REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

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1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
01/26/2022	Final Technical Report	October 1, 2019 - September 30, 2021

4. TITLE AND SUBTITLE
Development of Medical Technology for Contingency Response to Marrow Toxic Agents – Final Technical Report with SF298, October 1, 2019 - September 30, 2021

5a. CONTRACT NUMBER
N/A

5b. GRANT NUMBER
N00014-20-1-2705

5c. PROGRAM ELEMENT NUMBER
N/A

6. AUTHOR(S)
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5d. PROJECT NUMBER
N/A

5e. TASK NUMBER
Project 1, 2, 3, 4

5f. WORK UNIT NUMBER
N/A

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
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8. PERFORMING ORGANIZATION REPORT NUMBER
N/A

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Office of Naval Research
875 N. Randolph Street, Suite 1425
Arlington VA 22203-1995

10. SPONSOR/MONITOR'S ACRONYM(S)
ONR

11. SPONSORING/MONITORING AGENCY REPORT NUMBER
N/A

12. DISTRIBUTION AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited

13. SUPPLEMENTARY NOTES
N/A

14. ABSTRACT

1. Contingency Preparedness: 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.

2. Rapid Identification of Matched Donors: Increase operational efficiencies that accelerate the search process and increase patient access are key to preparedness in a contingency event.

3. Immunogenic Studies: Increase understanding of the immunologic factors important in HSC transplantation.

4. Clinical Research in Transplantation**:** Create a platform that facilitates multicenter collaboration and data management.

15. SUBJECT TERMS
Research in HLA Typing, Hematopoietic Stem Cell Transplantation and Clinical Studies to Improve Outcomes

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
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U	U	U		48	19b. TELEPONE NUMBER (*Include area code*) 763-406-4730

Grant Award N00014-20-1-2705

DEVELOPMENT OF MEDICAL TECHNOLOGY FOR CONTINGENCY RESPONSE TO MARROW TOXIC AGENTS

FINAL REPORT

SUBMITTED JANUARY 26, 2022

Office of Naval Research

And

The National Marrow Donor Program®

500 5th St N

Minneapolis, MN 55401

I. Heading

PI: Jeffery Auletta, M.D

N00014-20-1-2705

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. 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.[1] 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.

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

- One new transplant center joined RITN: Baylor University Medical Center, Dallas, TX.
- Co-hosted the Radiation Track at the National Association of County and City Health Officials (NACCHO) annual Preparedness Summit. We were joined by the Department of Energy's Radiation Emergency Assistance Center and Training Site (REAC/TS) and the Advanced Hazmat Life Support organization in this venture to ensure radiation continues to be part of the education agenda.

- Completed development of the RITN Acute Radiation Syndrome (ARS) Cytokine Administration Triage guidelines and shipped hard copies of poster versions and pocket cards to all RITN hospitals as well as to RITN partner organizations.
- Finalized the RITN training videos and posted on the RITN website and the RITN YouTube Channel for access globally:
    - Decontamination and Care for Radiation Disaster Patients
    - Updated: Introduction to RITN
- Initiated and continued collaboration for the Department of Defense through the Uniformed Services University with the American Burn Association to assist with updating combined injury (Burn and acute radiation syndrome) treatment guidelines for use in the forward operations setting.
- Completed the creation of adult and pediatric medical orders in the Epic Electronic Medical Record System, which is scheduled to be deployed worldwide in February 2021
- Supported Gryphon Scientific CDC funded project to assess United States laboratory capabilities for ionizing radiation related testing.
- Continued to develop the Hospital Radiation Morbidity Toolkit as part of the CDC grant awarded to RITN.

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.

Supported HLA typing of 142,179 newly registered volunteer donors between October 1, 2019 and September 30, 2021.

Modeling and analysis of registry coverage for the Warfighter

Due to potential radiation emergencies that the Warfighter may encounter, it is important to model and analyze the potential to provide warfighters with cellular therapy. In this work we created synthetic HLA haplotype frequencies based on known racial/ethnic groups of warfighters from 2017 published demographics. Then we prepare for calculation of the likelihood of finding a potential donor in the Be The Match Registry for known warfighter demographic distributions. To examine potential emergency scenarios, we created synthetic multilocus unphased genotypes (MUGs) from the warfighter HLA haplotype frequencies to identify gaps in likelihood of potential donors available for warfighter treatment.

Warfighter Study Population

We considered the population of 2,103,415 individuals in the military force reported in a 2017 demographic profile of US warfighters. There are six race groups of the warfighter- White, Native Hawaiian/Pacific Islander, Black/African American, Asian, American Indian/Alaska, and Hispanic. The number of individuals of each race group is listed in Table 1.

Note that there are 73,691 individuals in the military force reported as other/unknown race, so we did not take into account these individuals in the modeling and analysis. We also considered five age groups: 25 years or younger, 26 to 30 years, 31 to 35 years, 36 to 40 years, and 41 years or older. The percentages of the warfighter population that are in these age groups are 40.3, 20.6, 15.5, 11.0, and 12.6, respectively. As the age distribution for the individual racial/ethnic groups in the warfighter community are unspecified, we used these percentages to generate population subsets for each age group, as shown in Table 2.

Table 1. Race of the military force

Race Group	**Population**
White	1,487,237
Native Hawaiian/Pacific Islander	19,990
Black or African American	356,870
Asian	91,943
American Indian or Alaska	21,526
Hispanic	294,003

Table 2. Age group and population distribution of the military force

Race Group	**Y25L**	**Y26-30**	**Y31-35**	**Y36-40**	**Y41G**
White	599,356	306,371	230,522	163,596	187,392
Native Hawaiian/Pacific Islander	8,056	4,118	3,098	2,199	2,519
Black or African American	143,818	73,515	55,315	39,256	44,966
Asian	37,053	18,940	14,251	10,114	11,585
American Indian or Alaska	8,675	4,434	3,337	2,368	2,712
Hispanic	118,483	60,565	45,571	32,340	37,044

Be The Match Registry

According to final inventory and adult donor models in 2017, National Marrow Donor Program® (NMDP) /Be The Match maintains a registry of 18,267,161 adult donor registrants as of December 31, 2016. We considered HLA haplotype frequencies of 8 U.S. racial and ethnic groups to generate synthetic haplotype frequencies for the warfighter population.

HLA Match Definitions

We consider an HLA-matching model with high-resolution matching at HLA-A, HLA-B, HLA-C, and HLA-DRB1. We have 8/8 HLA matching when we have matches at all of these loci and we consider a single-allele mismatch at any of these loci in case of 7/8 HLA matching.

Estimating Match Rates for the Donor Race Categories

Before we estimated the match rates of the warfighter, we calculated the match rates of the 21 donor populations. Table 3 lists the detailed race groups of the 21 donor populations.

Table 3. Detailed race groups of Be The Match Registry

Race code	Detailed race/ethnic description
AAFA	African American
AFB	African
AINDI	South Asian Indian
AISC	American Indian – South or Central Am.
ALANAM	Alaska native or Aleut
AMIND	North American Indian
CARB	Caribbean Black
CARHIS	Caribbean Hispanic
CARIBI	Caribbean Indian
EURCAU	European Caucasian
FILII	Filipino
HAWI	Hawaiian or Other Pacific Islander
JAPI	Japanese
KORI	Korean
MENAFC	Middle Eastern or N. Coast of Africa
Race code	**Detailed race/ethnic description**

MSWHIS	Mexican or Chicago
NCHI	Chinese
SCAHIS	Hispanic – South or Central American
SCAMB	Black – South or Central American
SCSEAI	Southeast Asian
VIET	Vietnamese

Estimating Match Rates for the Warfighter Race Categories

To estimate the match rates for the warfighter population, we mapped known warfighter race and ethnic groups back to BTM Registry race codes. Table 4 lists the Be The Match donor registry race groups used to create haplotype frequencies of the warfighters.

Table 4. Race groups of Be The Match Registry used to create race groups of the warfighters.

Warfighter Racial/Ethnic Group	**Be The Match Registry Race code**
White	MENAFC + NAMER (EURCAU)
Native Hawaiian/Pacific Islander	HAWI
Black or African American	AAFA + AFB + CARB + SCAMB
Asian	AINDI + FILII + JAPI + KORI + NCHI + SCSEAI + VIET
American Indian or Alaska	AISC + ALANAM + AMIND + CARIBI
Hispanic	CARHIS + MSWHIS + SCAHIS

Adult-donor Match Likelihood for 21 donor populations

Table 5 lists the 8/8 and 7/8 match rates for the 21 donor populations. The highest and lowest match rates were found for European Caucasian and African, respectively.

Table 5. Match rates of the 21 donor populations

Race code	8/8 Match (%)	7/8 Match (%)
AAFA	22	74
AFB	18	71
AINDI	37	87
AISC	52	88
ALANAM	57	89
AMIND	62	95
CARB	21	74
CARHIS	50	91
CARIBI	41	85
FILII	48	89
HAWI	37	81
JAPI	44	89
KORI	43	88
MENAFC	52	92
MSWHIS	49	90
NAMER (EURCAU)	79	99
NCHI	45	88
SCAHIS	40	85
SCAMB	40	81
SCSEAI	32	80
VIET	48	86
AAFA	22	74

Here we identified the likelihood of finding an unrelated donor on the Be The Match registry to provide an estimate for providing cellular therapy to warfighters in the event of radiation exposure. We also identified gaps in warfighter population coverage that will assist in targeted future recruitment efforts to address deficiencies. There are some limitations of this work, and we have room for improvement. To model and analyze registry coverage, we assumed 100% adult donor availability. Availability is the percentage of donors that will agree to donate if they are a match. Sometimes donors refuse or are unable to donate despite

being a match, and this availability rate varies by population. In future we will regenerate match rates while taking into account the actual percentage of donor availability. Currently, we do not have actual HLA data and age-specific population distributions for the warfighter population. However, we can refresh this calculation upon obtaining any new HLA frequencies and actual population distributions for warfighters. We also plan to revamp our methods to redefine and re-estimate match rates, including consideration for greater mismatches and improved population detail to revisit assumptions.

Development of science and technology for rapid communication of HLA data

A virtual Data Standards Hackathon was held April 23-25, 2020. This was a global event over 48-hours. 52 people asked to be part of it, nine from NMDP, 29 from academia, registries or health organizations, and 14 from companies. Exactly half the attendees were attending their first DaSH. There were people in eight time zones, with a 16-hour spread. We used slack, GitHub and video conferencing to collaborate.

