myeloid leukemia, most will be in adults, and about 10,920 deaths from AML will occur" (Kadia 2018). With a high mortality rate, researchers are working on new clinically focused research to aide in the development of new evidence-based practice that helps form the best treatment and therapy for patients with acute myeloid leukemia. With cancer being one of the leading causes of death among humans in the United States, it is key to work towards finding a cure for this type of leukemia. With the help of researchers, the best treatment option for Acute Myeloid Leukemia can be found.

Keywords: *Acute Myeloid Leukemia; Acute Myeloid Leukemia and Bone Marrow Transplant; Acute Myeloid Leukemia and Bone Marrow Transplant or Stem Cell Transplant; Treatment for Acute Myeloid Leukemia, Oncology; Patient Outcomes*

Introduction

Acute Myeloid Leukemia is one of the leading causes of death among adults and the elderly population in the United States (American Cancer Society, 2018). Leukemias are classified as cancers that start in the cells that normally develop into the different blood cells within the body. This specific leukemia starts in the bone marrow where it spreads to the blood cells outside and throughout the body. Myeloid cells develop into red blood cells, white blood cells, or platelets which show up as abnormal cells when screening for AML [1]. Acute myeloid leukemia is known as an "older adult cancer" which effects patients 60 years of age and older. The American Cancer Society (2018) stated that AML is uncommon prior to the age of 45 and the average age of diagnosis is 68 years of age. Acute Myeloid Leukemia are caused by both inherited genes and acquired gene changes. DNA mutations from different generations can cause AML, as receiving chemotherapy at an earlier time for another cancer can cause AML in the future. Risk factors for AML include getting older, being male, being exposed to chemicals such as benzene and formaldehyde, smoking, chemotherapy exposure from another cancer, radiation exposure, blood disorders such as thrombocytopenia, and having a family history of acute myeloid leukemia [2].

With AML, it can be caught very early or very late in the cancer process. "Symptoms cause low blood cells numbers, anemia, high white blood cell counts with no infection, fatigue, weight loss, loss of appetite, night sweats, leukostasis, bone or joint pain, abdomen swelling, and bleeding and clotting problems" (American Cancer Society, 2018). When AML is caught after metastasis, symptoms include enlarged

lymph nodes, seizures, headaches, vomiting, trouble with balance, kidney failure, and weakness. Gene testing in AML is key due to the different subtypes and the treatment of each. Medical research and literature states there is the question “Is bone marrow transplant or stem cell transplant a better option”? With these 2 treatments comes therapies to go along with them. Intensive chemotherapy is done prior to talks of stem cell versus bone marrow transplants, as the leukemia cells must become as low as possible prior to transplant. A bone marrow biopsy is done after chemotherapy or target therapy to see if there is 5% or less of myeloid cells making taking up the space of normal bone marrow cells [3]. The course of treatment is long and not always promising. Acute Myeloid Leukemia has one of the highest leukemia mortalities rates among the adult population. Nursing care is key for the AML patient receiving treatment. Mortality rates tend to be lower for the patient with the focus on patient care and for those they receive the recommended treatment. Nursing care includes administering the chemotherapy needed before stem cell transplant or a bone marrow transplant, monitoring vitals as to watch if the patient were to have a decrease in condition that can hinder treatment options and provide emotional support for the patient. Not only is the treatment a big deal for the patient and the family, but the mental health of the patient and the family is equally important for nursing considerations. Quality of life for these particular patients can be both positive and negative depending on the demographics and the immune systems response to treatment.

Purpose of the Study

The purpose of this evidence-based project was to show awareness of the evidence-based practice revolving around the acute myeloid leukemia patient and what the best treatment option can be for the patient population.

Methods

A literature review of ten articles was performed for Acute Myeloid Leukemia. The articles were retrieved from CINAHL, Google Scholar, Cochrane Library, and information from the American Cancer Society. Search items and terms included Acute Myeloid Leukemia, Acute Myeloid Leukemia and Bone Marrow Transplant, Acute Myeloid Leukemia and Bone Marrow Transplant or Stem cell transplant, and Treatment for Acute Myeloid Leukemia. Relevance to studies was determined after obtaining statistical information and research from articles. One retrospective single center study, three narrative review series of treatment and diagnosis of acute myeloid leukemia, one clinical trial, two meta-analysis, one decision analysis charting system, one review on bone marrow transplant, and one CIBMTR observational registry study that comes from the National Marrow Donor program research organization that is apart of the registry for cancer research trials. All of the articles looked into Acute Myeloid Leukemia and the treatment options associated with the cancer diagnosis.

