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14. ABSTRACT <u>1. Contingency Preparedness:</u> Collect information from transplant centers, build awareness of the Transplant Center Contingency Planning Committee and educate the transplant community about the critical importance of establishing a nationwide contingency response plan. <u>2. Rapid Identification of Matched Donors:</u> Increase operational efficiencies that accelerate the search process and increase patient access are key to preparedness in a contingency event. <u>3. Immunogenic Studies:</u> Increase understanding of the immunologic factors important in HSC transplantation. <u>4. Clinical Research in Transplantation:</u> Create a platform that facilitates multicenter collaboration and data management.					
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DEVELOPMENT OF MEDICAL TECHNOLOGY
FOR CONTINGENCY RESPONSE TO MARROW TOXIC AGENTS
INTERIM ANNUAL REPORT
SUBMITTED November 1st, 2022

Office of Naval Research

And

The National Marrow Donor Program®

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I. Heading

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National Marrow Donor Program

N00014-20-1-2832

Development of Medical Technology for Contingency Response to Marrow Toxic Agents

II. Scientific and Technical Objectives

The main goal of all activities funded through this grant is to develop, test and mature the ability of the NMDP Coordinating Center and NMDP contracted network sites to address contingency events wherein civilian or military personnel are exposed to marrow toxic agents, primarily ionizing radiation or chemical weapons containing nitrogen mustard. As a result of prior efforts in this regard a solid foundation has been established. The proposed new activities will continue to enhance and expand our capabilities in each of the four focus areas. Contingency preparedness activities will continue to integrate NMDP's role with federal, state, and local agencies.

An accident, a military incident, or a terrorist act in which a number of individuals are exposed to marrow toxic agents will result in injuries from mild to lethal. But the extent of individual injuries and the likelihood of recovery in many cases will not be apparent until days or weeks after the event. Casualties will be triaged by first responders, and those with major marrow injuries who will need aggressive medical support and may be ultimately candidates for hematopoietic cell transplantation (HCT), will need to be identified. While these patients are being supported, HCT donor identification activities will be initiated because it will not be initially clear which ones may ultimately require HCT. NMDP approved transplant centers will provide a uniform and consistent clinical foundation for receiving, evaluating and caring for casualties. NMDP Coordinating Center will orchestrate the selection and testing necessary to rapidly identify the best available donor or cord blood unit for each patient utilizing its state-of-the-art communication infrastructure, sample repository, laboratory network, and human leukocyte antigen (HLA) expertise. NMDP's on-going immunobiologic and clinical research activities promote studies to advance the science and technology of HCT transplantation to improve outcome and quality of life for the patients.

Importantly, most individuals with near-lethal marrow toxic injuries will recover their own marrow function provided they receive intensive supportive care from the medical professionals that are part of the contingency response community. These professionals can save the lives of persons with severe marrow suppression using the knowledge and skills practiced every day to treat patients undergoing HCT coordinated through the NMDP.

III. Approach

A. Contingency Preparedness

HCT teams are uniquely positioned to care for the casualties of marrow toxic injuries. The NMDP manages a network of centers that work in concert to facilitate unrelated HCT. The Radiation Injury Treatment Network (RITN), comprised of a subset of NMDP's network centers, is dedicated to radiological disaster preparedness activities and develops procedures for response to marrow toxic mass casualty incidents.

B. Development of Science and Technology for Rapid Identification of Matched Donors

Disease stage at the time of transplantation is a significant predictor of survival. Decreasing the time to identify the best matched donor is critical. Methods are under development to rapidly provide the best matched donor for HCT.

C. Immunogenetic Studies in Transplantation

Improving strategies to avoid and manage complications due to graft alloreactivity is essential to improve the outcomes of HCT. Research efforts are focused on strategies to maximize disease control while minimizing the toxicity related to alloreactivity in HCT.

D. Clinical Research in Transplantation

Clinical research creates a platform that facilitates multi-center collaboration and data management to address issues important for managing radiation exposure casualties. Advancing the already robust research capabilities of the NMDP network will facilitate a coordinated and effective contingency response.

IV. Updates

A. Contingency Preparedness

Maintain the Radiation Injury Treatment Network (RITN) to prepare for the care of patients resulting from a hematopoietic toxic event.

During this year RITN continued to develop the preparedness of its network of hospitals through the following activities:

- RITN and the Radiation Emergency Assistance Center/Training Site (REAC/TS) developed a new 2.5-day in-person training course which targets a new audience (healthcare coalition members). The course includes lecture, hands on demonstrations, skill practice, and an exercise. The University of San Francisco and Stanford University successfully hosted the course June 28-30, 2022. The Children's Hospital of Philadelphia, Thomas Jefferson University, and the University of Pennsylvania also successfully hosted the course July 12-14, 2022.
- RITN FY2022 Workshop Planning Committee continued planning for the August 2022 Workshop. Final planning activities and the workshop were supported under a separate award.
- RITN Training committee workgroup completed the modular acute radiation syndrome (ARS) treatment just-in-time training course for healthcare providers. The purpose was to create a shorter, multi-part series to replace the current, longer (16-minute) ARS just-in-time training video. The three-part series of modules may each be used as standalone just-in-time training but are also a cohesive series, building off each other. The target audience for two of the modules are physicians, advanced practitioners, and advanced registered nurses who are not familiar with ARS and care of ARS patients, yet the material is not given on a basic medical level. The other module covers preparedness plans for emergency managers and those in the safety areas. The videos are available

on the RITN YouTube Channel (<https://www.youtube.com/channel/UCkd45X1DlPqeRr-u5lph6Og>) as well as the RITN website (<https://ritn.net/training/>).

- What to Expect...Does the Patient Have ARS? (~9 minutes)
 - This module is designed to give answers to frequently asked questions that may arise about treating patients with Acute Radiation Syndrome.
- Treating Radiation Victims...Am I Safe? (~7 minutes)
 - This module addresses one of the most commonly asked radiation questions heard from medical staff..."Am I Safe Treating Acute Radiation Syndrome... or ARS...Patients?" And the answer is Yes!
- Preparedness Steps...Identifying Your Resources (~8 minutes)
 - This module focuses on how to prepare for a radiological emergency before it happens.
- Completed the development of five virtual educational training sessions for RITN hospitals and partners in lieu of the semi-annual RITN Workshop that would typically be held in summer 2021. Sessions 1, 2, 4, and 5 were held in May, June, August, and September of 2021, respectively. Session 3 has been postponed until further notice.
 - Session 3 - July: NDMS/RITN Patient Movement: From Incident to RITN Center
 - July 28, 2021
 - John Koerner and Andrew McBrearty
 - Session 4 - August: COVID-19 Cohort Management Program (CCMP): An Adaptable Model For Outpatient Surge Management
 - August 24, 2021
 - Memorial Sloan Kettering Cancer Center staff
 - Session 5 - September: Chernobyl: 35 Years Later
 - September 22, 2021
 - Dr. Alla Shapiro
- Continued supporting the Gryphon Scientific's Center for Disease Control (CDC) funded project to assess United States laboratory capabilities for ionizing radiation related testing. As the closing of the survey (September 2021), 1,298 labs completed and submitted the survey (1,000 was the target minimum). Analysis has begun and the preliminary data is available for workgroup members.
- Completed the development of the Hospital Radiation Morbidity Toolkit as part of the CDC grant awarded to RITN. Developed an After-Action Report (AAR) of the use of the tool by 72 hospitals to validate it worked, identify any necessary modifications, implemented 73 modifications, and submitted the AAR with updated tool to CDC.
- Completed all seven sessions of the annual exercise for RITN centers. This year's exercise tested a newly created post-improvised nuclear device (IND) morbidity data form for the CDC.
- All 72 active RITN centers completed their annual tasks (one center inactive due to staffing for FY2021). Task completion included updating administrative information, emergency communications testing, reviewing and submitting their Standard Operating Procedures and

marrow toxic injury consent forms, participate in the annual exercise, and complete educational training.

- In September 2021, representatives from Grady Health System, Emory, the U.S. Centers for Disease Control (CDC) and RITN conducted a tabletop exercise to address laboratory surge following an improvised nuclear device (IND) detonation in a distant city. The primary strengths and opportunities for improvement discovered during this exercise are listed below.
 - Primary Strengths
 - Grady’s laboratory capabilities include enough equipment, supplies, staff and throughput capability to meet the testing demand as defined in this scenario.
 - Grady has a laboratory surge plan in place to call back additional staff in the event of an emergency.
 - CDC indicated that they could provide resources to Grady for radiation surveys, if necessary. In addition, they could utilize up to 18 radiation portal monitors (RPMs) from the State of Georgia.
 - There are potential capabilities to share laboratory testing information through EPIC and other electronic medical record products that interface with EPIC.
 - Supply chain impacts could be mitigated through vendor relationships and proximity to Atlanta.
 - Primary Opportunities for Improvement
 - There is a need to identify just-in-time training capabilities at Grady for staff to provide them basic radiation awareness.
 - There is a need to further coordinate with local and state public health authorities to determine how large-scale processing sites will be established for self-evacuated patients.
 - Grady should consider keeping a roster of retired laboratory professionals in the event there is a need to call them back to volunteer for laboratory surge emergencies.
 - While Grady does keep an approximate 30-day supply of laboratory consumables on-hand, it should be considered that impacts on the supply chain and increased demand nationwide will likely result in a shortage.
 - Additional planning and coordination should occur between Grady and Emory to discuss the process and resources for human leukocyte antigen (HLA) typing in this scenario.
- The Department of Health and Human Services-Assistant Secretary for Preparedness and Response's Operational Intent for FY2022 was a radiation focus. In support of this RITN developed a functional exercise (drill) kit (or an ‘exercise-in-a-box’) to be used by healthcare coalition members to meet this requirement. The exercise has six modules and an after-action review (hot wash), each module taking approximately 45 minutes to conduct. It is also Homeland Security Exercise and Evaluation Program (HSEEP) compliant.
 - There is no cost for hospitals to use this exercise-in-a-box to fulfill their requirements for increased preparedness for ASPR. It is important to note that this is free as hospitals are accustomed to paying for any kind of training and material.

- The exercise-in-a-box has been added to the RITN website as well as on ASPR's Technical Resources, Assistance Center, and Information Exchange (TRACIE) website, and was showcased at the National Healthcare Coalition Preparedness Conference (NHPC) in December 2021.

The purpose of the exercise is to address the operational elements of the receipt, triage, and care of radiation-injury and acute blast/burn injury casualties in accordance with existing RITN, Health Care Coalition, and individual hospital/agency plans. The exercise will evaluate key actions to respond to a medical surge following an 10kT improvised nuclear device (IND) detonation in a distant location where patients are transported to hospitals around the nation primarily through the National Disaster Medical System (NDMS).

The exercise-in-a-box will be added to the RITN website, on ASPR's Technical Resources, Assistance Center, and Information Exchange (TRACIE) website, and at the National Healthcare Coalition Preparedness Conference (NHPC) in late 2021.