All respondents who answered the question said they wanted another virtual hackathon. It is likely that more people are interested in attending such a low-cost event than will actually have the time to code or discuss things. This is to be expected of virtual hackathons, even when not during a pandemic. The number of active attendees is about the average of all previous DaSHes. The main accomplishments during this event was to develop standards and system systems for processing electronic HLA messages for the 18th IHIW (http://www.ihiw18.org) and enhancements to a system for automated annotation of HLA sequences as part of the Gene Feature Enumeration Project (https://github.com/orgs/nmdp-bioinformatics/projects/1).

A Data Standards Hackathon and symposium was held on September 16-18, 2020. The symposium involved 13 talks and was open to the public. The agenda was focused on HL7-FHIR implementation and rapid communication of HLA. These talks were attended by 52 individuals: 28 from NMDP, 5 from industry and 19 from government or academic health centers.

The hackathon was attended by 25 participants: 13 NMDP employees, 4 industry partners and 8 from government or academic health centers. The main topics of the hackathon was testing messages from industry partners and vetting a new data format for HLA antibody testing.

Oral Presentations: Title and Speaker

- Data Transformation Initiative — Kristina Bloomquist
- Introduction to FHIR, ONC & CMS Rules — Lloyd McKenzie
- Roadmap to R5 — Lloyd McKenzie
- CIBMTR Reporting App Update — Kirt Schaper
- FHIR Implementation Guides: Tooling — Lloyd McKenzie
- HL7 Genomics Reporting IG — Bob Milius
- S4G Phase 3: HLA Reporting IG — Bob Milius
- HML Gateway — Miranda Bauer
- Converting Proprietary HLA format to FHIR — Bob Milius
- HML2FHIR Update — Bob Milius

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

A manuscript entitled "HLA Haplotype Frequency Estimation for Heterogeneous Populations Using a Graph- Based Imputation Algorithm" was published in Human Immunology during this grant period. This paper describes methods, developed under this grant, to address limitations of the population genetics models upon which current donor selection algorithms are based. Specifically, the assumption that an individual's genetic background can be linked to one population. The paper demonstrates a new method that addresses individuals who are multi-racial or where race information is unknown and allows this information to be imputed in the expectation step of the population "expectation maximization" algorithm. The result of applying this new method to multiple data sets is that this new method produces much higher likelihood values and better haplotype recovery than all evaluated EM implementations (including our own methods). This method can be applied to generating new frequencies which we believe result in a direct improvement in matching accuracy for populations that are currently underserved by this therapy.

A manuscript entitled "Excess homozygosity in HLA alleles and haplotypes at mating and population levels" was submitted to Frontiers in Immunology. This study evaluates the population genetics of HLA in the US population where we find excess homozygosity in all non-African populations and all loci. This excess can be the result of preferential mating, population substructure, and perhaps transmission imbalance in chromosome 6. In Asian populations, even stronger homophily is observed in HLA that present epitopes involved in NK cell education through KIR and the C2 and Bw4 KIR binding motifs in combination with the leader peptide of HLA-B. This finding is relevant for understanding HLA at population levels and modeling registry growth and matching since many current population genetics methods assume Hardy-Weinberg Equilibrium in the distribution of HLA genotypes. Population substructure and natural selection driven by regulation of the immune system, observable in generational transmission bias of HLA, result in substantial deviation from an equilibrium state which needs to be accounted for when analyzing HLA in US populations.

New HLA haplotype frequencies were generated from the NMDP registry database. These frequencies are the first to extend to the HLA-DPB1, -DPA1 and -DQA1 loci and are the largest cohorts analyzed to date (23.5M total, 10.4M). This data will be prepared for publication.

A manuscript entitled "Optimal donor selection for hematopoietic cell transplantation using Bayesian machine learning" was published in the Journal of Clinical Oncology Clinical Cancer Informatics describing the results of machine learning experiments to assign risk of clinical endpoints (180 day survival and acute Graft vs Host Disease) on a per donor and per patient basis. The main finding of the study is that upon re-evaluation of searches that resulted in an 8/8 allele matched adult unrelated donor transplant from the period 2015-2016 an achievable improvement was possible with 10% of patients where a risk reduction of ~5% was possible with a younger available donor. This work is being extended in the current grant period to extended to a larger and more recent cohort (2016-2018) and focusing on the 4 clinical endpoints at the 1-year milestone that constitute "Event Free Survival" (death, relapse, rejection and moderate-to-severe chronic Graft vs Host Disease).

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 selected >8,600 pairs for enrollment in the project and used grant funds to support approximately half of the typing costs. All selected sample pairs have shipped to the project laboratory for testing. All results were received prior to Sept. 30, 2020 and efforts to finalize the data audit were completed under the FY21 grant.

Full HLA Gene Matching Analysis

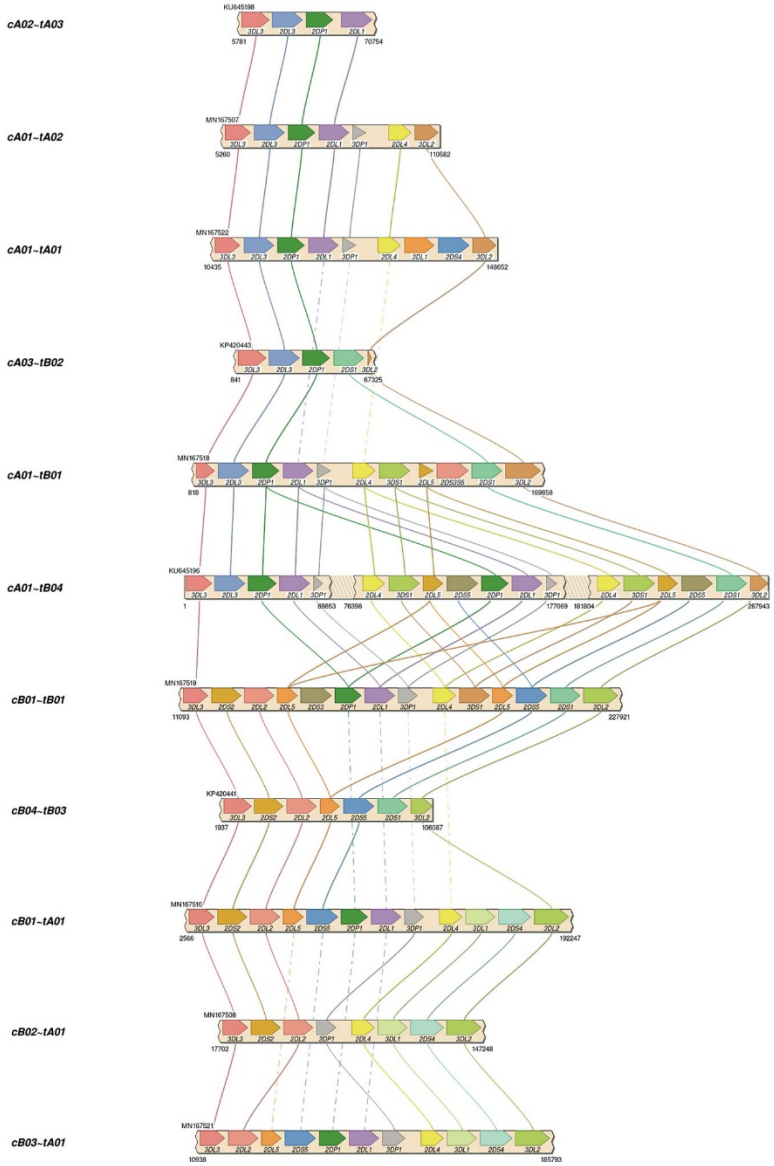
Completed the analysis for the study IB19-01: Impact of ultra-high resolution (UHR) HLA matching on the outcome of unrelated donor hematopoietic cell transplantation. The manuscript entitled, "Impact of previously unrecognized HLA mismatches using ultrahigh resolution typing in unrelated donor hematopoietic cell transplantation" was accepted and published in the Journal of Clinical Oncology. Summary of findings:

a. UHR matching was not associated with the primary outcome of overall survival in the T cell deplete, T cell replete or full cohort.
b. 12/12 UHR matching was associated with lower aGVHD2-4 compared to <=11/12 UHR matched.
c. TCE non-permissive mismatch was associated with worse aGVHD2-4 than matched: HR=1.26 (1.10,1.45), P=0.0007.
d. The combination of TCE and CMV 'TCE_CMV' was associated with OS, TRM, DFS and relapse in various models (full cohort, TCD and T replete). Although highly statistically significant they are not consistent with hypothesized biologic mechanisms.
e. The HLA-DPB1 TCE effect was weaker than previously observed in CIBMTR studies (Pidala et al Blood 2014) HR 1.2 vs. 1.08 for permissive vs. non-permissive mismatching. A post-hoc power calculation suggests that a sample size of N=21,267 would be required to detect a difference at the 0.05 significance level with 80% power. Study team reviewing differences between the Pidala and current cohort to identify factors that could have influenced the impact of DPB1-TCE matching.

Develop and mature typing protocols for the highly polymorphic KIR.

A manuscript "Efficient Sequencing, Assembly, and Annotation of Human KIR Haplotypes" has been published in Frontiers in Immunology. This study was supported under this grant and is a collaboration with industry partners to deliver a new typing protocol for the highly polymorphic KIR. This method addresses the limitations inherent in "shotgun" based methods by using hybrid probe capture to sequence large (2-8k) fragments of DNA on a new sequencing platform and assembling these in a way that preserves two inherited genomic segments without ambiguity. This method has been shown to provide results that are concordant with more expensive methods for Fosmid cloning and sequencing at < $1/10^{th}$ of the price. With continued support we hope to further multiplex this method to achieve another order of magnitude drop in price which will allow large research cohorts to be fully characterized at the genomic level in this highly polymorphic and structurally varying region for the first time.

The figure from the paper and depicted below, shows the genomic arrangements observed in a set of eight European and eight African donors. The variation in terms of deletions and duplications of entire chromosomal segments is substantial. Investigation of the clinical impact of this structural and allele variation, especially its role in hematopoietic stem cell transplantation, has not been possible at this scale until now.