Literature Review

A meta-analysis study was done that evaluated chemotherapy treatment options with the granulocyte colony-stimulating factor (G-CSF) for the patient in hopes of receiving a stem cell transplant. The study included survival rate and disease recurrence in the AML patient. Overall survival of the AML patient showed significant improvement ($p = .019$) and disease-free survival ($p = .002$) for the patient receiving G-CSF. This analysis studied 5,076 patients; 2,466 in the G-CSF positive group and 2,610 in the non-G-CSF group. The results of the meta-analysis concluded that patients who did not receive the G-CSF will have a lower survival rate with high risk of stem cell transplant failure. The second meta-analysis study focused on AML in the elderly patient over 60 years of age that received allogeneic stem cell transplant. The study was conducted on 749 patients and showed that the outcomes for AML in the elderly receiving stem cell transplants has poor estimates and were sporadically reported. Rashidi's (2016) meta-analysis study allogeneic stem cell transplantation in elderly patient with AML concluded the following: “A total of 14 reports were studied in detail. All but 2 studies were retrospective and 6 multicenter. All studies were single-arms studies; 13 used RI and 1 used MA conditioning. Because only 1 study used MA conditioning, this study was not analyzed. The included studies had a total of 749 eligible patients. The sample size ranged between 6 and 195. The proportion of patient with poor-risk cytogenetics ranged between 6% and 29%. Eleven studies scored 2, and 3 studies scored 1. The pooled estimates for RFS at 6 months, 1 year, 2 years, and 3 years were 62%, 47%, 44%, and 35%”.

A retrospective single center descriptive study analyzed and evaluated data from patient with AML who underwent the first allogeneic stem cell transplant from 2006 to 2016. During this study, the patient was at a median of 53 years old with representation of more men than women. Scheich's [4] study found the following: "Regarding the characteristics of the underlying AML, 176 of 264 patients (66.7%) had *de novo* AML, 35 of 264 (13.3%) had AML blasts with favorable-risk cytogenetics and 57 of 264 (21.6%) had adverse-risk cytogenetics according to the ELN 2010 classifications. Almost one-half of patients (111 of 264; 42%) underwent transplantation while their AML was active, 123 of 264 (46.6%) underwent transplantation in first complete remission (CR) and 30 of 264 (11.4%) underwent transplantation in second or later CR".

This study later showed that the outcome was favored for the AML patient undergoing an allogeneic stem cell transplant.

The CIBMTR observational registry study focused on the comparison of the clinical outcomes and factors that were associated with survival rates among AML patients who diagnosis relapsed after Allogeneic Hematopoietic cell transplantation. This study researched 1,788 AML patients from 1990 to 2010. This study explains that Allogeneic hematopoietic transplantation is a potentially curative treatment option for AML patients. The observational study showed that this treatment option accounted for 40% of relapsed AML with a decreased survival rate in 20% of the patients. Out of the 1,788 patients, 413 survived greater than one year after relapse. The decision analysis study addressed which transportation procedure should be prioritized with acute myeloid leukemia harboring high or immediate risk for relapse using donor umbilical cord blood units. In this analysis, the study had 3 main sources which included three phase III clinical trials for a chemotherapy cohort (n = 907) and the data from the registry that was collected (n = 752). Results from the decision analysis showed that immediate umbilical cord blood transplantation is a better transplant option for the Acute myeloid leukemia patient [5].

"Genomic Classification and Prognosis in Acute Myeloid Leukemia" is a clinical trial study that enrolled 1,540 patients in three different trials of intensive therapy that combined treatment options. The goal of the study was to identify subtypes and subgroups of AML and how to treat them accordingly. It revealed that AML has multiple distinct molecular subgroups that can determine better clinical outcomes with use of certain treatment options and prognosis. A review on bone marrow transplant was done on AML patients to find a conclusion whether or not this is a good treatment option. The study focused on adults aged 65-70 that received bone marrow transplant for AML diagnosis. The concluding information showed that interactions between leukemia cells and the bone marrow niche influence hematopoiesis, leukemogenesis, and chemotherapy resistance require more of an ongoing study.