B. Development of Science and Technology for Rapid Identification of Matched Donors

Expand the genetic diversity of the registry through continued addition of adult donors and cord blood units, utilizing high volume HLA typing methodologies.

A total of 115,619 newly registered volunteer donors were HLA typed and added to the Be The Match Registry during the performance period.

Modeling and analysis of registry coverage for the Warfighter

Forward deployed Warfighters are at a higher risk of exposure to marrow toxic injuries due to ionizing radiation or marrow toxic chemical agents. As such, it is important to model and determine the likelihood that Warfighters will have a suitably matched unrelated donor (defined as 8/8 or 7/8 matched for HLA-A, B, C and DRB1) on the NMDP/Be The Match Registry to support lifesaving HCT or cellular therapy. Our prior results indicated that most warfighters will have suitable adult donors though there is not an optimal match for many warfighters.

Previously, we identified the likelihood of finding an unrelated donor on the Be The Match registry to provide an estimate for providing HCT or cellular therapy to warfighters in the event of radiation or marrow toxic chemical exposure. We also identified gaps in warfighter population coverage that will assist in targeted future recruitment efforts to address deficiencies.

To address the gaps in warfighter population coverage at the 8/8 or 7/8 level, we consider the increasing body of evidence for advances in post-HCT immune modulation that allow for safe and effective HCT

despite a greater number of HLA mismatches between the donor and potential patient. To this end, we have defined new scenarios to re-estimate match rates specific to different race and ethnic groups that consider HLA-A, B, C, and DRB1 high resolution matching at 8/8, 7/8, 6/8, 5/8, and 4/8 HLA alleles. These will take into consideration the larger potential donor pool at higher levels of mismatches and will be adjusted for known donor age and availability statistics. These modeling efforts will evaluate less stringent HLA matching criteria to expand access for warfighters and allow for rapid identification of suitable donors for HCT and cellular therapy.

This quarter, additional progress was made to update the donor registry population under consideration in the model with 2020 registry characteristics. Registry data was reapportioned based on known population ratios and adjusted for demonstrated donor availability. Through the application of a population-based genetic model, match likelihoods for 21 race/ethnic groups for donors of any age and less than or equal to 35 years of age were considered. Preliminary results demonstrate the potential for available donor coverage, when allowing for HLA match levels to 5/8 to reach >99%. An abstract describing the results of the analysis were presented as a poster at the 2022 BMT Tandem annual meeting.

Development of science and technology for rapid communication of HLA data

Tool Development

Development and improvement of tools continues for handling HLA data toward the rapid communication, identification, and evaluation of matched donors in transplantation. In the past year, additional updates were made to py-ard (<https://github.com/nmdp-bioinformatics/py-ard>), a Python-based HLA annotation and conversion tool, to handle refresh of multiple allele codes in the intake process, smart sort for genetic group and expression character expansions, reinstall the reference IMGT database and perform database status checks. This tool has matured the point where it provides a standard HLA pre-processing filter for any downstream analysis of HLA including clinical outcomes studies.

We held a 2-day hackathon Sept 2-3, 2021. This event involved seven employees of NMDP and focused on developing an open-source software package called py-ard (<https://github.com/nmdp-bioinformatics/py-ard>) for normalization and conversion of HLA data between different resolutions.

The main accomplishments of the events were:

- Development of a roadmap to achieve a 1.0.0 release of the software <https://github.com/nmdp-bioinformatics/py-ard/projects/2>
- Production of several intermediate releases (0.6.7, 0.6.8, 0.6.9) including functionality to deal with P-group and G-group alleles
- During the hackathon the team achieved successful generation of a global file of 45,235,309 human subjects from 50 with normalized HLA data for haplotype frequency analysis.

During the past year we co-authored a paper summarizing challenges with commercial adoption of an XML data standard, developed by NMDP, for the reporting of HLA genotyping based on Next-Generation Sequencing (NGS). <https://www.sciencedirect.com/science/article/abs/pii/S019888592100210X>

Use of population genetics and machine learning to automate the donor selection process

Machine Learning-based prediction of overall survival

Improvements were made to the machine learning pipeline for patient overall survival outcomes following allogeneic HCT. New research into the representation and interpretation of feature importance and variable

encoding were pursued. The contribution of molecular matching data at different levels will be added in future models. Analyses were also performed at different stages of the patient journey and for different donor types.

To contrast with One-Hot Encoding process for treatment of variables, Weight of Evidence (WoE) encoding methodology for data preprocessing was applied to the dataset for categorical variables and label encoding for ordinal variables. An in-depth assessment and classification of variables based on prior physician or clinician-based knowledge is under way to bring new perspective to interpretation of machine-learned results. SHAP (Shapley Additive Explanation) results were explored for interaction across variables.

Enhance population genetics driven donor selection algorithms

During the past year progress was made in several aspects toward the goal of improving population genetics driven donor selection algorithms.

1. Global populations: HLA haplotype frequencies were generated for a global file of 45,235,309 human subjects from 50 different countries. This data will allow improved matching and modeling of HLA of populations for these countries.
2. Higher resolution: HLA haplotype frequencies were generated at the 3rd and 4th field of resolution. This will allow more accurate matching and modeling and will facilitate clinical decision making based on variants that are outside of the antigen-recognition-domain of most previous work.
3. Additional loci: HLA haplotype frequencies have been extended to cover 9 HLA loci which will allow clinical decision making, prediction and modeling based on genes which are typically not typed (e.g. HLA-DQA1 & HLA-DPA1)
4. Multi-racial individuals: A paper was published “**HLA haplotype frequency estimation for heterogeneous populations using a graph-based imputation algorithm**” (<https://www.sciencedirect.com/science/article/abs/pii/S019885921001750>). This novel multi-racial EM implementation considers race as a Bayesian prior, enabling integration of HLA information from multiple single-race population groups, and for the first-time including individuals with ambiguous or mixed ethnic backgrounds. This multi-racial EM produces much higher likelihood values and better haplotype recovery than all evaluated EM implementations when tested on real datasets of US donor registry HLA typings as well as simulated multi-racial datasets of ambiguous HLA typings.

C. Immunogenetic Studies in Transplantation

Evaluate HLA disparity and impact on HCT by adding selected pairs to the Donor/Recipient Pair project utilizing sample selection criteria that optimize the new data generated by the typing project.

Donor Recipient Pair Project

The study team continued to audit typing results generated in the prior grant year. Case selection for the next typing cohort was completed in late summer 2021 and a total of 2497 donor/recipient transplant pairs (2010 using unrelated donors and 487 using related donors) shipped for typing. Complete results are anticipated early next quarter and will be audited under a subsequent grant. This population is critical to

expanding access to donors for warfighters and civilians without an available fully-matched donor on the world-wide registries.

Develop and mature typing characterization of immunogenetic regions from underserved populations to improve matching and transplant outcomes for more diverse patients

An assessment was performed on the donor recruitment HLA typing performed on 160,000 donors requested for confirmatory typing between 2010 and 2020. In general, donors of color were found to have less complete typing at recruitment. An association was found between missing or incomplete HLA typing and compromised quality of match predictions for diverse patients. In general, prediction quality for AFA (African American) and API (Asian Pacific Islander) groups were impacted the most. Further analysis is being pursued to generate solutions for upgrading the typing and characterization of immunogenetic regions to improve matching and transplant outcomes for more diverse patients.

Determine the frequency and risks associated with donor clonal hematopoiesis of indeterminate potential in HCT.

Evaluating the impact of donor clonal hematopoiesis of indeterminate potential (CHIP) on HCT outcomes

Completed the analysis for the study entitled “GV19-01: Exploring the link between donor engrafted clonal hematopoiesis and adverse outcomes in allogeneic HCT: Pilot study. The study found no associations between donor CHIP and any outcomes. An abstract describing the results of the pilot study was presented as a poster at the 2022 BMT Tandem Meetings. A manuscript describing the results of the pilot study is under development. The lack of an association between CHIP and outcomes resulted in a reevaluation of this line of inquiry under this grant. Funds allocated for this effort have been reassigned to address the more pressing topics noted below.

Evaluation of Unrelated Donor Peripheral Blood Stem Cell (PBSC) Graft Composition and Impact on Allogeneic HCT Outcomes

While allogeneic HCT offers potentially curative therapy to patients with a variety of benign and malignant diseases, both acute and chronic GVHD continue to plague the field and often limit the longevity and quality of life for patients. The composition of PBSC grafts has been evaluated in multiple studies to attempt to discern associations between various cellular subsets and outcomes. The BMT CTN 0201 randomized trial of bone marrow versus PBSC found that PBSC grafts were associated with a higher risk of cGVHD and worse quality of life following unrelated donor HCT compared to BM. A correlative study of graft immunophenotype failed to identify any associations between PBSC graft composition and outcomes. However, the PBSC cohort included only 147 evaluable products limiting the power to evaluate various cellular subsets. The association between PBSC graft immunophenotype and outcomes remains unclear.

The primary aim of this study is to evaluate PBSC graft stem cell and associated immune cell composition and to determine at 12-months of follow-up how either the comprehensive graft cellular composition profile or specific graft composition elements influences the primary outcomes of time to neutrophil engraftment and overall survival. Secondary outcomes of interest include, but not limited to, incidence of acute and chronic GVHD, primary disease relapse, TRM, and DFS. The study will evaluate approximately 2,100 PBSC products over a 3-year accrual period with 1,100 collected in the U.S. through the NMDP and an additional 1,000 collected in Germany for U.S. based patients through the DKMS. The U.S. testing will be supported through this grant and DKMS will support testing of German collected products. Data will be merged with CIBMTR collected clinical outcomes for analysis and correlation with clinical outcomes.

Analyses include:

- Stem cell subset composition (not just number) influences time to engraftment and immune reconstitution.
- Both conventional and novel unconventional T cell subsets within the graft influence GVHD, relapse, infection and immune reconstitution after transplant.
- Natural killer cells have a role in transplant biology and number and phenotype in the donor graft influence GVHD, relapse, infection and immune reconstitution after transplant.
- The myeloid/antigen presenting cell compartment of the graft influences infection risk and immune reconstitution, thus play a role in long term patient outcome.

The secondary aims of this study are:

- Explore potential associations of favorable PBSC graft composition features that may be predicted by analysis of peripheral blood samples at time of unrelated donor work-up such that these biomarkers could be incorporated into donor selection algorithms.
- Evaluate graft composition association with >12-month outcomes for overall survival, primary disease relapse, DFS and the incidence of late transplant effects including, but not limited to, chronic GVHD, diseases of the cardiovascular, pulmonary, and endocrine systems, dysfunction of the thyroid gland, bone diseases and the development of secondary primary malignancies.
- Establish a cohort of pre-transplant recipient and pre-donation adult unrelated donor biologic samples (whole blood, plasma, viable PBMC and viable donor PBSC graft mononuclear cells) collected prospectively from donors and patients enrolled on this study. This important biospecimen resource will be critical for the support of additional protocol team defined allogeneic HCT related correlative studies that will extend the knowledge gained from the primary study.