During the grant period we completed an analysis of genomic data from 48 donor samples typed using a long-read sequencing method developed under this grant. This method had previously been shown to efficiently capture, sequence, and assemble diploid human KIR genomes on 16 individuals. This method has been adapted to a new long-read sequencing platform (PacBio Sequel) and multiplexing has been introduced to reduce costs substantially. Although analysis is ongoing, preliminary results of the KIR allele calls were found to be sufficiently concordant with previous typing results using targeted gene sequencing protocols. Based on these results, we have proposed scaling this approach to 200 samples. Scaling of this assay and analysis pipeline will provide an opportunity to evaluate the clinical impact the genomic structure and, for the first time, the intergenic and regulatory aspects of KIR which have not been evaluated clinically to date.

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

- Completed the preliminary analysis for the study entitled "GV19-01: Exploring the link between donor-engrafted clonal hematopoiesis and adverse outcomes in allogeneic hematopoietic cell transplant recipients: Pilot study".
- The detected CHIP frequency was ~10% vs. the expected 15% rate used for the power calculations. Leaving the study underpowered.
- No associations were found between the presence of donor CHIP and any clinical outcomes in either univariate (see Table 6 below) or multivariate analysis (data not shown).
- CHIP was called at VAF >0.02 for preliminary analysis, which aligns with prior published studies of CHIP in allogeneic transplantation. The study team has been evaluating approaches to produce accurate calls at VAF <0.02. This could increase the CHIP frequency, but with no hint of any associations at the current VAF it is unclear whether this will impact the current results.
- The lack of an association between CHIP and any clinical outcomes in the present analysis and other studies has diminished enthusiasm for further investigation of CHIP as a donor selection factor.

Table 6: Univariate results of GV19-01: Exploring the link between donor-engrafted clonal hematopoiesis and adverse outcomes in allogeneic hematopoietic cell transplant recipients: Pilot Study

	CHIP+ (N = 30)		CHIP- (N = 269)		
Outcomes	**N**	**Prob (95% CI)**	**N**	**Prob (95% CI)**	**P Value**
Overall survival	30		269		0.882
100-day		83.3 (68.2-94.3)%		94.4 (91.4-96.8)%	
6 months		76.7 (60.2-89.8)%		85.9 (81.5-89.8)%	
1-year		76.7 (60.2-89.8)%		68.8 (63.1-74.2)%	
Disease free survival	30		267		0.898
100-day		73.3 (56.4-87.3)%		86.9 (82.6-90.7)%	
6 months		70 (52.7-84.8)%		69.7 (64-75)%	
1-year		63.3 (45.6-79.4)%		56.9 (51-62.8)%	
Relapse	30		267		0.173
100-day		13.3 (3.6-27.9)%		9.4 (6.2-13.1)%	
6 months		13.3 (3.6-27.9)%		22.1 (17.3-27.3)%	
1-year		20 (7.7-36.3)%		30 (24.6-35.6)%	
Treatment related mortality	30		267		0.165
100-day		13.3 (3.6-27.9)%		3.7 (1.8-6.4)%	
6 months		16.7 (5.6-32.2)%		8.2 (5.2-11.8)%	
1-year		16.7 (5.6-32.2)%		13.1 (9.3-17.4)%	
Chronic GVHD	30		268		0.496
100-day		0%		2.6 (1-4.9)%	
6 months		10 (1.9-23.4)%		17.2 (12.9-22)%	
1-year		NE		41 (35.2-47)%	

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 are not limited to, incidence of acute and chronic GVHD, primary disease relapse, TRM, and DFS.

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.

The study protocol was finalized, a testing laboratory selected and the immunophenotyping panel established during the grant year. The study will continue under future grants.

D. Clinical Research in Transplantation

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

Observational Research

- Published a total of 174 manuscripts in peer-reviewed journals during the grant period (Oct. 1, 2019-September 30, 2021).
- Presented 12 oral and 13 poster abstracts at the American Society of Hematology Annual Meeting. A list of the presentations is provided in the table below. Complete abstracts were published in the Nov. 13, 2019 issue of Blood (https://ashpublications.org/blood/issue/134/Supplement_1).

Title	***Status***	***Presenter***
Fludarabine and Melphalan Compared with Reduced Doses of Busulfan and Flurabine Improves Transplant Outcomes in Older MDS Patients	**Oral**	Betul Oran
Primary Plasma Cell Leukemia Outcomes Remain Dismal Despite Novel Agents and Hematopoietic Cell Transplantation	**Oral**	Sagar Patel
Superior Survival with Post-Remission Pediatric-Inspired Chemotherapy Compared to Myeloablative Allogeneic Hematopoietic Cell Transplantation in Adolescents and Young Adults with Ph-Negative Acute Lymphoblastic Leukemia in First Complete Remission: Comparison of CALGB 10403 to Patients Reported to the CIBMTR	**Oral**	Matthew Wieduwilt
Comparison of Reduced-Intensity Conditioning (RIC) Regimens for Allogeneic Hematopoietic Cell Transplantation (alloHCT) in Non-Hodgkin Lymphomas (NHL)-a Center for International Blood & Marrow Transplant Research (CIBMTR) Analysis	**Oral**	Nilanjan Ghosh
Allogeneic Hematopoietic Stem Cell Transplantation for Therapy-Related Myelodysplastic Syndromes and Acute Myeloid Leukemia	**Poster**	Leland Metheny
Lower Hematopoietic Progenitor Cell Counts and Yields at Subsequent Donations Is Influenced By a Shorter Inter-Donation Interval between the First and Subsequent Mobilizations	**Poster**	Sandhya Panch
Busulfan, Melphalan, and Bortezomib Compared to Single Agent High- Dose Melphalan As a Conditioning Regimen for Autologous Hematopoietic Stem Cell Transplantation in Multiple Myeloma: Long Term Follow up of a Novel Conditioning Regimen	**Poster**	Patrick Hagen
Genome-Wide Association Study Identifies an Immune-Related Etiology for Severe Aplastic Anemia	**Poster**	Sharon Savage

De Novo and Therapy-Related Acute Myeloid Leukemia and Myelodysplastic Syndrome: Similarities and Differences in SNP-Array Detected Chromosomal Aberrations in Pre-Transplant Blood Samples	**Poster**	Youjin Wang
Allogeneic Transplantation for Myelodysplastic Syndrome in Adults over 50 Years Old Using Reduced Intensity/Non-Myeloablative Conditioning: Haploidentical Relative Versus Matched Unrelated Donor	**Poster**	Michael Grunwald
Impact of Renal Dysfunction Measured By Estimated Glomerular Filtration Rate (eGFR) on Outcomes after Allogeneic Hematopoietic Cell Transplantation (HCT)	**Poster**	Ajoy Dias
Comparison of Reduced-Intensity Conditioning (RIC) Regimens for Allogeneic Hematopoietic Cell Transplantation (alloHCT) for Classical Hodgkin Lymphoma (cHL):a Center for International Blood & Marrow Transplant Research (CIBMTR) Analysis	**Poster**	Sairah Ahmed
Tisagenlecleucel Chimeric Antigen Receptor (CAR) T-Cell Therapy for Relapsed/Refractory Children and Young Adults with Acute Lymphoblastic Leukemia (ALL): Real World Experience from the Center for International Blood and Marrow Transplant Research (CIBMTR) and Cellular Therapy (CT) Registry	**Poster**	Stephan Grupp
Early Broad-Spectrum Antibiotics and Risk of Acute Graft-Versus-Host Disease in Children: an analysis from the Center for International Blood and Marrow Transplantation Research (CIBMTR) and the Pediatric Health Information System (PHIS)	**Oral**	Caitlin Elgarten
Excellent Overall Survival and Low Incidence of Late Effects in Patients Undergoing Allogeneic Hematopoietic Cell Transplant for Sickle Cell Disease: A Report from the Center for International Blood and Marrow Transplant Research (CIBMTR)	**Oral**	Elizabeth Stenger
Post-Transplant Work Status of Young Adult Survivors of Allogeneic Hematopoietic Cell Transplant: A Report from the Center for International Blood and Marrow Transplant Research (CIBMTR)	**Oral**	Neel A. Bhatt
Post-Marketing Use Outcomes of an Anti-CD19 Chimeric Antigen Receptor (CAR) T Cell Therapy, Axicabtagene Ciloleucel (Axi-Cel), for the Treatment of Large B Cell Lymphoma (LBCL) in the United States (US)	**Oral**	Marcelo Pasquini
Breaking the Glass Ceiling of Age in Transplant in Multiple Myeloma	**Oral**	Pashna N. Munshi
Novel Prognostic Scoring System for Autologous Hematopoietic Cell Transplantation (AHCT) in Multiple Myeloma (MM)	**Oral**	Binod Dhakal
Tisagenlecleucel Chimeric Antigen Receptor (CAR) T-Cell Therapy for Adults with Diffuse Large B-Cell Lymphoma (DLBCL): Real World Experience from the Center for International Blood & Marrow Transplant Research (CIBMTR) Cellular Therapy (CT) Registry	**Oral**	Samantha Jaglowski

Does Addition of Rituximab® to BEAM Conditioning Improve Outcomes of Patients with Diffuse Large B-Cell Lymphoma (DLBCL) Undergoing Autologous Hematopoietic Cell Transplantation (auto-HCT)?	**Oral**	Deepa Jagadeesh
Impact of Depth of Pretransplant Clinical Response on Outcomes of Acute Myeloid Leukemia Patients in First Complete Remission (AML-CR1) Who Undergo Allogeneic Hematopoietic Cell Transplantation (AlloHCT)	**Poster**	Mary-Elizabeth Percival
Cognitive Impairment Is Associated with Inferior Survival and Increased Non-Relapse Mortality in Older Allogeneic Hematopoietic Cell Transplant (alloHCT) Recipients: A Multicenter Retrospective Study	**Poster**	Rebecca Olin
Myeloablative Conditioning Is Preferred for Allogeneic Transplantation of Acute Myeloid Leukemia and Myelodysplastic Syndromes with Low/Intermediate but Not High Disease Risk Index	**Poster**	Nelli Bejanyan
Genome Wide Interaction Analysis Identifies Expression Quantitative Trait Loci Associated with Reduced Survival after Reduced Intensity Conditioning HLA-Matched Unrelated Donor Allogeneic Hematopoietic Cell Transplant	**Poster**	Ezgi Karaesmen

- Presented 14 oral and 8 poster abstracts at the Transplant and Cellular Therapy Annual Meeting. A list of the presentations is provided in the table below. Complete abstracts were published in the March 2020 issue of Biology of Blood and Marrow Transplant (https://www.bbmt.org/issue/S1083-8791(19)X0014-2).