Results and Discussion

Each of the ten articles focused on Acute Myeloid Leukemia and discussed stem cell transplant versus bone marrow transplant as the best treatment options. The literature reviewed showed that stem cell transplant has a higher survival rate and lower relapse occurrence than a bone marrow transplant option. With all the different types of research pathways taken, positive and negative effects were shown in all ten articles in regards to the treatment options for this disease. As stated in the research, bone marrow transplant option is a treatment of the past with stem cell transplant leading the way to higher survival rates in the adult and elderly populations. Stem cell transplant is used in conjunction with chemotherapies, targeted therapy drugs, non-chemo drugs, surgery, and radiation therapy. Higher survival and lower relapse and mortality rates are linked to adjunct therapies used in combination with the stem cell therapy. Allogeneic, stem cells from another person and autologous, stem cells from self are the two options offered for stem cell transplant. Allogeneic stem cells have the most research and evidence base on why or why not they should be used for AML, as autologous has slim to no research as it is not favored to use own stem cells with a patient with the active AML disease.

Research has shown that graft-versus-host or graft-versus-leukemia becomes a large issue and raises the mortality rate for AML. In graft-versus-host, the body receives the new stem cells and as the immune system comes in contact with them it is viewed as a foreign body and the immune system begins to attack them. When this effect occurs, it is common for the patient to become very ill and lose all

other options for treatment. With autologous transplants, the research is low but the current research shows patients tolerate receiving their own cells, but adjunct chemotherapy causes side effects that are not suitable for the patient causing major health problems. With the elderly patient, the research has shown AML is very difficult to treat. Patient's over 60 years of age have comorbidities that increase the risk for graft-versus-host and major side effects to the adjunct therapies used. Immune systems in the elderly also decrease as age increases, causing them to not qualify for recommended treatment options for AML.

After review of all the articles, there still remains to be stipulations to all treatment options. Not only does the immune system of the patient effect the treatment options, but included with treatment option considerations comes age, gender, stage of the acute myeloid leukemia disease in the body, and ethnicity. Each research type varied in age groups and gender, but came to the same conclusion that stem cell transplantation was the best choice for the AML patient. As with every stem cell transplant comes the side effects and possible adverse effects that were not covered in most of the studies reviewed. The literature reviewed has high evidence that can be used to make a clinical recommendation to oncology clinicians and cancer patients that stem cell transplantation is the best and safest option over a bone marrow transplant for a variety of patients. Strengths from the literature reviews were detailed result sections showing in depth statistical data supporting the study and multiple participants in each group of studies. Limitations and weakness shown were not much information about bone marrow transplant and stem cell transplant itself, only the results from patients involved in the study.

Recommendations

The recommendation based on the literature review is the choice of stem cell transplantation for the acute myeloid leukemia patient over bone marrow transplants. Many hospitals around the United States lack communication and information in regards to cancer diagnosis. With Acute Myeloid Leukemia, many hospitals and providers leave a gray area as to what the next step is in treating this disease. Pamphlets, PowerPoints, and informational sessions can be used to help for the patient's and families to better understand AML. Many older adults diagnosed with AML do not know all the treatment options out there, meaning they don't have the options that should be given to all patients with the disease. Patient's should be shown the research done for treatment options along with bone marrow transplant versus stem cell transplant options. As stem cell transplant is the best option for the general population of the AML patients, it may not be for one specific patient. Co-morbidities play a role in the safety of treatment in certain AML patients. "Lack of communication can be the cause in poor prognosis with higher mortality and higher relapse rate in the AML patient [6-11]".

Conclusion

Acute Myeloid Leukemia is the most common form of acute leukemia among the adult population and is responsible for the largest number of deaths due to leukemia per year in the United States. Research shows that stem cell transplant in the AML patient is the best treatment option along with adjunct chemotherapy and targeted therapy. Increased survival rates are linked to the use of allogeneic stem cell transplants, as survival rate stayed the same across the board with autologous stem cell transplants. Communication between the patient and the provider is key in the safety and lower mortality rates for AML. With the use of many different types of research methods such as meta-analysis, clinical trials, and CIBMTR studies, providers can find the right treatment for each type of AML and have a better prognosis with this disease.

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