During the past quarter accrual continued for U.S. based donors. A total of 212 product samples were received and tested through September 30, 2022. Testing costs are covered under this grant while staff support is funded under a subsequent grant. The DKMS laboratory continued efforts to establish the standardized immunophenotyping panel for testing of Germany based donors. The study team met several times to finalize plans for concordance testing between the U.S. and DKMS laboratories. Concordance testing using known controls supplied by the NMDP testing laboratory will be performed in the next quarter. Accrual of German donors has begun on a limited basis and will be expanded following successful completion of the concordance evaluation to ensure that data is being consistency captured in both the U.S. and German laboratories. Testing of German donors will be fully funded by DKMS.

A national framework for introducing measurable residual disease testing into the clinical care of AML patients undergoing allogeneic transplantation

While allogeneic HCT is a curative therapy for many patients with acute myeloid leukemia (AML), the risk of relapse even after achieving a cytomorphological complete remission (CR) is the most common form of treatment failure and death. Transplant-related morbidity and mortality is a major obstacle for the effective use of alloHCT, resulting in the potential under- or over-utilization of conditioning regimen intensity to prevent AML relapse. The presence of residual leukemic burden, known as measurable residual disease (MRD), prior to transplant is associated with worse outcomes after transplantation. AML MRD testing is not standardized, and no clear path to translate findings from research laboratories to clinical transplant settings currently exists.

Planning continued on a project designed to address this issue by developing a coordinated national framework to 1) allow collection of leftover initial AML diagnosis material from patients who have received alloHCT in US centers, 2) prospectively collect samples from AML patients after unrelated donor alloHCT to determine optimal timing and method for post-alloHCT MRD monitoring and 3) implement findings from phases 1 and 2, together with a central reference laboratory, to allow local centers to perform

standardized MRD testing pre or post alloHCT. This would allow both selection of conditioning intensity, but also inform post-transplant maintenance and allow patient selection for novel clinical trials.

During the past quarter the protocol team continued to meet regularly to finalize plans to launch the IRB approved and [ClinicalTrials.gov](https://clinicaltrials.gov) registered study protocol entitled, “MEASURE: Molecular Evaluation of AML patients after Stem cell transplant to Understand Relapse Events”. To date, 15 centers have committed to participate in the study and combined plan to enroll >250 patients per year. Eight of 15 sites have received local IRB approval for the protocol. All sites have initiated submission of regulatory documents required for participation. One site has fully opened the study and has enrolled 3 patients. The study will continue under a subsequent grant.

Even when patient and donor are HLA matched, post-transplant complications occur, therefore, other loci may play a role

During the past year a KIR genomic typing project completed its 4th phase with 200 samples using a KIR capture and long-range sequencing protocol developed under this grant. This phase, combined with the previous phases of 8, 12, and 48 samples brings the total to 268 individuals and demonstrates the ability to scale this assay to clinical cohort levels.

The KIR genes encode proteins containing two or three extracellular immunoglobulin-like domains that recognize human leukocyte antigen (HLA)/peptide complexes and other ligands. This recognition helps initiate inhibitory or activating cytotoxic signaling in natural killer (NK) cells. NKs and their KIR receptors are essential to human health and their genes impact infections (including HIV), pregnancy, autoimmune diseases, transplantation, and immunotherapy.

KIR genes have expanded via tandem duplication and evolved in primates over the last 30–40 million years. They are 10–15 000 bp long and separated by ~1000 bp. Homology is a characteristic of the region, and a pair of alleles of any two genes are ~85–98% identical. The recombination rate is high in this system, and dozens of gene-content haplotypes are seen in Europeans. It is a transposon-rich region, which provides the primary mechanism for recurrent meiotic recombination events. These characteristics have made the region intractable and essentially invisible to whole genome sequencing based on short read-length methods (e.g., shotgun sequencing). Targeted typing methods using NGS generate results that are highly ambiguous and incomplete and require assumptions about the underlying genomics to interpret.

Many studies have published associations with KIR and human health. They are not necessarily consistent, but they all are based on low-resolution factors such as presence/absence of gene region or short motifs in certain genes. Higher-resolution genomic analysis has not been possible due to lack of sequencing capability until now. The new “clonal” genomic sequencing method developed under this grant provides the ability to annotate and associate at any resolution or feature. The relevance of establishing this at scale is that it means for the first time the clinical relevance of the entire KIR system can be studied instead of small fractions. Analysis of this data is still underway, but it has already contributed 27 new haplotypes to the human genome reference which now contains more alternate references for the KIR region than any full chromosome, 47% of which are from African Americans.

D. Clinical Research in Transplantation

Conduct clinical outcomes research using the CIBMTR research database and repository.

Observational Research

- Published 155 manuscripts in peer-reviewed journals during the grant period.
- A total of 32 abstracts were submitted and accepted for presentation at the 2021 American Society of Hematology Annual Meeting to be held in person and virtually this December in Atlanta, GA. Presentations titles and oral/poster status are noted in the table below:

Table: CIBMTR presentations at 2021 American Society of Hematology Annual Meeting

Title	Status
Saturday, December 11, 2021	
Single HLA Class I Mismatches with High Peptide Divergence in the Graft-Versus-Host Direction Are Associated with Inferior Survival after 9/10 HLA-Matched UD-HCT: A Retrospective Study from the CIBMTR	Oral
Efficacy and Long-Term Outcomes of Autologous Stem Cell Transplant (ASCT) for Patients with POEMS Syndrome (Polyneuropathy, Organomegaly, Endocrinopathy, Monoclonal Protein, Skin Changes): A CIBMTR Analysis	Oral
Haploidentical Vs. Matched Unrelated Donor Transplants Using Post-Transplant Cyclophosphamide for Lymphoma: A Joint CIBMTR/EBMT Study	Oral
Deleterious Germline Variants Are Present in Patients with Myelodysplastic Syndrome of All Ages Treated with Related Allogeneic Stem Cell	Oral
The Impact of Pre-Apheresis Health Related Quality of Life on Peripheral Blood Progenitor Cell Yield and Donor's Health and Outcome: Secondary Analysis of Rdsafe and BMT CTN 0201	Poster
The Impact of Pre-Apheresis Health Related Quality of Life on Peripheral Blood Progenitor Cell Yield and Donor's Health and Outcome: Secondary Analysis of Rdsafe and BMT CTN 0201	Poster

Sunday, December 12, 2021	
Health-Related Quality of Life in a Biologic Assignment Trial of Reduced Intensity Hematopoietic Cell Transplantation Based on Donor Availability in Patients Aged 50-75 with Advanced Myelodysplastic Syndrome	Oral
Real-World Efficacy and Safety Outcomes for Patients with Relapsed or Refractory (R/R) Aggressive B-Cell Non-Hodgkin's Lymphoma (aBNHL) Treated with Commercial Tisagenlecleucel: Update from the Center for International Blood and Marrow Transplant Research (CIBMTR) Registry	Oral
The Impact of Somatic Mutations on Allogeneic Hematopoietic Cell Transplantation in Chronic Myelomonocytic Leukemia: A Center for International Blood and Marrow Transplant Research (CIBMTR) Analysis	Oral
Late Effects after Allogeneic Hematopoietic Cell Transplantation Among Children and Adolescents with Non-Malignant Disorders: A Report from the Center for International Blood and Marrow Transplant Research (CIBMTR)	Oral
Prompt CR Plus Consolidation Therapy Yields Improve Survival after Allogeneic Transplantation for AML Patients Receiving Myeloablative, but Not Reduced-Intensity Conditioning: A CIBMTR Analysis	Oral
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Research data collection and systems enhancements

During the past year, CIBMTR has continued support for electronic data submission initiatives, production FormsNet Recipient, FormsNet Donor, and AGNIS customers, as well as Data Warehouse users.

FormsNet

Continued the quarterly releases of recipient form revisions to be current with existing treatment practices, as well as implemented revisions of forms to support the cellular therapies registry. Completed and in-process enhancements within Data Capture applications include:

- The Japanese multi-language support, allowing FormsNet system and forms to display in a language other than English, was updated in July 2021 to reflect three Cellular Therapy form revisions.
- Form Due Dates were updated to support CIBMTR's updated CPI policy. The Recipient Center Forms Due page was also updated to better suit the needs for users to run their own reports and metrics.
- Updates were made to the Consent Tool, including the ability for users to view and respond to queries.
- Continued monthly security monitoring and incorporating fixes to security vulnerabilities within the month.
- Infectious Disease Marker (IDM) Tool:
 - Successful testing and support for IDM Lab VRL's migration to Corepoint
 - CMP Status Date/Time Enhancement
- Formsnet Forms Definition Manager (FDM): Cross-form validation improvements and security vulnerability fixes
- AGNIS Mapping Tool (FDM): Hidden form mapping and clear filters enhancements
- FormsNet 3 Donor: Required updates to 715, 730, and 731 Donor forms were released to production on September 30th (715) and July 23rd (730/731).
- Made updates to support data collection for gene therapy infusions as a new type of HCT. Required forms will be similar to those for HCT, but with additional follow up visits through 15 years and a new product form (to be released in October 2021).
- Developed and released the following data collection forms in July 2021.

Form	Form Name	Category
2100R7	Post-Infusion Follow-Up	Revised recipient form
4000R8	Cellular Therapy Essential Data Pre-Infusion	Revised recipient form
4100R7	Cellular Therapy Essential Data Follow-Up	Revised recipient form
3500R2	Subsequent Neoplasms	Revised recipient form

Electronic data submission/AGNIS

CIBMTR continued support for electronic data submission initiatives and production AGNIS customers. Effort focused on development of new AGNIS instances of CIBMTR disease specific forms, and support for CIBMTR form revision updates to existing forms. The team is in process of completing communication, educational and technical project implementations to lower AGNIS submission burden and increase the client-base including but not limited to:

- Increasing the reuse of existing AGNIS modules when supporting form revisions and other Forms Builder reports enhancements
- Additional AGNIS reports and enhancements to the AGNIS test environments to help support external users when they are testing new AGNIS forms.

Recent AGNIS and other electronic data submission accomplishments:

- Updated CIBMTR Reporting App (CRA) functionality to introduce time-saving efficiencies for end users
- Expanded CRA usage to twelve centers
- The AGNIS team continues to release forms for centers to use in data submission to the CIBMTR as well as address questions or issues raised by centers and their vendors.
- Two AGNIS forms were released to production and five for external testing.
 - Form 2815r1 (for an AGNIS implementation of the Consent Tool) is now available for testing by external centers and vendors.
- A new website was created and released to replace the legacy website used by external centers and vendors for the development of AGNIS.

Integrated Data Warehouse (IDW) and Unified Domain Model (UDM)

CIBMTR continued to increase the capabilities of the IDW and UDM. Accomplishments include:

- Integrated Data Warehouse (IDW) – Operational Data Warehouse utilized for delivery of key data to stakeholders.
- Incorporated ongoing forms revisions into the warehouse.
- Enhanced processes to support CIBMTR's Domestic and International CPI Processes.
- Created reports in new Business Intelligence tool, Looker, to support CIBMTR Prospective Research team needs.
- Completed Cord Blood Bank requests to the Cord Blood Data Quality Report.
- Enhanced a pathway to capture and store survey data from CIBMTR's ePRO system.