Title	***Status***	***Presenter***
Higher Total Body Irradiation (TBI) Dose-Intensity in Fludarabine (Flu)/TBI-Based Reduced-Intensity Conditioning (RIC) Regimen Is Associated with Inferior Survival in Non-Hodgkin Lymphoma (NHL) Patients Undergoing Allogeneic Hematopoietic Cell Transplantation (alloHCT).	**Oral**	Mehdi Hamadani
MLL-Rearranged AML Is Associated with Poor Outcomes As Compared to Patients with Intermediate- and Adverse-Risk Disease: A CIBMTR Study of 3779 Adult Patients	**Oral**	Kamal Menghrajani
Long-Term Follow up of BMT CTN 0901, a Randomized Phase III Trial Comparing Myeloablative (MAC) to Reduced Intensity Conditioning (RIC) Prior to Hematopoietic Cell Transplantation (HCT) for Acute Myeloid Leukemia (AML) or Myelodysplasia (MDS) (MAvRIC Trial)	**Oral**	Bart L. Scott
Impact of Genetic Mutations on the Outcomes of Allogeneic Hematopoietic Cell Transplantation in Patients with Acute Myeloid Leukemia with Antecedent Myeloproliferative Neoplasm	**Oral**	Vikas Gupta

Prognostic Impact of Pre-Transplant Chromosomal Aberrations Detected By SNP-Array in Patients Undergoing Unrelated Donor Hematopoietic Cell Transplant for Acute Myeloid Leukemia	**Oral**	Youjin Wang
Development of the Renal Adjusted Hematopoietic Cell Transplant Comorbidity Index (RA-HCT-CI) Using Different Levels of Renal Dysfunction According to Estimated Glomerular Filtration Rate (eGFR)	**Poster**	Nosha Farhadfar
Hematopoietic Cell Transplantation (HCT) Followed By Solid Organ Transplantation (SOT) and SOT Followed By HCT: A Descriptive Analysis of Patients Undergoing Sequential Transplantation in the United States	**Poster**	Meera Gupta
Hematopoietic Cell Transplantation (HCT) Predictions for the Year 2023	**Poster**	Nosha Farhadfar
Acute Graft-Versus-Host Disease Is Less Severe and Associated with Lower Non-Relapse Mortality after Haploidentical Transplantation with Post-Cyclophosphamide Prophylaxis	**Oral**	Rima M. Saliba
A Qualitative Study of State Medicaid Coverage Benefits for Allogeneic Hematopoietic Cell Transplantation (alloHCT) for Patients with Sickle Cell Disease (SCD)	**Oral**	Tatenda G. Mupfudze
Transplant Physicians' Attitudes on Candidacy for Allogeneic Hematopoietic Cell Transplantation (HCT) in Older Patients: The Need for a Standardized Geriatric Assessment (GA) Tool	**Oral**	Asmita Mishra
Evaluation of Tumor Vaccine Generation in a Phase II Multicenter Trial of Single Autologous Hematopoietic Cell Transplant (AutoHCT)Followed By Lenalidomide Maintenance for Multiple Myeloma (MM) with or without Vaccination with Dendritic Cell/ Myeloma Fusions (DC/MM fusion vaccine): Blood and Marrow Transplant Clinical Trials Network (BMT CTN) 1401	**Oral**	David E. Avigan
Transplantation Using Bone Marrow from a (very) HLA Mismatched Unrelated Donor in the Setting of Post-Transplant Cyclophosphamide Is Feasible and Expands Access to Underserved Minorities	**Poster**	Bronwen Shaw
Comparison of Haploidentical Related Donor with Post-Transplant Cyclophosphamide (PTCy) and Umbilical Cord Blood (UCB) Transplantation after Myeloablative Conditioning for Hematological Malignancy	**Poster**	John E. Wagner

Incidence and impact of Non-CMV herpes viral infection in Haploidentical and Matched Sibling Donors receiving Post-transplant Cyclophosphamide (PTCy): A CIBMTR Analysis.	**Poster**	Anurag K. Singh
BMT CTN 1803: Trial to Investigate If Haploidentical Natural Killer Cells (CSTD002) Prevent Post-Transplant Relapse in AML and MDS (NK-REALM)	**Poster**	Sumithira Vasu
Incidence and Impact of Cytomegalovirus Infection in Haploidentical and Matched-Related Donors Receiving Post-Transplant Cyclophosphamide (PTCy): A CIBMTR Analysis	**Oral**	Scott R. Goldsmith
Feasibility of Centralized Electronic Patient-Reported Outcome (ePRO) Collection By an Outcome Registry, a CIBMTR Study of Patients on the Centers for Medicaid & Medicare Coverage with Evidence Development (CMS CED) Myelodysplasia Protocol	**Oral**	Bronwen Shaw
Incidence and Impact of Community Respiratory Viral Infection (CRV) in Haploidentical and Matched Sibling Donors receiving post-transplant Cyclophosphamide (PTCy): A CIBMTR analysis	**Oral**	Randy Taplitz
HLA Genotyping Does Not Predict Outcomes in Hematopoietic Cell Transplantation (alloHCT)	**Oral**	Charlotte Story
Results of Blood and Marrow Transplant Clinical Trials Network Protocol 1101 a Multicenter Phase III Randomized Trial of Transplantation of Double Umbilical Cord Blood Vs. HLA-Haploidentical -Related Bone Marrow for Hematologic Malignancy	**Oral**	Claudio G. Brunstein

- Presented 24 abstracts to the 2020 American Society of Hematology Annual Meeting. All were accepted with 9 assigned to oral presentations and 15 as poster presentations. The study titles, presentation type and presenting author are noted below. Complete abstracts were published in the Nov. 5, 2020 issue of Blood (https://ashpublications.org/blood/issue/136/Supplement%201).

Study Title	***Presentation type***	***Presenting author***
A Multi-Center Biologic Assignment Trial Comparing Reduced Intensity Allogeneic Hematopoietic Cell Transplantation to Hypomethylating Therapy or Best Supportive Care in Patients Aged 50-75 with Advanced Myelodysplastic Syndrome: Blood and Marrow Transplant Clinical Trials Network Study 1102	**Oral**	Corey Cutler

Comparison of Outcomes after Haploidentical Relative and HLA Matched Unrelated Donor Transplantation with Post-Transplant Cyclophosphamide Containing Gvhd Prophylaxis Regimens	**Oral**	Mahasweta Gooptu
Impact of Cryopreservation of Donor Grafts on Outcomes of Allogeneic Hematopoietic Cell Transplant (HCT)	**Oral**	Jack Hsu
Comparison of Haploidentical Donor Hematopoietic Cell Transplantation Using Post-Transplant Cyclophosphamide to Matched-Sibling, Matched-Unrelated, Mismatched-Unrelated, and Umbilical Cord Blood Donor Transplantation in Adults with Acute Lymphoblastic Leukemia: A CIBMTR Study	**Oral**	Matthew Wieduwilt
Chromosomal Aberrations in Pre-HCT Blood Samples and Outcomes after Transplantation in Patients with Myelofibrosis	**Oral**	Youjin Wang
Expanded Comorbidity Definitions Improve Application of the Hematopoietic Cell Transplantation Comorbidity Index (HCT-CI) for Children and Young Adults with Non-Malignant Diseases Receiving Allogeneic Hematopoietic Cell Transplantation	**Oral**	Larisa Broglie
Superiority of Thiotepa-Containing Conditioning Regimens in Patients with Primary Diffuse Large B-Cell Lymphoma (DLBCL) of the Central Nervous System (CNS) Undergoing Autologous Hematopoietic Cell Transplantation (autoHCT)	**Oral**	Trent Wang
Population Distribution of GvL and GvH Minor Histocompatibility Antigens	**Oral**	Kelly Olsen
Allogeneic Hematopoietic Cell Transplantation (allo-HCT) in T-Cell Prolymphocytic Leukemia (T-PLL): An Analysis from the CIBMTR	**Poster**	Hemant Murthy
Impact of Age on the Outcomes of HCT for AML in CR1: Promising Therapy for Older Adults	**Poster**	Joseph Maakaron
Improving Donor Selection for Haploidentical Stem Cell Transplantation with Post-Transplant Cyclophosphamide through Selective HLA-Mis/Matching	**Poster**	Ephraim Fuchs
Conditioning Regimens and Outcomes after Allogeneic Hematopoietic Cell Transplant for Hyperinflammatory Inborn Errors of Immunity	**Poster**	Rebecca Marsh
Outcomes of Pediatric Patients with JMML Following Unrelated Donor Transplant: The Impact of Donor KIR Gene Content and KIR Ligand Matching	**Poster**	Hemalatha Rangarajan
Geographic Disparities of Hematopoietic Cell Transplantation in Acute Myeloid Leukemia Patients in Virginia	**Poster**	Joseph Mock

Prognostic Impact of a Modified European LeukemiaNet (ELN) Genetic Risk Stratification in Predicting Outcomes for Adults with Acute Myeloid Leukemia (AML) Undergoing Allogeneic Hematopoietic Stem Cell Transplantation (HCT). a Center for International Blood and Marrow Transplant Research (CIBMTR) Analysis for the CIBMTR Acute Leukemia Writing Committee	**Poster**	Antonio Jimenez
Meta-Analysis of Genome-Wide Association Studies of Acute Myeloid Leukemia (AML) Patients Identifies Variants Associated with Risk of 11q23/*KMT2A*-Translocated and Core-Binding Factor (CBF) AML and Suggests a Role for Transcription Elongation in Leukemogenesis	**Poster**	Lara Sucheston-Campbell
BMT CTN 1803: Haploidentical Natural Killer Cells (K-NK002) to Prevent Post-Transplant Relapse in AML and MDS (NK-REALM)	**Poster**	Sumithira Vasu
Associations of Clinical Outcomes after Allogeneic Hematopoietic Cell Transplantation with Number of Predicted Class II Restricted mHA	**Poster**	Othmane Jadi
Pre-Transplant Clonal Mosaicism Is Associated with Increased Relapse and Lower Survival in Acute Lymphoblastic Leukemia Patients Undergoing Allogeneic Hematopoietic Cell Transplant	**Poster**	Yiwen Wang
Non-Infectious Pulmonary Toxicity after Allogeneic Hematopoietic Cell Transplantation (HCT): A Center for International Blood and Marrow Transplant Research (CIBMTR) Study	**Poster**	Sagar Patel
Maintenance Use Is More Important Than the Choice of Bortezomib-Based Triplet Induction in Newly Diagnosed Multiple Myeloma Patients Undergoing Upfront Autologous Stem Cell Transplantation	**Poster**	Surbhi Sidana
Younger HLA-Matched Unrelated Donor Allogeneic Hematopoietic Cell Transplantation (allo-HCT) for Myelodysplastic Syndromes (MDS) Is Associated with Superior Disease-Free Survival Compared to Older HLA-Identical Sibling Donors: CIBMTR Analysis	**Poster**	Guru Murthy

Research data collection and systems enhancements

During the grant 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 January 2020 to reflect four Cellular Therapy form

revisions, in May 2020 to reflect one Cellular Therapy form revision & in July 2020 to reflect one Cellular Therapy form revision.