- Created new Business Intelligence reports to support ePRO Data Quality efforts.
- Business Intelligence Data Sharing- Continued expansion of business intelligence tool capabilities. Adding to the existing suite of external Business Intelligence data sharing applications including the introduction of more data, dimensions and measures, stakeholder groups, and continuing data quality initiatives.

Center Volumes Data Reports

- Phase one of the annual CVDR update has been completed successfully.

Data Operations Dashboard

- Released a new environment for sharing data within the DataOps dashboard called 'Data Requests'. This new environment securely shares Observational Study data with the transplant centers.

Unified Domain Model- continuing the process of building this single source of truth of data that will contain high quality, validated data readily available to researchers for immunobiology, outcomes, and other types of analyses

- Continued delivery of monthly and quarterly CAR T-cell data sets to our Japan and pharmaceutical partners
- Delivered 4 Periodic Safety Update Reports (PSUR) for two CAR T-cell therapies. Continued transitioning HCT data from the Research Database to the Unified Domain Model and delivered the first set of Stem Cell Therapeutic Outcomes Data required for the HRSA SCTOD quarterly report.
- Delivered 15 new data extracts combining data from the new Unified Domain Model database with older data from the Research Database, as we work toward sunsetting the Research Database.
- Continued work on adding human leukocyte antigen data (HLA) data to the Unified Domain Model

Support for the Clinical Transplant-Related Long-term Outcomes of Alternative Donor Allogeneic Transplantation (CTRL-ALT-D) trial

BMT CTN 1702: Clinical Transplant-Related Long-term Outcomes of Alternative Donor Allogeneic Transplantation (CTRL-ALT-D) trial has accrued 1758 subjects through September 2022. A total of 2 patients were accrued in the past quarter and closed to accrual on August 10, 2022. Study follow-up will continue under a subsequent grant.

Publications

1. Bejanyan N, Zhang M, Bo-Subait K, et al. Myeloablative conditioning for allogeneic transplantation results in superior disease-free survival for acute myeloid leukemia and myelodysplastic syndromes with low/intermediate, but not high disease risk index: A CIBMTR study: Superior DFS with MAC compared to RIC HCT in AML/MDS with low/intermediate risk DRI. *Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation*. doi:10.1016/j.bbmt.2020.09.026. Epub 2020 Oct 1. Impact factor: 3.9
2. Gadalla SM, Wang Y, Wang T, et al. Association of donor IFNL4 genotype and non-relapse mortality after unrelated donor myeloablative haematopoietic stem-cell transplantation for acute leukaemia: A retrospective cohort study. *The Lancet Haematology*. 7(10):e715-e723. doi:10.1016/S2352-3026(20)30294-5. Epub 2020 Oct 1. PMC7735535. Impact factor: 10.4
3. Gupta V, Kim S, Hu Z-H, et al. Comparison of outcomes of HCT in blast phase of BCR-ABL1-MPN with de novo AML and with AML following MDS. *Blood Advances*. 2020 Oct 13; 4(19):4748-4757. doi:10.1182/bloodadvances.2020002621. Epub 2020 Oct 2. PMC7556156. Impact factor: 4.6
4. Kim S, Logan B, Riches M, et al. Tatistical methods for time-dependent variables in hematopoietic cell transplantation studies. *Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation*. doi:10.1016/j.bbmt.2020.09.034. Epub 2020 Oct 2. Impact factor: 4.7
5. Fahadfar N, Burns LJ, Mupfudze T, et al. Hematopoietic Cell Transplantation Predictions for the Year 2023 *Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation*. doi:10.1016/j.bbmt.2020.10.006. Epub 2020 Oct 9. PMC7546661. Impact factor: 3.9
6. Roe D, Williams J, Ivery K, et al. Efficient sequencing, assembly, and annotation of human KIR haplotypes. *Frontiers in Immunology*. 11:582927. doi:10.3389/fimmu.2020.582927. Epub 2020 Oct 9. PMC7581912. Impact factor: 6.4
7. Dehn J, Chitphakdithai P, Shaw BE, et al. Likelihood of proceeding to allogeneic hematopoietic cell transplantation in the United States after search activation in the National Registry: Impact of patient age, disease and search prognosis. *Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation*. doi:10.1016/j.bbmt.2020.10.004. Epub 2020 Oct 10. Impact factor: 3.9
8. Camacho-Bydume C, Wang T, Sees JA, et al. Specific class I HLA supertypes but not HLA zygosity or expression are associated with outcomes following HLA-matched allogeneic hematopoietic cell transplant: HLA supertypes impact allogeneic HCT outcomes. *Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation*. doi:10.1016/j.bbmt.2020.10.010. Epub 2020 Oct 11. Impact factor: 4.7
9. Hong S, Brazauskas R, Hebert KM, et al. Community health status and outcomes after allogeneic hematopoietic cell transplantation in the United States. *Cancer*. doi:10.1002/cncr.33232. Epub 2020 Oct 21. Impact factor: 5.7

10. Dhakal B, D'Souza A, Callander N, et al. Novel prognostic scoring system for autologous hematopoietic cell transplantation in multiple myeloma. *British Journal of Haematology*. 2020 Nov 20; 191(3):442-452. doi:10.1111/bjh.16987. Epub 2020 Oct 23. Impact factor: 5.5
11. Bona K, Brazauskas R, He N, et al. Neighborhood-poverty and pediatric allogeneic hematopoietic cell transplantation outcomes: A CIBMTR analysis. *Blood*. doi:10.1182/blood.2020006252. Epub 2020 Oct 26. Impact factor: 17.5
12. Shah NN, Ahn KW, Litovich C, et al. Is autologous transplant in relapsed DLBCL patients achieving only a PET+ PR appropriate in the CAR-T cell era? *Blood*. doi:10.1182/blood.2020007939. Epub 2020 Oct 29. Impact factor: 17.5
13. Pasquini MC, Hu Z-H, Curran K, et al. Real-world evidence of tisagenlecleucel for pediatric acute lymphoblastic leukemia and non-Hodgkin lymphoma. *Blood Advances*. 2020 Nov 10; 4(21):5414-5424. doi:10.1182/bloodadvances.2020003092. Epub 2020 Nov 4. PMC7656920. Impact factor: 4.6
14. Single RM, Meyer D, Nunes K, et al. Demographic history and selection at HLA loci in Native Americans. *PLoS One*. 15(11):e0241282. doi:10.1371/journal.pone.0241282. Epub 2020 Nov 4. PMC7641399. Impact factor: 2.7
15. Qayed M, Ahn KW, Kitko CL, et al. A validated pediatric disease risk index for allogeneic hematopoietic cell transplantation. *Blood*. doi:10.1182/blood.2020009342. Epub 2020 Nov 18. Impact factor: 17.5
16. Martens, MJ, Logan, B. A unified approach to sample size and power determination for testing parameters in generalized linear and time-to-event regression models. *Statistics in Medicine*. doi:10.1002/sim.8823. Epub 2020 Nov 18. Impact factor: 1.8
17. Roe D, Vierra-Green C, Pyo C-W, et al. A detailed view of KIR haplotype structures and gene families as provided by a new motif-based multiple sequence alignment. *Frontiers in Immunology*. 11:585731. doi:10.3389/fimmu.2020.585731. Epub 2020 Nov 18. PMC7708349. Impact factor: 6.4
18. Gupta V, Kennedy JA, Capo-Chichi J-M, et al. Genetic factors rather than blast reduction determine outcomes of allogeneic HCT in BCR-ABL⁻negative MPN in blast phase. *Blood Advances*. 2020 Nov 20; 4(21):5562-5573. doi:10.1182/bloodadvances.2020002727. Epub 2020 Nov 20. PMC7656913. Impact factor: 4.6
19. Tay J, Beattie S, Bredeson C, et al. Pre-transplant marital status and hematopoietic cell transplantation outcomes. *Current Oncology*. 2020 Dec 1; 27(6):e596-e606. doi:10.3747/co.27.6327. Epub 2020 Dec 1. PMC7755447. Impact factor: 2.3
20. Preussler JM, Payton TJ, Moore HK, et al. Application and evaluation of survivorship care guides for hematopoietic cell transplantation recipients. *Transplantation and Cellular Therapy*. 2021 Mar 1; 27(3):266.e1-266.e7. doi:10.1016/j.jtct.2020.12.007. Epub 2020 Dec 16. NA. Impact factor: *See below
21. Cornell RF, Fraser R, Costa L, et al. Bortezomib-based induction is associated with superior outcomes in light chain amyloidosis patients treated with autologous hematopoietic cell transplantation regardless of plasma cell burden. *Transplantation and Cellular Therapy*. 2021 Mar 1; 27(3):264.e1-264.e7. doi:10.1016/j.jtct.2020.11.018. Epub 2020 Dec 21. Impact factor: *See below

22. El Fakih R, Greinix H, Koh M, et al. Worldwide Network for Blood and Marrow Transplantation (WBMT) recommendations regarding essential medications required to establish an early stage hematopoietic cell transplantation program. *Transplantation and Cellular Therapy*. 2021 Mar 1; 27(3):267.e1-267.e5. doi:10.1016/j.jtct.2020.12.015. Epub 2020 Dec 21. NA. Impact factor: *See below
23. Worel N, Shaw BE, Aljurf M, et al. Changes in hematopoietic cell transplantation practices in response to COVID-19: A survey from the Worldwide Network for Blood & Marrow Transplantation. *Transplantation and Cellular Therapy*. 2021 Mar 1; 27(3):270.e1-270.e6. doi:10.1016/j.jtct.2020.11.019. Epub 2020 Dec 21. NA. Impact factor: *See below
24. Elgarten CW, Li Y, Getz KD, et al. Broad spectrum antibiotics and risk of graft-versus-host disease in pediatric patients transplanted for acute leukemia: association of carbapenem use with risk of acute GVHD. *Transplantation and Cellular Therapy*. 2021 Feb 1; 27(2):177.e1-177.e8. doi:10.1016/j.jtct.2020.10.012. Epub 2020 Dec 21. PMC7946150. Impact factor: *See below
25. Wang Y, Zhou W, Wang J, et al. Pre-HCT mosaicism increases relapse risk and lowers survival in acute lymphoblastic leukemia patients post unrelated HCT. *Blood Advances*. 2021 Jan 12; 5(1):66-70. doi:10.1182/bloodadvances.2020003366. Epub 2021 Jan 5. PMC7805319. Impact factor: 4.9
26. Chhabra S, Visotcky A, Pasquini MC, et al. Corrigendum to Ixazomib for chronic Graft-Versus-Host Disease prophylaxis following allogeneic hematopoietic cell transplantation? [Biology of Blood and Marrow Transplantation 26/10 (2020) 1876-1885]. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2021.01.005. Epub 2021 Jan 10. NA. Impact factor: *See below
27. Watkins B, Qayed M, McCracken C, et al. Phase II trial of costimulation blockade with abatacept for prevention of acute GVHD. *Journal of Clinical Oncology*. doi:10.1200/JCO.20.01086. Epub 2021 Jan 15. Impact factor: 32.9
28. Seftel MD, Chitphakdithai P, Miller JP, et al. Serious adverse events in related donors: A report from the Related Donor Safe Study. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2021.01.009. Epub 2021 Jan 15. Impact factor: *See below
29. Alsaggaf R, Katta S, Wang T, et al. Epigenetic aging and hematopoietic cell transplantation in patients with severe aplastic anemia. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2021.01.013. Epub 2021 Jan 16. Impact factor: *See below
30. Schetelig J, Baldauf H, Koster L, et al. Haplotype motif-based models for KIR-genotype informed selection of hematopoietic cell donors fail to predict outcome of patients with myelodysplastic syndromes or secondary acute myeloid leukemia. *Frontiers in Immunology*. 11:584520. doi:10.3389/fimmu.2020.584520. Epub 2021 Jan 19. PMC7851088. Impact factor: 5.1
31. Sharma A, Bhatt NS, St. Martin A, et al. Clinical characteristics and outcomes of COVID-19 in haematopoietic stem-cell transplantation recipients: an observational cohort study. *The Lancet Haematology*. doi:10.1016/S2352-3026(20)30429-4. Epub 2021 Jan 19. PMC7816949. Impact factor: 10.4
32. Shalabi H, Gust J, Taraseviciute A, et al. Beyond the storm - subacute toxicities and late effects in children receiving CAR T cells. *Nature Reviews Clinical Oncology*. doi:10.1038/s41571-020-00456-y. Epub 2021 Jan 25. Impact factor: 53.3

33. Reshef R, Saber W, Bolaños-Meade J, et al. Acute GVHD diagnosis and adjudication in a multicenter trial: A report from the BMT CTN 1202 Biorepository Study. *Journal of Clinical Oncology*. doi:10.1200/JCO.20.00619. Epub 2021 Jan 28. Impact factor: 32.9
34. Sharma A, Badawy SM, Suelzer EM, et al. Systematic reviews in hematopoietic cell transplantation and cellular therapy: considerations and guidance from the American Society for Transplantation and Cellular Therapy, European Society for Blood and Marrow Transplantation, and the Center for International Blood and Marrow Transplant Research Late Effects and Quality of Life Working Committee. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2020.12.002. Epub 2021 Jan 28. Impact factor: *See below
35. Mupfudze TG, Preussler JM, Sees JA, et al. A qualitative analysis of state Medicaid coverage benefits for allogeneic hematopoietic cell transplantation (alloHCT) for patients with sickle cell disease (SCD). *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2021.01.022. Epub 2021 Jan 29. Impact factor: *See below
36. Sharma A, Badawy SM, Suelzer EM, et al. Systematic reviews in hematopoietic cell transplantation and cellular therapy: considerations and guidance from the American Society for Transplantation and Cellular Therapy, European Society for Blood and Marrow Transplantation, and the Center for International Blood and Marrow Transplant Research Late Effects and Quality of Life Working Committee. *Bone Marrow Transplantation*. doi:10.1038/s41409-020-01199-1. Epub 2021 Jan 29. Impact factor: 4.7
37. Grunwald MR, Zhang M-J, Elmariah H, et al. Alternative donor transplantation for myelodysplastic syndromes: Haploidentical relative and matched unrelated donors. *Blood Advances*. 2021 Feb 23; 5(4):975-983. doi:10.1182/bloodadvances.2020003654. Epub 2021 Feb 12. PMC7903230. Impact factor: 4.9
38. Farhadfar N, Dias A, Wang T, et al. Impact of pretransplantation renal dysfunction on outcomes after allogeneic hematopoietic cell transplantation *Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation*. doi:10.1016/j.jtct.2021.02.030. Epub 2021 Feb 26. Impact factor: 3.9
39. Scott BL, Pasquini MC, Fei M, et al. Myeloablative versus Reduced-Intensity Conditioning for Hematopoietic Cell Transplantation in Acute Myelogenous Leukemia and Myelodysplastic Syndromes-Long-Term Follow-Up of the BMT CTN 0901 Clinical Trial. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2021.02.031. Epub 2021 Feb 26. Impact factor: *See below
40. Goldsmith SR, Abid MB, Auletta JJ, et al. Post-Transplant Cyclophosphamide (PTCy) is Associated with Increased Cytomegalovirus Infection: A CIBMTR Analysis. *Blood*. doi:10.1182/blood.2020009362. Epub 2021 Mar 3. Impact factor: 17.5
41. Panch SR, Logan B, Sees JA, et al. Shorter interdonation interval contributes to lower cell counts in subsequent stem cell donations. *Transplantation and Cellular Therapy*. 2021 Jun 1; 27(6):503.e1-503.e8. doi:10.1016/j.jtct.2021.03.008. Epub 2021 Mar 9. PMC8217152. Impact Factor: *See below

42. Hsu JW, Farhadfar N, Murthy H, et al. The effect of donor graft cryopreservation on allogeneic hematopoietic cell transplantation outcomes: A Center for International Blood and Marrow Transplant Research Analysis. Implications during the COVID-19 pandemic. *Transplantation and Cellular Therapy*. 2021 Jun 1; 27(6):507-516. doi:10.1016/j.jtct.2021.03.015. Epub 2021 Mar 22. PMC8217124. Impact Factor: *See below
43. Asmita Mishra, Jaime M Preussler, Bhatt VR, et al. Breaking the age barrier: Physicians perceptions on candidacy for allogeneic hematopoietic cell transplantation in older adults. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2021.03.028. Epub 2021 Mar 28. Impact Factor: *See below
44. Dhakal B, Patel S, Girnius S, et al. Correction to: Hematopoietic cell transplantation utilization and outcomes for primary plasma cell leukemia in the current era. *Leukemia*. 2021 Jun 1; 35(6):1828. doi:10.1038/s41375-021-01233-1. Epub 2021 Mar 29. PMC8188513. Impact Factor: 8.6
45. Wieduwilt MJ, Stock W, Advani A, et al. Superior survival with pediatric-style chemotherapy compared to myeloablative allogeneic hematopoietic cell transplantation in older adolescents and young adults with Ph-negative acute lymphoblastic leukemia in first complete remission: Analysis from CALGB 10403 and the CIBMTR. *Leukemia*. doi:10.1038/s41375-021-01213-5. Epub 2021 Mar 30. Impact Factor: 8.6
46. Mayor NP, Wang T, Lee SJ, et al. Impact of previously unrecognized HLA mismatches using ultrahigh resolution typing in unrelated donor hematopoietic cell transplantation. *Journal of Clinical Oncology*. doi:10.1200/JCO.20.03643. Epub 2021 Apr 9. Impact Factor: 32.9
47. Gooptu M, Romee R, St Martin A, et al. HLA haploidentical versus matched unrelated donor transplants with post-transplant cyclophosphamide based prophylaxis. *Blood*. doi:10.1182/blood.2021011281. Epub 2021 Apr 13. Impact Factor: 17.5
48. Percival M-E, Wang H-L, Zhang M-J, et al. Impact of depth of clinical response on outcomes of acute myeloid leukemia patients in first complete remission who undergo allogeneic hematopoietic cell transplantation. *Bone Marrow Transplantation*. doi:10.1038/s41409-021-01261-6. Epub 2021 Apr 16. Impact Factor: 4.7
49. Story CM, Wang T, Bhatt VR, et al. Genetics of HLA peptide presentation, and impact on outcomes in HLA-matched allo-HCT. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2021.04.003. Epub 2021 Apr 18. Impact Factor: *See below
50. Duncan C, St. Martin A, Pérez WS, et al. Veno-occlusive disease risk in pediatric patients with acute myeloid leukemia treated with gemtuzumab ozogamicin before allogeneic hematopoietic cell transplantation. *Pediatric Blood & Cancer*. doi:10.1002/pbc.29067. Epub 2021 Apr 19. Impact Factor: 2.3
51. Wingard JR, Ahn KW, Dandoy C, et al. COVID-19 and Hematopoietic Cell Transplant Center-specific survival analysis: Can we adjust for the impact of the pandemic? Recommendations of the COVID-19 Taskforce of the 2020 CIBMTR Center Outcomes Forum. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2021.04.008. Epub 2021 Apr 22. PMC8061634. Impact Factor: *See below

52. Mupfudze TG, Meyer C, Preussler JM, et al. Hematopoietic cell transplant outcomes among Medicaid and privately insured patients with sickle cell disease Transplantation and Cellular Therapy. doi:10.1016/j.jtct.2021.04.009. Epub 2021 Apr 22. Impact Factor: *See below
53. Bhatt NS, Brazauskas R, Salit RB, Syrjala K, et al. Return to work among young adult survivors of allogeneic hematopoietic cell transplantation in the United States. Transplantation and Cellular Therapy. doi:10.1016/j.jtct.2021.04.013. Epub 2021 Apr 22. Impact Factor: *See below
54. Shaw BE, Jimenez-Jimenez AM, Burns LJ, et al. National Marrow Donor Program-sponsored multicenter, phase II trial of HLA-mismatched unrelated donor bone marrow transplantation using post-transplant cyclophosphamide. Journal of Clinical Oncology. 2021 Jun 20; 39(18):1971-1982. doi:10.1200/JCO.20.03502. Epub 2021 Apr 27. Impact Factor: 32.9
55. Shah NN, Ahn KW, Litovich C, et al. Correction: Allogeneic transplantation in elderly patients ≥65 years with non-Hodgkin lymphoma: A time-trend analysis. Blood Cancer Journal. 2021 Apr 29; 11(4):82. doi:10.1038/s41408-021-00472-w. Epub 2021 Apr 29. PMC8085088. Impact Factor: 8.0
56. Sharma A, Badawy SM, Suelzer EM, et al. Correction: Systematic reviews in hematopoietic cell transplantation and cellular therapy: Considerations and guidance from the American Society for Transplantation and Cellular Therapy, European Society for Blood and Marrow Transplantation, and the Center for International Blood and Marrow Transplant Research Late Effects and Quality of Life Working Committee. Bone Marrow Transplantation. 2021 Jun 1; 56(6):1486. doi:10.1038/s41409-021-01316-8. Epub 2021 May 3. Impact Factor: 4.7
57. Scordo M, Wang TP, Ahn KW, et al. Outcomes associated with thiotepa-based conditioning in patients with primary central nervous system lymphoma after autologous hematopoietic cell transplant. JAMA Oncology. doi:10.1001/jamaoncol.2021.1074. Epub 2021 May 6. Impact Factor: 24.7
58. Wang W, Auer P, Zhang T, et al. Impact of epigenomic hypermethylation at TP53 on allogeneic hematopoietic cell transplantation outcomes for myelodysplastic syndromes. Transplantation and Cellular Therapy. doi:10.1016/j.jtct.2021.04.027. Epub 2021 May 13. Impact Factor: *See below
59. Percival M-E, Wang H-L, Zhang M-J, et al. Correction to: Impact of depth of clinical response on outcomes of acute myeloid leukemia patients in first complete remission who undergo allogeneic hematopoietic cell transplantation. Bone Marrow Transplantation. doi:10.1038/s41409-021-01353-3. Epub 2021 May 20. Impact Factor: 4.7
60. Reilly CR, Myllymäki M, Redd RA, et al. The clinical and functional effects of TERT variants in myelodysplastic syndrome. Blood. doi:10.1182/blood.2021011075. Epub 2021 May 21. Impact Factor: 17.5
61. Allan DS. A timely CIBMTR analysis of how cryopreservation impacts allogeneic hematopoietic cell transplantation to apply in the COVID era. Transplantation and Cellular Therapy. 2021 Jun 1; 27(6):446-447. doi:10.1016/j.jtct.2021.05.009. Epub 2021 Jun 1. PMC8205308. Impact Factor: *See below
62. Pearce EE, Horvath S, Katta S, et al. DNA-methylation-based telomere length estimator: Comparisons with measurements from flow FISH and qPCR. Aging (Albany NY). 13(11):14675-14686. doi:10.18632/aging.203126. Epub 2021 Jun 3. PMC8221337. Impact Factor: 4.8