- Enhancements to form capabilities to support data capture for COVID-19.
- Introduced new monthly security monitoring and incorporating fixes to security vulnerabilities within the month. Nineteen vulnerabilities were fixed in August and September with release in October 2020.
- Completed successful configuration of FormsNet to manage automated donor reimbursement for the costs of donation and collection, Medical and Associated Expense Solution (MAAES)
- Completed nine Formsnet Forms Definition Manager (FDM) grid conversions from the Telerik to Kendo ahead of Telerik's impending retirement
- Completed the last of the six FormsNet Forms Definition Manager (FDM) grid conversions from the Telerik to Kendo ahead of Telerik's impending retirement in September 2020, thereby improving FormsNet security.
- Updated the FDM Mapping Tool to automate major portions of the AGNIS metadata mapping to decrease manual errors and the time to map FormsNet form revisions to AGNIS.
- Updated Formsnet 3 Donor Module to successfully interface with required changes to the option group/review section of the Protocol Deviation Form (Form 3000).
- Completed messaging and error validation enhancements, end-to-end integration testing, and bug fixing for the Infections Disease Marker (IDM) Automation project which will reduce the time it takes to clear a donor by automating the reporting of IDM results and improve any error handling should these messages fail to send as expected (will be in production by 10/15/20).
- Deployed updates to the audit tool to allow for the querying of forms in query/pending status to prepare for and maximize an audit's completeness, up-to-date accuracy, and transplant center satisfaction.
- Completed the work to support the Multi-Center reporting/viewing functionality. This functionality, which provides centers the ability to see all forms completed for a patient regardless of which center reported the data, was released in May. This change has become necessary as patients can receive multiple infusion types (e.g., HCT, CT), at different centers.
- Introduced combined follow-up reporting in Formsnet3 to align follow-up data collection forms to the same timepoint when recipient has had both a hematopoietic cellular transplant and a genetically modified cellular therapy.
- Implemented a new type of data validation that uses a web service call, to ensure that a valid clinical trial study ID number is being reported.
- Made Inotuzumab Supplemental form (2541 r1 & r2) "unselectable" by the Audit Tool and completed analysis on how Audit can interface with several key fields that will no longer appear on forms (to be in production by January 2021).
- Disabled DID for Donor Forms and IDM Upload Tool to support GRID requirements and 12/15/20 deadline (Successfully developed, QA tested, regression testing is underway for 10/23 release)
- Creation and configuration of a new Enterprise Service Bus (ESB) message to communicate typing results received by CORE system for customized typing orders, so that FN3 can inform users of the status of the order and the scanned form (supports impending KeyLink retirement).
- Developed and released the following data collection forms in July 2020.

Form	Form Name	Category
2030R3	Sickle Cell Disease Pre-Infusion Data	Revised recipient form
Form	Form Name	Category
2130R3	Sickle Cell Disease Post-Infusion Data	Revised recipient form
2543R1	Gemtuzumab Ozogamicin (Mylotarg TM) Supplemental	New study form
2402r5	Disease Classification	Revised recipient form
2014r4	MDS Pre-Infusion Data	Revised recipient form
2114r4	MDS Post-Infusion Data	Revised recipient form
2057r1	MPN Pre-Infusion Data	Revised recipient form
2157r1	MPN Post-Infusion Data	Revised recipient form
2400r7	Pre-Transplant Essential Data	Revised recipient form
2500r4	Recipient Eligibility Form	Revised recipient form
2532r2	BMT CTN 1702 Enrollment Form	Revised study form
2533r2	BMT CTN 1702 Donor Testing	Revised study form
2534r2	BMT CTN 1702 Monthly Update	Revised study form
2536r2	BMT CTN 1702 Off Study	Revised study form
2149r1	Respiratory Viruses	New recipient form
2450r5	Post-Transplant Essential Data	Updated for COVID-19
4000r6	Pre-Cellular Therapy Essential Data	Updated for COVID-19
2900r4	Recipient Death Data	Updated for COVID-19
2000R5	Recipient Baseline Data	Revised recipient form
2400R6	Pre-Transplant Essential Data	Revised recipient form
2402R4	Disease Classification	Revised recipient form
2450R5	Post-Transplant Essential Data	Revised recipient form
2004R5	Infectious Disease Markers	Revised recipient form

2005R7	Confirmation of HLA Typing	Revised recipient form
2006R5	Hematopoietic Cellular Transplant (HCT) Infusion	Revised recipient form
2016R4	Plasma Cell Disorders (PCD) Pre-Infusion Data	Revised recipient form
2116R4	Plasma Cell Disorders (PCD) Post-Infusion Data	Revised recipient form
2500R3	Recipient Eligibility Form	Revised recipient form
2542R1	Mogamulizumab Supplemental Data	New study form
4000R6	Cellular Therapy Essential Data Pre-Infusion Form	Revised cellular therapy form
4003R3	Cellular Therapy Product	Revised cellular therapy form
4006R4	Cellular Therapy Infusion	Revised cellular therapy form
4100R5	Cellular Therapy Essential Data Follow-Up Form	Revised cellular therapy form

- FormsNet2 server decommissioning was completed by January 2020.

Electronic data submission/AGNIS

CIBMTR continued support for electronic data submission initiatives and production AGNIS customers. Efforts 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.
- Investigations and pilots into the acquisition of discrete / structured data elements outside of the forms context, such as acquisition of structured laboratory data from source systems.
- 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:

- Successfully connected Children's Hospital Colorado Production environment using the CIBMTR Reporting App and began exchanging:
    - Patient demographics
    - CRID assignment
    - GVHD observations
- 12 form revisions have been released in Production for AGNIS users.
- 7 form revisions have been released for external AGNIS users to test.
- Successfully updated 6 forms with COVID-19 options.
- AGNIS auto-population enhancement development has been completed.
- Testing and release efforts for resolution of an AGNIS 2804r6 production issue.
- Testing related to an AGNIS 4000r6 update needed after FN3 update for clinical trials field.
- Testing and release efforts for AGNIS maintenance release updates (field name changes, floating text updates, etc.).
- Testing and release efforts for AGNIS of two donor linking issues, initiated common validations testing and AGNIS auto-population test case preparation.
- Implementation of check-digit logic for AGNIS.
- Donor linking issue from external center was developed, tested and released for AGNIS.

Integrated Data Warehouse (IDW) and Unified Data 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.
- Incorporated additional metric capture capability into the CIBMTR's Data Quality Dashboard.
- Added additional checks to CIBMTR's Critical Systems Dashboard to track the status of CIBMTR systems and reports.
- Implemented new processes to support CIBMTR's International CPI Processes.
- Developed a data file sharing process with external partner, Emmes.
- Added additional reporting capabilities to our business intelligence suite to support CIBMTR Prospective Research team needs.
- Completed pathway to capture and store survey data from CIBMTR's ePRO system.
- Enhanced Cord Blood Data Quality Report to include additional Cellular Therapy data.
- Began first round of Transplant Center data review for the 2020 Center Volumes Data Reporting project.
- Added new reports to the Quarterly Cord Blood Quality to highlight Cellular Therapy data and capture month to month data changes.
- Business Intelligence Data Sharing- Continue 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. Recent accomplishments include:

- Data Operations Dashboard
    - Enhanced the DataOps dashboard to include a COVID Impacts extract which collect data from Transplant Centers on impacts to specific patient's treatment plan/infusion.
    - Introduced a new dashboard to facilitate secure, self-service file downloading.
    - DataOps dashboard currently contains files for Consecutive Transplant Audit (CTA Reports) and Transplant Center Specific Analysis reports.

  Consecutive Transplant Audit (CTA reports)
    - Formerly a service offered through secure email; is now offered on a self-service portal
    - Reports are updated weekly

  Transplant Center Specific Analysis (TCSA reports)
    - Formerly a service offered through secure email; is now offered on a self-service portal
    - Contains both the draft report collaborations and the final reports
    - Reports are updated in the spring and winter

  Web Portal (website) Improvement
    - Added Multi-Factor Authentication (MFA) for enhanced security
    - Revamped the look and feel of customer portal pages for a better user experience

  Center Performance Analytics (CPA):
    - Expanded CPA to include many international sites
    - Introduced a new File Archive tab which will present files related to the CPA
    - Added Raw TCSA files to the File Archive converting manual processes into a self-service model for our customers.

  Data For 'Request For Information' (Data for RFI):
    - Data for RFI annual updates are due to be released in April, development, preparation, testing, and validation are ongoing.

  Survival Calculator
    - Annual refresh of Survival Calculator has been completed and published for the users.

- Unified Domain Model- In 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.
    - Completed loading and validation of CAR T-cell and attendant infectious disease data.
    - Completed building domain model infrastructure for enabling data extracts from the unified database.
    - Delivered first research-ready CAR T-cell data extracts out of the unified database.
    - Continued mapping of infectious disease data, transplant essential data, and new respiratory virus data to the physical data model.
    - Completed loading of new and updated data tied to Spring 2020 FormsNet revisions

- Loaded cellular therapy data into the data warehouse, and validated 95% of the extract data.
- Continued mapping of transplant essential data to the physical data model.
- Continued building infrastructure for enabling data extracts from the unified database and validated with first extract for use in cellular therapy.
- Completed loading of new and updated FormsNet cellular therapy data tied to Winter 2020 FormsNet revisions.
- Completed conceptual mapping of Multiple Myeloma forms in anticipation of upcoming contractual obligations.
- Created project plans for using new data warehouse for upcoming working committee studies and anticipated partnerships with vendors.
- Completed loading and validation of multiple myeloma infectious disease data into the unified database.
- Completed mapping of pre- and post- transplant essential data (TED).
- Completed data architecture design for bringing patient related outcomes data (ePRO) into the unified database.
- Delivered first production CAR T-cell data sets to our Japan partners.
- Completed design for and continued building of infrastructure required to incorporate HLA donor and recipient data into the unified database.

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 559 subjects through September 2020. No further activity was attributed to this grant.

Rapid mobilization and collection of stem cells for HCT will decrease time to transplant and simplify the logistics of product harvest.

Initiated preliminary discussions to plan a prospective trial to evaluate the safety and efficacy of same day stem cell mobilization using experimental agents. A draft protocol was developed, and the project moved forward without support from this grant.

Publications

1. Mohty M, Malard F, Abecasis M, et al. Prophylactic, preemptive, and curative treatment for sinusoidal obstruction syndrome/veno-occlusive disease in adult patients: a position statement from an international expert group. Bone Marrow Transplantation. doi:10.1038/s41409-019-0705-z. Epub 2019 Oct 1. Impact factor: 4.70.

2. Solomon SR, St. Martin A, Shah NN, et al. Myeloablative vs reduced intensity T-cell-replete haploidentical transplantation for hematologic malignancy. Blood Advances. 2019 Oct 8; 3(19):2836-2844. doi:10.1182/bloodadvances.2019000627. Epub 2019 Oct 3. PMC6784523. Impact factor: 4.6.

3. Muhsen IN, Hashmi SK, Niederwieser D, et al. Correction: Worldwide Network for Blood and Marrow Transplantation (WBMT) perspective: the role of biosimilars in hematopoietic cell transplant: current opportunities and challenges in low- and lower-middle income countries. Bone Marrow Transplantation. doi:10.1038/s41409-019-0714-y. Epub 2019 Oct 15. Impact factor: 4.70.

4. Snowden JA, Saccardi R, Orchard K, et al. Benchmarking of survival outcomes following haematopoietic stem cell transplantation: A review of existing processes and the introduction of an international system from the European Society for Blood and Marrow Transplantation (EBMT) and the Joint Accreditation Committee of ISCT and EBMT (JACIE). Bone Marrow Transplantation. doi:10.1038/s41409-019-0718-7. Epub 2019 Oct 21. Impact factor: 4.70.

5. Bejanyan N, Kim S, Hebert KM, et al. Choice of conditioning regimens for bone marrow transplantation in severe aplastic anemia. Blood Advances. 2019 Oct 22; 3(2):3123-3131. doi:10.1182/bloodadvances.2019000722. Epub 2019 Oct 22. PMC6849938. Impact factor: 4.6.

6. Herr MM, Curtis RE, Tucker MA, et al. Risk factors for the development of cutaneous melanoma after allogeneic hematopoietic cell transplantation. Journal of the American Academy of Dermatology. doi:10.1016/j.jaad.2019.10.034. Epub 2019 Oct 22. Impact factor: 7.69.

7. Askar M, Madbouly A, Zhrebker L, et al. HLA haplotypes in 250 families: The Baylor Laboratory results and a perspective on a core NGS testing model for the 17th International HLA And Immunogenetics Workshop. Human Immunology. 2019 Nov 1; 80(11):897-905. doi:10.1016/j.humimm.2019.07.298. Epub 2019 Oct 23. Impact factor: 2.3.

8. DeFilipp Z, Ancheta R, Liu Y, et al. Maintenance tyrosine kinase inhibitors following allo-HCT for chronic myeloid leukemia: A CIBMTR study. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. 2020 Mar 1; 26(3):472-479. doi:10.1016/j.bbmt.2019.10.017. Epub 2019 Oct 25. Impact factor: 3.9.

9. Petersdorf EW, Carrington M, O'hUigin C, et al. Role of HLA-B exon 1 in graft-versus-host disease after unrelated haemopoietic cell transplantation: A retrospective cohort study. The Lancet Haematology. 2020 Jan 1; 7(1):e50-e60. doi:10.1016/S2352-3026(19)30208-X. Epub 2019 Oct 25. PMC6948919. Impact factor: 59.75.

10. Louzoun Y, Lobkovsky AE, Levi L, et al. Reply to Hedrick and Klitz: High haplotype discovery rate in the HLA locus. Proc Natl Acad Sci USA. 2019 Oct 29. pii: 201916124. doi: 10.1073/pnas.1916124116. [Epub ahead of print]. Impact factor: 9.4.

11. Eapen M. A resurgence of cord blood transplantation? The Lancet Haematology. doi:10.1016/S2352-3026(19)30234-0. Epub 2019 Nov 5. Impact factor: 59.75.

12. Newell LF, DeFor TE, Cutler C, et al. Follistatin and Soluble Endoglin Predict 1-Year Nonrelapse Mortality after Allogeneic Hematopoietic Cell Transplantation Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. 2020 Mar 1; 26(3):606-611. doi:10.1016/j.bbmt.2019.11.006. Epub 2019 Nov 10. Impact factor: 3.9.

13. Buchbinder D, Brazauskas R, Bo-Subait K, et al. Predictors of lost to follow-up among pediatric and adult hematopoietic cell transplant survivors: A report from the Center for International Blood and Marrow Transplant Research. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. 2020 Mar 1; 26(3):553-561. doi:10.1016/j.bbmt.2019.11.003. Epub 2019 Nov 11. Impact factor: 3.9.

14. Sapir-Pichhadze R, Zhang X, Ferradji A, et al. Epitopes as characterized by antibody-verified eplet mismatches determine risk of kidney transplant loss. Kidney International. doi:10.1016/j.kint.2019.10.028. Epub 2019 Nov 12. Impact factor: 8.9.

15. Sapir-Pichhadze R, Zhang X, Ferradji A, et al. Epitopes as characterized by antibody-verified eplet mismatches determine risk of kidney transplant loss. Kidney International. 2020 Apr;97(4):778-785. e-pub November 12, 2019 doi: 10.1016/j.kint.2019.10.028. Impact factor: 8.9.

16. Preussler JM, Denzen EM, Majhail NS, et al. Engaging patients and caregivers in the design of print and web-based hematopoietic cell transplantation Individualized survivorship care plan tools. Supportive Care in Cancer. doi:10.1007/s00520-019-05114-3. Epub 2019 Nov 15. TBD. Impact factor: 2.6.

17. Pidala J, Hamadani M, Dawson P, et al. Randomized multicenter trial of sirolimus vs prednisone as initial therapy for standard-risk acute GVHD: The BMT CTN 1501 trial. Blood. 2020 Jan 1; 135(2):97-107. doi:10.1182/blood.2019003125. Epub 2019 Nov 18. PMC6952830. Impact factor: 17.5.

18. Simanovsky AL, Madbouly A, Halagan M, et al. Single haplotype admixture models using large scale HLA genotype frequencies to reproduce human admixture. Immunogenetics. 2019 Nov 1; 71(10):589-604. doi:10.1007/s00251-019-01144-7. Epub 2019 Nov 18. Impact factor: 2.36.

19. Majhail NS, Mau L-W, Chitphakdithai P, et al. Transplant center characteristics and survival after allogeneic hematopoietic cell transplantation in adults. Bone Marrow Transplantation. doi:10.1038/s41409-019-0748-1. Epub 2019 Nov 18. Impact factor: 4.7.

20. Ballen K, Logan BR, Chitphakdithai P, et al. Unlicensed umbilical cord blood units provide a safe and effective graft source for a diverse population: A study of 2456 umbilical cord blood recipients. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. doi:10.1016/j.bbmt.2019.11.016. Epub 2019 Nov 19. Impact factor: 3.9.

21. Sapir-Pichhadze R, Zhang X, Ferradji A, et al. Epitopes as characterized by antibody-verified eplet mismatches determine risk of kidney transplant loss. Kidney International e-pub November 12, 2019 doi: 10.1016/j.kint.2019.10.028. Impact factor: 8.95.

22. Giralt S, Costa LJ, Maloney D, et al. Tandem Autologous-Autologous versus Autologous-Allogeneic Hematopoietic Stem Cell Transplantation for Patients with Multiple Myeloma: Long-term Follow-Up Results from the Blood and Marrow Transplant Clinical Trials Network (BMT CTN) 0102 Trial. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. doi:10.1016/j.bbmt.2019.11.018. Epub 2019 Nov 19. Impact factor: 3.9.

23. Snowden JA, Saccardi R, Orchard K, et al. Correction: Benchmarking of survival outcomes following haematopoietic stem cell transplantation: A review of existing processes and the introduction of an international system from the European Society for Blood and Marrow Transplantation (EBMT) and the Joint Accreditation Committee of ISCT and EBMT (JACIE). Bone Marrow Transplantation. doi:10.1038/s41409-019-0740-9. Epub 2019 Nov 21. Impact factor: 4.7.

24. Meyer C, Mau L-W, Murphy EA, et al. Addressing knowledge gaps in acute myeloid leukemia to improve referral for hematopoietic cell transplantation consultation. Journal of the National Comprehensive Cancer Network : JNCCN. 2019 Dec 1; 17(12):1473-1481. doi:10.6004/jnccn.2019.7327. Epub 2019 Dec 1. Impact factor: 9.31.

25. Shah NN, Ahn KW, Litovich C, et al. Allogeneic transplantation in elderly patients ?65 years with non-Hodgkin lymphoma: A time-trend analysis. Blood Cancer Journal. 9(12):97. doi:10.1038/s41408-019-0261-1. Epub 2019 Dec 3. PMC6890709. Impact factor: 8.0.

26. Ho VT, Martin AS, Pérez WS, et al. Prior gemtuzumab ozogamicin exposure in adults with acute myeloid leukemia does not increase hepatic veno-occlusive disease risk after allogeneic hematopoietic cell transplantation: A CIBMTR analysis. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. doi:10.1016/j.bbmt.2019.12.763. Epub 2019 Dec 28. Impact factor: 3.9.

27. Dunavin N, Mau L-W, Meyer CL, et al. Health care reimbursement, service utilization, and financial responsibility among Medicare beneficiaries with multiple myeloma receiving autologous hematopoietic cell transplantation in inpatient and outpatient settings. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. doi:10.1016/j.bbmt.2019.12.772. Epub 2020 Jan 6. Impact factor: 3.9.