63. Paczesny S, Pasquini MC, Pavletic SZ, et al. Blueprint for the discovery of biomarkers of toxicity and efficacy for CAR T cells and T-cell engagers. *Blood Advances*. 2021 Jun 8; 5(11):2519-2522. doi:10.1182/bloodadvances.2021004604. Epub 2021 Jun 8. Impact Factor: -1
64. Mulroney CM, Bilal Abid M, Bashey A, et al. Incidence and impact of community respiratory viral infections in post-transplant cyclophosphamide-based graft-versus-host disease prophylaxis and haploidentical stem cell transplantation. *British Journal of Haematology*. doi:10.1111/bjh.17563. Epub 2021 Jun 14. Impact Factor: 5.5
65. Kelly DL, Syrjala K, Taylor M, et al. Biobehavioral research and hematopoietic stem cell transplantation: Expert review from the Biobehavioral Research Special Interest Group of the American Society for Transplantation and Cellular Therapy. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2021.06.007. Epub 2021 Jun 15. Impact Factor: *See below
66. Roe D, Vierra-Green C, Pyo C-W, et al. Corrigendum: A detailed view of KIR haplotype structures and gene families as provided by a new motif-based multiple sequence alignment. *Frontiers in Immunology*. 12:724357. doi:10.3389/fimmu.2021.724357. Epub 2021 Jul 1. PMC8282192. Impact Factor: 6.42
67. Saber W, Steinert P, Zhang M-J, et al. A prospective cohort study comparing long-term outcomes with and without palifermin in patients receiving hematopoietic cell transplantation for hematologic malignancies. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2021.06.028. Epub 2021 Jul 2. Impact Factor: 5.77
68. Mock J, Meyer C, Mau L-W, et al. Barriers to access to hematopoietic cell transplantation among patients with acute myeloid leukemia in Virginia. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2021.06.030. Epub 2021 Jul 2. Impact Factor: 5.77
69. Zhou Z, Nath R, Cerny J, et al. Reduced intensity conditioning for acute myeloid leukemia using melphalan- vs busulfan-based regimens: a CIBMTR report. *Blood Adv*. 2020;4(13):3180-3190. *Blood Advances*. 2021 Jul 13; 5(13):2752. doi:10.1182/bloodadvances.2021005193. Epub 2021 Jul 9. PMC8270564. Impact Factor: 6.68
70. Munshi PN, Vesole D, Jurczyszyn A, et al. Erratum to "Age no bar: A CIBMTR analysis of elderly patients undergoing autologous hematopoietic cell transplantation for multiple myeloma." *Cancer*. doi:10.1002/encr.33755. Epub 2021 Jul 13. N/A. Impact Factor: 6.07
71. Wang Y, Zhou W, McReynolds LJ, et al. Prognostic impact of pre-transplant chromosomal aberrations in peripheral blood of patients undergoing unrelated donor hematopoietic cell transplant for acute myeloid leukemia. *Scientific Reports*. 11(1):15004. doi:10.1038/s41598-021-94539-0. Epub 2021 Jul 22. PMC8298542. Impact Factor: 5.13
72. Gooptu M, Romee R, St Martin A, et al. HLA-haploidentical vs matched unrelated donor transplants with posttransplant cyclophosphamide-based prophylaxis. *Blood*. 2021 Jul 22; 138(3):273-282. doi:10.1182/blood.2021011281. Epub 2021 Jul 22. PMC8310426. Impact Factor: 22.11
73. Ciurea SO, Kongtim P, Soebbing D, et al. Decrease post-transplant relapse using donor-derived expanded NK-cells. *Leukemia*. doi:10.1038/s41375-021-01349-4. Epub 2021 Jul 26. Impact Factor: 8.66

74. Lazaryan A, Dolan M, Zhang M-J, et al. Errata Corrige: Impact of cytogenetic abnormalities on outcomes of adult Philadelphia-negative acute lymphoblastic leukemia after allogeneic hematopoietic stem cell transplantation: A study by the Acute Leukemia Working Committee of the Center for International Blood and Marrow Transplant Research. *Haematologica*. 2021 Aug 1; 106(8):2295-2296. doi:10.3324/haematol.2021.279046. Epub 2021 Aug 1. PMC8327734. Impact Factor: 4.70
75. Sajulga R, Madbouly A, Fingerson S, et al. Predicting HLA-DPB1 permissive probabilities through a DPB1 prediction service towards the optimization of HCT donor selection. *Human Immunology*. doi:10.1016/j.humimm.2021.06.010. Epub 2021 Aug 3. Impact Factor: 2.85
76. Marsh RA, Hebert K, Kim S, et al. A comparison of hematopoietic cell transplant conditioning regimens for hemophagocytic lymphohistiocytosis disorders. *Journal of Allergy and Clinical Immunology*. doi:10.1016/j.jaci.2021.07.031. Epub 2021 Aug 7. Impact Factor: 10.79
77. Niederwieser D, Baldomero H, Bazuaye N, et al. One and a half million hematopoietic stem cell transplants: continuous and differential improvement in worldwide access with the use of non-identical family donors. *Haematologica*. doi:10.3324/haematol.2021.279189. Epub 2021 Aug 12. Impact Factor: 4.70
78. Oran B, Ahn KW, Fretham C, et al. Fludarabine and melphalan compared with reduced doses of busulfan and fludarabine improves transplant outcomes in older MDS patients. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2021.08.007. Epub 2021 Aug 14. Impact Factor: 5.77
79. Rangarajan HG, Pereira MSF, Brazauskas R, et al. Donor KIR gene content and KIR-ligand matching and outcomes of pediatric patients with JMML following unrelated donor transplant. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2021.08.009. Epub 2021 Aug 15. Impact Factor: 5.77
80. Hu Z-H, Wang H-L, Gale RP, et al. A SAS macro for estimating direct adjusted survival functions for time-to-event data with or without left truncation. *Bone Marrow Transplantation*. doi:10.1038/s41409-021-01435-2. Epub 2021 Aug 19. Impact Factor: 4.72
81. Munshi PN, Hamadani M, Kumar A, et al. ASTCT, CIBMTR, and EBMT clinical practice recommendations for transplant and cellular therapies in mantle cell lymphoma. *Bone Marrow Transplantation*. doi:DOI: 10.1038/s41409-021-01288-9. Epub 2021 Aug 20. Impact Factor: 4.72
82. Metheny L, Callander NS, Hall AC, et al. Allogeneic transplantation to treat therapy related MDS and AML in adults. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2021.08.010. Epub 2021 Aug 21. Impact Factor: 5.77
83. Riedell PA, Hamadani M, Ahn KW, et al. Outcomes and utilization trends of front-line autologous hematopoietic cell transplantation for mantle cell lymphoma. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2021.08.014. Epub 2021 Aug 24. Impact Factor: 5.77

84. Munshi PN, Hamadani M, Kumar A, et al. American Society of Transplantation and Cellular Therapy, Center of International Blood and Marrow Transplant Research, and European Society for Blood and Marrow Transplantation Clinical Practice recommendations for transplantation and cellular therapies in mantle cell lymphoma. *Transplantation and Cellular Therapy*. 2021 Sep 1; 27(9):720-728. doi:10.1016/j.jtct.2021.03.001. Epub 2021 Aug 24. Impact Factor: 5.77
85. Wagner JE, Ballen KK, Zhang M-J, et al. Comparison of haploidentical and umbilical cord blood transplantation after myeloablative conditioning. *Blood Advances*. doi:10.1182/bloodadvances.2021004462. Epub 2021 Aug 30. Impact Factor: 6.68
86. Orfali N, Zhang MJ, Allbee-Johnson M, et al. Planned granulocyte-colony stimulating factor adversely impacts survival after allogeneic hematopoietic cell transplantation performed with Thymoglobulin for myeloid malignancy. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2021.08.031. Epub 2021 Sep 8. Impact Factor: 5.77
87. Herrera AF, Ahn KW, Litovich C, et al. Autologous and allogeneic hematopoietic cell transplantation for diffuse large B-cell lymphoma-type Richter syndrome. *Blood Advances*. doi:10.1182/bloodadvances.2021004865. Epub 2021 Sep 8. Impact Factor: 6.68
88. Menghrajani K, Gomez-Arteaga A, Madero-Marroquin R, et al. Risk classification at diagnosis predicts post-HCT outcomes in intermediate-, adverse-risk, and KMT2A-rearranged AML. *Blood Advances*. doi:10.1182/bloodadvances.2021004881. Epub 2021 Sep 22. Impact Factor: 6.68
89. Shadman M, Pasquini MC, Ahn KW, et al. Autologous transplant versus chimeric antigen receptor T-cell therapy for relapsed DLBCL in partial remission. *Blood*. doi:10.1182/blood.2021013289. Epub 2021 Sep 27. Impact Factor: 22.11
90. Riedell PA, Hamadani M, Ahn KW, et al. Effect of time to relapse on overall survival in patients with mantle cell lymphoma following autologous haematopoietic cell transplantation. *British Journal of Haematology*. doi:10.1111/bjh.17865. Epub 2021 Sep 28. Impact Factor: 5.67
91. Jimenez Jimenez AM, De Lima M, Komanduri KV, et al. An adapted European LeukemiaNet genetic risk stratification for acute myeloid leukemia patients undergoing allogeneic hematopoietic cell transplant. A CIBMTR analysis. *Bone Marrow Transplantation*. 2021 Dec 1; 56(12):3068-3077. doi:10.1038/s41409-021-01450-3. Epub 2021 Sep 28. Impact Factor: 5.48
92. Pasvolsky O, Yeshurun M, Fraser R, et al. Maintenance therapy after second autologous hematopoietic cell transplantation for multiple myeloma. A CIBMTR analysis. *Bone Marrow Transplantation*. doi:10.1038/s41409-021-01455-y. Epub 2021 Oct 4. Impact Factor: 5.48
93. Bhatt VR, Wang T, Chen K, et al. Chronic Graft-Versus-Host Disease, Non-Relapse Mortality and Disease Relapse in Older versus Younger Adults Undergoing Matched Allogeneic Peripheral Blood Hematopoietic Cell Transplantation: A CIBMTR Analysis. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2021.10.002. Epub 2021 Oct 9. Impact Factor: See Below
94. Cancio M, Hebert K, Kim S, et al. Outcomes in hematopoietic stem cell transplantation for congenital amegakaryocytic thrombocytopenia. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2021.10.009. Epub 2021 Oct 17. Impact Factor: See Below

95. Hamadani M, Gopal AK, Pasquini MC, et al. Allogeneic Transplant and CAR-T Therapy After Autologous Transplant Failure in DLBCL: A Noncomparative Cohort Analysis. *Blood Advances*. doi:10.1182/bloodadvances.2021005788. Epub 2021 Oct 21. Impact Factor: 6.79
96. Phelan R, Im A, Hunter RL, et al. Male-specific late effects in adult hematopoietic cell transplantation recipients: a systematic review from the Late Effects and Quality of Life Working Committee of the Center for International Blood and Marrow Transplant Research and Transplant Complications Working Party of the European Society of Blood and Marrow Transplantation. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2021.10.013. Epub 2021 Oct 29. Impact Factor: 5.77
97. Cusatis R, Flynn KE, Vasu S, et al. Adding centralized electronic patient-reported outcome data collection to an established international clinical outcomes registry. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2021.10.016. Epub 2021 Oct 29. Impact Factor: See Below
98. Fuchs EJ, McCurdy SR, Solomon SR, et al. HLA informs risk predictions after haploidentical stem cell transplantation with post-transplantation cyclophosphamide. *Blood*. doi:10.1182/blood.2021013443. Epub 2021 Nov 1. Impact Factor: 22.11
99. Zou J, Wang T, He M, et al. Number of HLA mismatched eplets is not associated with major outcomes in haploidentical transplantation with post-transplantation cyclophosphamide: A Center for International Blood and Marrow Transplant Research Study. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2021.11.001. Epub 2021 Nov 11. Impact Factor: 5.77
100. O' Donnell PV, Brunstein CG, Fuchs EJ, Zhang M-J, Allbee-Johnson M, Antin JH, Leifer ES, Elmariah H, Grunwald MR, Hashmi H, Horowitz MM, Magenau JM, Majhail NS, Milano F, Morris LE, Rezvani AR, McGuirk JP, Jones RJ, Eapen M. Umbilical cord blood or HLA-haploidentical transplantation: Real world outcomes vs randomized trial outcomes. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2021.11.002. Epub 2021 Nov 11. Impact Factor: 5.77
101. Sidana S, Kumar S, Fraser R, et al. Impact of induction therapy with VRD vs. VCD on outcomes in patients with multiple myeloma in partial response or better undergoing upfront autologous stem cell transplantation. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2021.10.022. Epub 2021 Nov 12. Impact Factor: 5.77
Martin PJ, Levine DM, Storer BE, et al. A model of minor histocompatibility antigens in allogeneic hematopoietic cell transplantation. *Frontiers in Immunology*. 12:782152. doi:10.3389/fimmu.2021.782152. Epub 2021 Nov 18. PMC8636906. Impact Factor: 6.42
102. Tan CR, Estrada-Merly N, Landau H, et al. A second autologous hematopoietic cell transplantation is a safe and effective salvage therapy in select relapsed or refractory AL amyloidosis patients. *Bone Marrow Transplantation*. doi:10.1038/s41409-021-01527-z. Epub 2021 Nov 20. Impact Factor: 5.48
103. Meyers G, Hamadani M, Martens MJ, et al. Lessons learned from early closure of a clinical trial for steroid-refractory acute GVHD. *Bone Marrow Transplantation*. doi:10.1038/s41409-021-01529-x. Epub 2021 Nov 23. Impact Factor: 5.48
104. Luznik L, Pasquini M, Logan B, et al. Randomized Phase III BMT CTN Trial of Calcineurin Inhibitor-Free Chronic Graft-Versus-Host Disease Interventions in Myeloablative Hematopoietic Cell Transplantation for Hematologic Malignancies. *Journal of Clinical Oncology*. doi:10.1200/JCO.21.02293. Epub 2021 Dec 2. Impact Factor: 44.54

105. Hamadani M, Ngoya M, Sureda A, et al. Outcome of allogeneic transplantation for mature t-cell lymphomas: impact of donor source and disease characteristics. *Blood Advances*. doi:10.1182/bloodadvances.2021005899. Epub 2021 Dec 3. Impact Factor: 6.79
106. Epperla N, Hamadani M. Double-refractory Hodgkin lymphoma: tackling relapse after brentuximab vedotin and checkpoint inhibitors. *Hematology / the Education Program of the American Society of Hematology*. 2021 Dec 10; 2021(1):247-253. doi:10.1182/hematology.2021000256. Epub 2021 Dec 10. Impact Factor: 3.06
107. Schetelig J, Baldauf H, Koster L, et al. Corrigendum: Haplotype motif-based models for kir-genotype informed selection of hematopoietic cell donors fail to predict outcome of patients with myelodysplastic syndromes or secondary acute myeloid leukemia. *Frontiers in Immunology*. 2021 Dec 21; 12:813838. doi:10.3389/fimmu.2021.813838. Epub 2021 Dec 21. Impact Factor: 7.56
108. Iqbal M, Savani BN, Hamadani M. New indications and platforms for CAR-T therapy in lymphomas beyond DLBCL. *EJHaem*. 2022 Jan 1; 3(Suppl 1):11-23. doi:10.1002/jha2.323. Epub 2022 Jan 1. Impact Factor: 2.99
109. Martin PJ, Levine D, Storer BE, et al. Genetic associations with immune-mediated outcomes after allogeneic hematopoietic cell transplantation. *Blood Advances*. doi:10.1182/bloodadvances.2021005620. Epub 2022 Jan 7. Impact Factor: 5.48
110. Guru Murthy GS, Kim S, Hu Z-H, et al. Relapse and disease-free survival in patients with myelodysplastic syndrome undergoing allogeneic hematopoietic cell transplantation using older matched sibling donors vs younger matched unrelated donors. *JAMA Oncology*. doi:10.1001/jamaoncol.2021.6846. Epub 2022 Jan 13. Impact Factor: 31.77
111. Xu Y, Kim S, Zhang M-J, et al. Competing risks regression models with covariates-adjusted censoring weight under the generalized case-cohort design. *Lifetime Data Analysis*. doi:10.1007/s10985-022-09546-8. Epub 2022 Jan 15. Impact Factor: 1.58
112. Kim S, Kim J-K, Ahn KW. A calibrated Bayesian method for the stratified proportional hazards model with missing covariates. *Lifetime Data Analysis*. doi:10.1007/s10985-021-09542-4. Epub 2022 Jan 16. Impact Factor: 1.58
113. Murthy HS, Ahn KW, Estrada-Merly N, et al. Outcomes of allogeneic hematopoietic cell transplantation in T-cell prolymphocytic leukemia: a contemporary analysis from the Center for International Blood and Marrow Transplant Research. *Transplantation and Cellular Therapy*. 2022 Feb 8; 6(3):920-930. doi:10.1016/j.jtct.2022.01.017. Epub 2022 Jan 23. Impact Factor: *See Below
114. Hu Z-H, Wang H-L, Gale RP, et al. Correction to: A SAS macro for estimating direct adjusted survival functions for time-to-event data with or without left truncation. *Bone Marrow Transplantation*. doi:10.1038/s41409-021-01533-1. Epub 2022 Feb 1. Impact Factor: 5.48
115. Savani M, Ahn KW, Chen Y, et al. Impact of conditioning regimen intensity on the outcomes of peripheral T-cell lymphoma, anaplastic large cell lymphoma and angioimmunoblastic T-cell lymphoma patients undergoing allogeneic transplant. *British Journal of Haematology*. doi:10.1111/bjh.18052. Epub 2022 Feb 2. Impact Factor: 6.99

116. Mei M, Hamadani M, Ahn KW, et al. Autologous hematopoietic cell transplantation in diffuse large B-cell lymphoma after 3 or more lines of prior therapy: evidence of durable benefit. *Haematologica*. doi:10.3324/haematol.2021.279999. Epub 2022 Feb 3. Impact Factor: 9.94
117. Dispenzieri A, Krishnan A, Arendt B, et al. Mass-Fix better predicts for PFS and OS than standard methods among multiple myeloma patients participating on the STAMINA trial (BMT CTN 0702 /07LT) *Blood Cancer Journal*. 2022 Feb 10; 12(2):27. doi:10.1038/s41408-022-00624-6. Epub 2022 Feb 10. Impact Factor: 11.03
118. Stewart MD, McCall B, Pasquini M, Yang AS, Britten CD, Chuk M, DeClaro RA, George B, Gormley N, Horowitz MM, Kowack E, McCoy C, Morrow PK, Okoye E, Ricafort R, Rossi J, Sharon E, Theoret M, Vegni F, Yu T, Allen J. Need for aligning the definition and reporting of cytokine release syndrome (CRS) in immuno-oncology clinical trials. *Cytotherapy*. doi:10.1016/j.jcyt.2022.01.004. Epub 2022 Feb 23. Impact Factor: 5.41
119. Petersdorf EW, Bengtsson M, Horowitz MM, et al. HLA-DQ heterodimers in hematopoietic-cell transplantation. *Blood*. doi:10.1182/blood.2022015860. Epub 2022 Mar 10. Impact Factor: 23.63
120. St. Martin A, Hebert KM, Serret-Larmande A, et al. Long-term survival after hematopoietic cell transplant for sickle cell disease compared to the United States population. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2022.03.014. Epub 2022 Mar 14. Impact Factor: *See Below
121. Abou-Ismaïl MY, Fraser R, Allbee-Johnson M, et al. Does recipient body mass index inform donor selection for allogeneic haematopoietic cell transplantation? *British Journal of Haematology*. doi:10.1111/bjh.18108. Epub 2022 Mar 14. Impact Factor: 5.67
122. Jimenez Jimenez AM, De Lima M, Komanduri KV, et al. Correction to: An adapted European LeukemiaNet genetic risk stratification for acute myeloid leukemia patients undergoing allogeneic hematopoietic cell transplant. A CIBMTR analysis. *Bone Marrow Transplantation*. doi:10.1038/s41409-022-01625-6. Epub 2022 Mar 16. Impact Factor: 5.48
123. Patel SS, Ahn KW, Khanal M, et al. Non-infectious pulmonary toxicity after allogeneic hematopoietic cell transplantation. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2022.03.015. Epub 2022 Mar 18. Impact Factor: *See Below
124. Baccarani M, Bonifazi F, Soverini S, et al. Questions concerning tyrosine kinase-inhibitor therapy and transplants in chronic phase chronic myeloid leukaemia. *Leukemia*. 2022 May 1; 36(5):1227-1236. doi:10.1038/s41375-022-01522-3. Epub 2022 Mar 25. PMC9061294. Impact Factor: 11.53
125. Correa C, Gonzalez-Ramella O, Baldomero H, et al. Increasing access to hematopoietic cell transplantation in Latin America: Results of the 2018 LABMT activity survey and trends since 2012. *Bone Marrow Transplantation*. 2022 Jun 1; 57(6):881-888. doi:10.1038/s41409-022-01630-9. Epub 2022 Mar 28. Impact Factor: 6.50
126. Maakaron JE, Zhang M-J, Chen K, et al. Age is no barrier for adults undergoing HCT for AML in CR1: Contemporary CIBMTR analysis. *Bone Marrow Transplantation*. 2022 Jun 1; 57(6):911-917. doi:10.1038/s41409-022-01650-5. Epub 2022 Apr 2. PMC9232949. Impact Factor: 5.48