28. Dreger P, Fenske TS, Montoto S, et al. Cellular immunotherapy for refractory DLBCL in the CART era: still a role for allogeneic transplantation? Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. doi:10.1016/j.bbmt.2019.12.771. Epub 2020 Jan 6. Impact factor: 3.9.

29. Dandoy CE, Kim S, Chen M, et al. Incidence, risk factors, and outcomes of patients who develop mucosal barrier injury-laboratory confirmed bloodstream infections in the first 100 days after allogeneic hematopoietic stem cell transplant. JAMA Network Open. 2020 Jan 3; 3(1):e1918668. doi:10.1001/jamanetworkopen.2019.18668. Epub 2020 Jan 8. PMC6991246. Impact factor: 24.8.

30. Wong WH, Bhatt S, Trinkaus K, et al. Engraftment of rare, pathogenic donor hematopoietic mutations in unrelated hematopoietic stem cell transplantation. Science Translational Medicine. 2020 Jan 15; 12(526):1-9. doi:10.1126/scitranslmed.aax6249. Epub 2020 Jan 15. Impact factor: 16.3.

31. McReynolds LJ, Wang Y, Thompson AS, et al. Population frequency of Fanconi pathway gene variants and their association with survival after hematopoietic cell transplant for severe aplastic anemia. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. doi:10.1016/j.bbmt.2020.01.011. Epub 2020 Jan 23. Impact factor: 3.9.

32. Levine JE, Antin JH, Allen CE, et al. Priorities for improving outcomes for non-malignant blood diseases: A report from the Blood and Marrow Transplant Clinical Trials Network. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. doi:10.1016/j.bbmt.2020.01.024. Epub 2020 Jan 24. Impact factor: 3.9.

33. Pagel JM, Othus M, Garcia-Manero G, et al, Appelbaum FR. Rapid donor identification improves survival in high-risk first-remission patients with acute myeloid leukemia. JCO Oncology Practice. doi:10.1200/JOP.19.00133. Epub 2020 Jan 27. Impact factor: 32.9.

34. Savage SA, Viard M, O'hUigin C, et al. Genome-wide association study identifies HLA-DPB1 as a significant risk factor for severe aplastic anemia. American Journal of Human Genetics. 2020 Feb 6; 106(2):264-271. doi:10.1016/j.ajhg.2020.01.004. Epub 2020 Jan 30. PMC7010969. Impact factor: 10.5.

35. Fatobene G, Rocha V, St Martin A, et al. Nonmyeloablative alternative donor transplantation for Hodgkin and non-Hodgkin lymphoma: From the LWP-EBMT, Eurocord, and CIBMTR. Journal of Clinical Oncology. doi:10.1200/JCO.19.02408. Epub 2020 Feb 7. Impact factor: 32.9.

36. Jagadeesh D, Majhail N, He Y, et al. Outcomes of rituximab?BEAM versus BEAM conditioning regimen in patients with diffuse large B cell lymphoma undergoing autologous transplantation. Cancer. doi:10.1002/cncr.32752. Epub 2020 Feb 12. Impact factor: 5.74.

37. Schmidt S, Liu Y, Hu Z-H, et al. The role of donor lymphocyte infusion (DLI) in post hematopoietic cell transplant (HCT) relapse for chronic myeloid leukemia (CML) in the tyrosine kinase inhibitor (TKI) era. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. doi:10.1016/j.bbmt.2020.02.006. Epub 2020 Feb 13. Impact factor: 3.9.

38. Shah O, Tamaresis JS, Kenyon LJ, et al. Analysis of Whole CDR3 TCR Repertoire After Hematopoietic Stem Cell Transplantation in Two Clinical Cohorts Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. doi:10.1016/j.bbmt.2020.01.020. Epub 2020 Feb 17. Impact factor: 3.9.

39. Hsu JW, Shaw BE, Kim S, et al. Collection of peripheral blood progenitor cells in one day is associated with decreased donor toxicity compared to two days in unrelated donors. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. doi:10.1016/j.bbmt.2020.02.011. Epub 2020 Feb 20. Impact factor: 3.9.

40. Farhadfar N, Hsu JW, Logan BR, et al. Weighty choices: Selecting optimal G-CSF doses for stem cell mobilization to optimize yield. Blood Advances. 2020 Feb 25; 4(4):706-716. doi:10.1182/bloodadvances.2019000923. Epub 2020 Feb 25. PMC7042992. Impact factor: 4.6.

41. Weisdorf D, Cooley S, Wang T, et al. KIR B donors improve the outcome for AML patients given reduced intensity conditioning and unrelated donor transplantation. Blood Advances. 2020 Feb 25; 4(4):750-754. doi:10.1182/bloodadvances.2019001053. Epub 2020 Feb 25. PMC7042994. Impact factor: 4.6.

42. Epperla N, Li A, Logan B, et al. Incidence, risk factors for and outcomes of transplant?associated thrombotic microangiopathy. British Journal of Haematology. doi:10.1111/bjh.16457. Epub 2020 Mar 2. Impact factor: 5.5.

43. Mau L-W, Preussler JM, Burns LJ, et al. Generalized additive modeling of cost trajectories from healthcare claims data: Costs of treating privately-insured patients with acute myeloid leukemia in the United States 2004-2014. PharmacoEconomics. doi:https://doi.org/10.1007/s40273-020-00891-w. Epub 2020 Mar 4. Impact factor: 3.33

44. Kuxhausen M, Burns L, Chitphakdithai P, et al. Clonal Hematopoiesis in related allogeneic transplant donors: Implications for screening and management. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. doi:10.1016/j.bbmt.2020.02.022. Epub 2020 Mar 5. Impact factor: 3.9.

45. Hamadani M, Khanal M, Ahn KW, et al. Higher total body irradiation dose-intensity in fludarabine/TBI-based reduced-intensity conditioning regimen is associated with inferior survival in non-Hodgkin lymphoma patients undergoing allogeneic transplantation: Flu/2Gy TBI vs Flu/4Gy TBI in NHL. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. doi:10.1016/j.bbmt.2020.02.025. Epub 2020 Mar 9. Impact factor: 3.9.

46. Curatis RN, Tecca HR, D'Souza A, et al. Prevalence of decisional regret among patients who underwent allogeneic hematopoietic stem cell transplantation and associations with quality of life and clinical outcomes. Cancer. doi:10.1002/cncr.32808. Epub 2020 Mar 10. Impact factor: 5.74.

47. Lee CJ, Kim S, Tecca HR, et al. Late effects after ablative allogeneic stem cell transplantation for adolescent and young adult acute myeloid leukemia. Blood Advances. 2020 Mar 24; 4(6):983-992. doi:10.1182/bloodadvances.2019001126. Epub 2020 Mar 13. PMC7094022. Impact factor: 4.6.

48. Hamadani M, Zhang MJ, Tang X-Y, et al. Graft cryopreservation does not impact overall survival allogeneic hematopoietic cell transplantation using post-transplant cyclophosphamide for GVHD prophylaxis. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. doi:10.1016/j.bbmt.2020.04.001. Epub 2020 Apr 10. Impact factor: 3.9.

49. Costa LJ, Iacobelli S, Pasquini MC, et al. Long-term survival of 1338 MM patients treated with tandem autologous vs. autologous-allogeneic transplantation Bone Marrow Transplantation. doi:10.1038/s41409-020-0887-4. Epub 2020 Apr 14. Impact factor: 4.7.

50. Ahmed S, Ghosh N, Ahn KW, et al. Impact of type of reduced?intensity conditioning regimen on the outcomes of allogeneic haematopoietic cell transplantation in classical Hodgkin lymphoma. British Journal of Haematology. doi:10.1111/bjh.16664. Epub 2020 Apr 21. Impact factor: 5.5.

51. Salit RB, Lee SJ, Burns LJ, et al. Return-to-work guidelines and programs for post-hematopoietic cell transplant survivors: An initial survey. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. 2020 Aug 1; 26(8):1520-1526. doi:10.1016/j.bbmt.2020.04.022. Epub 2020 Apr 29. Impact factor: 3.9.

52. Farhadfar N, Murthy HS, Logan BR, et al. Impact of autologous blood transfusion after bone marrow harvest on unrelated donor?s health and outcome: A CIBMTR analysis. Bone Marrow Transplantation. doi:10.1038/s41409-020-0911-8. Epub 2020 Apr 30. Impact factor: 4.7.

53. Mehta RS, Holtan SG, Wang T, et al. Composite GRFS and CRFS outcomes after adult alternative donor HCT. Journal of Clinical Oncology. 2020 Jun 20; 38(18):2062-2076. doi:10.1200/JCO.19.00396. Epub 2020 May 4. PMC7302955. Impact factor: 32.9.

54. Eapen M, Zhang M-J, Tang X-Y, et al. Hematopoietic cell transplantation with cryopreserved grafts for severe aplastic anemia. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. 2020 Jul 1; 26(7):e161-e166. doi:10.1016/j.bbmt.2020.04.027. Epub 2020 May 7. PMC7206419. Impact factor: 3.9.

55. Gowin K, Ballen K, Ahn KW, et al. Survival following allogeneic transplant in patients with myelofibrosis. Blood Advances. 2020 May 12; 4(9):1965-1973. doi:10.1182/bloodadvances.2019001084. Epub 2020 May 8. PMC7218417. Impact factor: 4.6.

56. D'Souza A, Fretham C, Lee SJ, et al. Current use and trends in hematopoietic cell transplantation in the United States. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. 2020 Aug 1; 26(8):e177-182. doi:10.1016/j.bbmt.2020.04.013. Epub 2020 May 11. Impact factor: 3.9.

57. Kahn JM, Brazauskas R, Tecca HR, et al. Subsequent neoplasms and late mortality in children undergoing allogeneic transplantation for nonmalignant diseases. Blood Advances. 2020 May 12; 4(9):2084-2094. doi:10.1182/bloodadvances.2019000839. Epub 2020 May 12. PMC7218429. Impact factor: 4.6.

58. Myers K, Hebert K, Antin J, et al. Hematopoietic stem cell transplantation for Shwachman-Diamond syndrome. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. 2020 Aug 1; 26(8):1446-1451. doi:10.1016/j.bbmt.2020.04.029. Epub 2020 May 16. PMC7371524. Impact factor: 3.9.

59. Im A, Rashidi A, Wang T, et al. Risk factors for graft-versus-host disease in haploidentical hematopoietic cell transplantation using post-transplant cyclophosphamide. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. 2020 Aug 1; 26(8):1459-1468. doi:10.1016/j.bbmt.2020.05.001. Epub 2020 May 17. Impact factor: 3.9.