127. Brunstein CG, O'Donnell P, Logan B, et al. Impact of Center Experience with Donor Type on Outcomes: A Secondary Analysis BMT CTN 1101 Open for Accrual June 2012 Open for Accrual June 2012 Transplantation and Cellular Therapy. doi:10.1016/j.jtct.2022.03.024. Epub 2022 Apr 4. Impact Factor: *See Below
128. Morishima Y, Morishima S, Stevenson P, et al. Race and survival in unrelated hematopoietic-cell transplantation. Transplantation and Cellular Therapy. doi:10.1016/j.jtct.2022.03.026. Epub 2022 Apr 8. Impact Factor: *See Below
129. Phelan R, Chen M, Bupp C, et al. Updated trends in hematopoietic cell transplantation in the United States with an additional focus on adolescent and young adult transplantation activity and outcomes. Transplantation and Cellular Therapy. doi:10.1016/j.jtct.2022.04.012. Epub 2022 Apr 18. Impact Factor: *See Below
130. Mei M, Pillai R, Kim S, et al. The mutational landscape in chronic myelomonocytic leukemia and its impact on allogeneic hematopoietic cell transplantation outcomes: a Center for Blood and Marrow Transplantation Research (CIBMTR) analysis. Haematologica. doi:10.3324/haematol.2021.280203. Epub 2022 Apr 21. Impact Factor: 9.94
131. Thanarajasingam G, Minasian LM, Bhatnagar V, et al. Reaching beyond maximum grade: progress and future directions for modernising the assessment and reporting of adverse events in haematological malignancies. The Lancet Haematology. 2022 May 1; 9(5):e374-e384. doi:10.1016/S2352-3026(22)00045-X. Epub 2022 Apr 29. Impact Factor: 18.94
132. Kansagra A, Dispenzieri A, Fraser R, et al. Outcomes after autologous hematopoietic cell transplantation in POEMS syndrome and comparison with multiple myeloma. Blood Advances. doi:10.1182/bloodadvances.2022007218. Epub 2022 May 4. Impact Factor: 5.48
133. Phelan R, Im A, Hunter RL, et al. Male-specific late effects in adult hematopoietic cell transplantation recipients: A systematic review from the Late Effects and Quality of Life Working Committee of the Center for International Blood and Marrow Transplant Research and Transplant Complications Working Party of the European Society of Blood and Marrow Transplantation. Bone Marrow Transplantation. doi:10.1016/j.jtct.2021.10.013. Epub 2022 May 6. Impact Factor: 5.48
134. Hamilton BK, Cutler C, Divine C, et al. Are We Making PROGRESS in Preventing Graft-versus-Host Disease and Improving Clinical Outcomes? Impact of BMT CTN 1301 Study Results on Clinical Practice Transplantation and Cellular Therapy. doi:10.1016/j.jtct.2022.05.002. Epub 2022 May 9. Impact Factor: *See Below
135. D'Souza A, Brazauskas R, Stadtmauer E, et al. Trajectories of quality of life recovery and symptom burden after autologous hematopoietic cell transplantation in multiple myeloma American Journal of Hematology. doi:10.1002/ajh.26596. Epub 2022 May 14. Impact Factor: 10.04
136. Broglie L, Friend BD, Chhabra S, et al. Differential use of the hematopoietic cell transplantation-comorbidity index among adult and pediatric transplant physicians. Leukemia & Lymphoma. doi:10.1080/10428194.2022.2076848. Epub 2022 May 18. Impact Factor: 3.28
137. Pearce EE, Alsaggaf R, Katta S, et al. Telomere length and epigenetic clocks as markers of cellular aging: A comparative study. GeroScience. 2022 Jun 1; 44(3):1861-1869. doi:10.1007/s11357-022-

00586-4. Epub 2022 May 18. PMC9213578. Impact Factor: 7.71

138. Holstein SA, Bhutani M, Hillengass J. Proceedings from the BMT CTN Myeloma Intergroup Workshop on Immune and Cellular Therapy in Multiple Myeloma Transplantation and Cellular Therapy. doi:10.1016/j.jtct.2022.05.019. Epub 2022 May 20. Impact Factor: *See Below
139. Munshi PN, Chen Y, Ahn KW, et al. Outcomes of Autologous Hematopoietic Cell Transplantation in Older Patients with Diffuse Large B Cell Lymphoma. Transplantation and Cellular Therapy. doi:10.1016/j.jtct.2022.05.029. Epub 2022 May 21. Impact Factor: *See Below
140. Jacobson CA, Locke FL, Ma L, et al. Real-world evidence of axicabtagene ciloleucel for the treatment of large B cell lymphoma in the United States. Transplantation and Cellular Therapy. doi:10.1016/j.jtct.2022.05.026. Epub 2022 May 21. Impact Factor: *See Below
141. Arrieta-Bolaños E, Crivello P, He M, et al. A core group of structurally similar HLA-DPB1 alleles drives permissiveness after hematopoietic cell transplantation. Blood. doi:10.1182/blood.2022015708. Epub 2022 May 24. Impact Factor: 22.11
142. Ambinder AJ, Jain T, Tsai HL, et al. HLA-matching with PTCy: A reanalysis of a CIBMTR dataset with propensity score matching and donor age. Blood Advances. doi:10.1182/bloodadvances.2022007741. Epub 2022 May 25. Impact Factor: 5.48
143. Farhadfar N, Ahn KW, Bo-Subait S, et al. The impact of pre-apheresis Health Related Quality of Life on peripheral blood progenitor cell yield and donor's health and outcome: Secondary analysis of Patient-Reported Outcome Data from the RDSafe and BMT CTN 0201 Clinical Trials Transplantation and Cellular Therapy. doi:10.1016/j.jtct.2022.05.042. Epub 2022 Jun 7. Impact Factor: *See Below
144. Osoegawa K, Marsh SGE, Holdsworth R, et al. A new strategy for systematically classifying HLA alleles into serological specificities. HLA. 2022 Sep 1; 100(3):193-231. doi:10.1111/tan.14662. Epub 2022 Jun 22. Impact Factor: 8.76
145. McReynolds LJ, Rafati M, Wang Y, et al. Genetic testing in severe aplastic anemia is required for optimal hematopoietic cell transplant outcomes. Blood. 2022 Aug 25; 140(8):909-921. doi:10.1182/blood.2022016508. Epub 2022 Jul 1. Impact Factor: 22.11
146. Krishnamurti L, Arnold SD, Haight A, et al. Sick Cell Transplantation Evaluation of Long-term and Late Effects Registry (STELLAR) to compare long-term outcomes after hematopoietic cell transplantation to those in siblings without sickle cell disease and in non-transplanted individuals with sickle cell disease: Design and feasibility study. JMIR Research Protocols. 11(7):e36780. doi:10.2196/36780. Epub 2022 Jul 6. PMC9301564. Impact Factor: 7.08
147. Bashir Q, Nishihori T, Pasquini MC, et al. Multicenter phase II, double-blind placebo-controlled trial of maintenance ixazomib after allogeneic transplantation for high-risk multiple myeloma: Results of the BMT CTN 1302 Trial Transplantation and Cellular Therapy. doi:10.1016/j.jtct.2022.07.007. Epub 2022 Jul 12. Impact Factor: *See Below
148. Saliba RM, Majid AA, Pidala J, et al. Characteristics of graft-versus-host disease (GvHD) after post-transplant cyclophosphamide versus conventional GvHD prophylaxis. Transplantation and Cellular Therapy. doi:10.1016/j.jtct.2022.07.013. Epub 2022 Jul 17. Impact Factor: *See Below

149. Lee CJ, Wang T, Chen K, et al. Association of chronic graft-versus-host disease with late effects following allogeneic hematopoietic cell transplantation for children with hematologic malignancy. *Transplantation and Cellular Therapy*. doi:10.1016/j.jtct.2022.07.014. Epub 2022 Jul 18. Impact Factor: *See Below
150. Rotz SJ, Yi JC, Hamilton BK, et al. Health Related Quality of Life in Young Adults Survivors of Hematopoietic Cell Transplantation, Transplantation and Cellular Therapy. doi:10.1016/j.jtct.2022.07.018. Epub 2022 Jul 22. Impact Factor: *See Below
151. DeZern AE, Eapen M, Wu J, et al. Haploidentical bone marrow transplantation in patients with relapsed or refractory severe aplastic anaemia in the USA (BMT CTN 1502): A multicentre, single-arm, phase 2 trial. *The Lancet Haematology*. 2022 Sep 1; 9(9):e660-e669. doi:10.1016/S2352-3026(22)00206-X. Epub 2022 Jul 27. PMC9444987. Impact Factor: 18.95
152. Worel N, Aljurf M, Anthias C, et al. Suitability of haematopoietic cell donors: Updated consensus recommendations from the WBMT standing committee on donor issues. *The Lancet Haematology*. 2022 Aug 1; 9(8):e605-e614. doi:10.1016/S2352-3026(22)00184-3. Epub 2022 Jul 29. Impact Factor: 30.15
153. Feurstein SK, Trottier AM, Estrada-Merly N, et al. Germline predisposition variants occur in myelodysplastic syndrome patients of all ages. *Blood*. doi:10.1182/blood.2022015790. Epub 2022 Aug 19. Impact Factor: 25.48
154. Brown DW, Zhou W, Wang Y, et al. Germline-somatic JAK2 interactions are associated with clonal expansion in myelofibrosis. *Nature Communications*. 13(1):5284. doi:10.1038/s41467-022-32986-7. Epub 2022 Sep 8. PMC9458655. Impact Factor: 17.69
155. Furqan F, Ahn KW, Chen Y, et al. Allogeneic haematopoietic cell transplant in patients with relapsed/refractory anaplastic large cell lymphoma. *British Journal of Haematology*. doi:10.1111/bjh.18467. Epub 2022 Sep 19. Impact Factor: 8.61

* The American Society of Blood and Marrow Transplant was renamed as The American Society of Transplant and Cellular Therapy in 2020. The change led to an update to the name of the society journal from *Biology of Blood and Marrow Transplant* (Impact Factor: 3.9) to the *Journal of Transplant and Cellular Therapy* resulting in a reset of the impact factor.