60. Nikiforow S, Mansour M, Hu Z-H, et al. Tocilizumab not associated with increased infection risk after CAR T-cell therapy: implications for COVID-19? Blood. 2020 Jul 2; 136(1):137-139. doi:10.1182/blood.2020006216. Epub 2020 May 25. PMC7332891. Impact factor: 17.5.

61. Arnold SD, Brazauskas R, He N, et al. The impact of donor type on outcomes and cost of allogeneic hematopoietic cell transplant for pediatric leukemia: a merged CIBMTR and PHIS analysis: Pediatric acute leukemia transplant risks and utilization. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. doi:10.1016/j.bbmt.2020.05.016. Epub 2020 May 25. Impact factor: 3.9.

62. Petersdorf EW, Stevenson P, Bengtsson M, et al. HLA-B leader and survivorship after HLA-mismatched unrelated donor transplantation. Blood. 2020 Jul 16; 136(3):362-369. doi:10.1182/blood.2020005743. Epub 2020 Jun 1. Impact factor: 17.5.

63. Petersdorf EW, Bengtsson M, De Santis D, et al. Role of HLA-DP expression in graft-versus-host disease after unrelated donor transplantation. Journal of Clinical Oncology. doi:10.1200/JCO.20.00265. Epub 2020 Jun 1. Impact factor: 32.9.

64. Solomon SR, Martin AS, Zhang MJ, et al. Optimal donor for African Americans with hematologic malignancy: HLA-haploidentical relative or umbilical cord blood transplant. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. doi:10.1016/j.bbmt.2020.06.029. Epub 2020 Jul 7. Impact factor: 3.9.

65. Chhabra S, Visotcky A, Pasquini MC, et al. Ixazomib for chronic graft-versus-host disease prophylaxis following allogeneic hematopoietic cell transplantation. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. doi:10.1016/j.bbmt.2020.07.005. Epub 2020 Jul 9. Impact factor: 3.9.

66. 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 Advances. 2020 Jul 14; 4(13):3180-3190. doi:10.1182/bloodadvances.2019001266. Epub 2020 Jul 14. PMC7362362. Impact factor: 4.6.

67. Hu B, Lin X, Lee HC, et al. Timing of allogeneic hematopoietic cell transplantation (alloHCT) for chronic myeloid leukemia (CML) patients. Leukemia & Lymphoma. doi:10.1080/10428194.2020.1783444. Epub 2020 Jul 14. 32662346. Impact factor: 2.8.

68. Algwaiz G, Aljurf M, Koh M, et al. Real-world issues and potential solutions in HCT during the COVID-19 pandemic: Perspectives from the WBMT and the CIBMTR's Health Services and International Studies Committee. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. doi:10.1016/j.bbmt.2020.07.021. Epub 2020 Jul 24. PMC7380217. Impact factor: 3.9.

69. Nazha A, Hu Z-H, Wang T, et al. A personalized prediction model for outcomes after allogeneic hematopoietic cell transplant in myelodysplastic syndromes patients. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. doi:10.1016/j.bbmt.2020.08.003. Epub 2020 Aug 8. Impact factor: 3.9.

70. Costa LJ, Derman BA, Bal S, et al. International harmonization in performing and reporting minimal residual disease assessment in multiple myeloma trials. Leukemia. doi:10.1038/s41375-020-01012-4. Epub 2020 Aug 11. Impact factor: 8.6.

71. Myllymäki M, Redd R, Reilly CR, et al. Short telomere length predicts non-relapse mortality after stem cell transplantation for myelodysplastic syndrome. Blood. doi:10.1182/blood.2020005397. Epub 2020 Aug 17. Impact factor: 17.5.

72. George G, Martin AS, Chhabra S, et al. The effect of G-CSF use on hospital length of stay after an allogeneic hematopoietic cell transplantation: A retrospective multicenter cohort study. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. doi:10.1016/j.bbmt.2020.08.013. Epub 2020 Aug 18. Impact factor: 3.9.

73. Switzer GE, Bruce JG, Kiefer D, et al. Health-related quality-of-life comparison of adult related and unrelated HSC donors: An RDSafe study. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. doi:10.1016/j.bbmt.2020.08.016. Epub 2020 Aug 20. Impact factor: 3.9.

74. Cowan AJ, Baldomero H, Atsuta Y, et al. The global state of hematopoietic cell transplantation for multiple myeloma: An analysis of the Worldwide Network of Blood and Marrow Transplantation (WBMT) Database and the Global Burden of Disease Study. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. doi:10.1016/j.bbmt.2020.08.018. Epub 2020 Aug 23. Impact factor: 3.9.

75. Hagen P, D'Souza A, Hari P, et al. Busulfan, melphalan, and bortezomib compared to melphalan as a high dose regimen for autologous hematopoietic stem cell transplantation in multiple myeloma: Long term follow up of a novel high dose regimen. Leukemia & Lymphoma. doi:10.1080/10428194.2020.1811275. Epub 2020 Aug 31. Impact factor: 2.8.

76. Fuchs E, O'Donnell P, Eapen M, et al. Double unrelated umbilical cord blood versus HLA-haploidentical bone marrow transplantation (BMT CTN 1101) Blood. doi:10.1182/blood.2020007535. Epub 2020 Aug 31. Impact factor: 17.5.

77. Dhakal B, Wang T, Kuxhausen M, et al. Prognostic Impact of Serum CXC Chemokine Ligands 4 and 7 on Myelodysplastic Syndromes Post Allogeneic Hematopoietic Cell Transplant Leukemia & Lymphoma. doi:10.1080/10428194.2020.1817446. Epub 2020 Sep 13. Impact factor: 2.8.

78. Bal S, Costa LJ, Sauter C, et al. Outcomes of autologous hematopoietic cell transplantation in diffuse large B-cell lymphoma refractory to first line chemoimmunotherapy. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. doi:10.1016/j.bbmt.2020.09.004. Epub 2020 Sep 16. Impact factor: 3.9.

79. Epperla N, Ahn KW, Khanal M, et al. Impact of reduced-intensity conditioning regimens on outcomes in diffuse large B-cell lymphoma undergoing allogeneic transplantation. Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation. doi:10.1016/j.bbmt.2020.09.014. Epub 2020 Sep 19. Impact factor: 3.9.

80. Badar T, Hari P, Dávila O, et al. African Americans with translocation t(11;14) have superior survival after autologous hematopoietic cell transplantation for multiple myeloma in comparison with Whites in the United States. Cancer. doi:10.1002/cncr.33208. Epub 2020 Sep 23. Impact factor: 5.7.

81. Munshi PN, Vesole D, Jurczyszyn A, et al. Age no bar: A CIBMTR analysis of elderly patients undergoing autologous hematopoietic cell transplantation for multiple myeloma. Cancer. doi:10.1002/cncr.33171. Epub 2020 Sep 23. Impact factor: 5.7.

82. 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

83. 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

84. 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

85. 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

86. 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

87. 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

88. 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

89. 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

90. 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

91. 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

92. 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

93. 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

94. 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

95. 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

96. 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

97. 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

98. 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

99. Gupta V, Kennedy JA, Capo-Chichi J-M, et al. enetic 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

100. 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: 2.2

101. 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

102. 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

103. 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. PMC8010222. Impact Factor: *See Below

104. 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

105. 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

106. 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: 6.68

107. 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

108. Shah NN, Hamadani M. Is there still a role for allogeneic transplantation in the management of lymphoma? Journal of Clinical Oncology. 2021 Feb 10; 39(5):487-498. doi:10.1200/JCO.20.01447. Epub 2021 Jan 12. Impact Factor: 32.9

109. Devine SM, Horowitz MM. Building a fit for purpose clinical trials infrastructure to accelerate the assessment of novel hematopoietic cell transplantation strategies and cellular immunotherapies. Journal of Clinical Oncology. 2021 Feb 10; 39(5):534-544. doi:10.1200/JCO.20.01623. Epub 2021 Jan 12. Impact Factor: 32.9

110. Weisdorf D. How old is too old for a transplant? Best Practice & Research, Clinical Haematology. 2021 Mar 1; 34(1):101243. doi:10.1016/j.beha.2021.101243. Epub 2021 Jan 12. PMC7994544. Impact Factor: 2.79

111. 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. 2021 Apr 1; 27(4):352.e1-352.e5. doi:10.1016/j.jtct.2021.01.009. Epub 2021 Jan 15. PMC8036235. Impact Factor: *See Below

112. 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

113. Alsaggaf R, Katta S, Wang T, Hicks BD, Zhu B, Spellman SR, Lee SJ, Horvath S, Gadalla SM. Epigenetic aging and hematopoietic cell transplantation in patients with severe aplastic anemia. Transplantation and Cellular Therapy. 2021 Apr 1; 27(4):313.e1-313.e8. doi:10.1016/j.jtct.2021.01.013. Epub 2021 Jan 16. PMC8036238. Impact Factor: *See Below

114. 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

115. 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: 5.0

116. 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: 53.2

117. 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

118. 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

119. 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. 2021 Apr 1; 27(4):345-351. doi:10.1016/j.jtct.2021.01.022. Epub 2021 Jan 29. NA. Impact Factor: *See Below

120. 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. 2021 Apr 1; 56(4):786-797. doi:10.1038/s41409-020-01199-1. Epub 2021 Jan 29. Impact Factor: 4.7

121. 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: 6.68

122. 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: 3.8

123. Scott BL, Pasquini MC, Fei M, Fraser R, 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

124. 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

125. 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. doi:10.1016/j.jtct.2021.03.008. Epub 2021 Mar 9. Impact Factor: *See Below

126. Hsu JW, Farhadfar N, Murthy HS, 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. doi:10.1016/j.jtct.2021.03.015. Epub 2021 Mar 22. Impact Factor: *See Below

127. 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

128. 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. doi:10.1038/s41375-021-01233-1. Epub 2021 Mar 29. Impact Factor: 8.6

129. 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

130. 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

131. 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

132. Percival M-E, Wang H-L, Zhang M-J, et al. BM. 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

133. 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

134. 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

135. Bhatt NS, Brazauskas R, Salit RB, 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

136. 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

137. 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. Impact Factor: *See Below

138. Shaw BE, Jimenez-Jimenez AM, Burns LJ, et al. Bolaños-Meade J. 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. doi:10.1200/JCO.20.03502. Epub 2021 Apr 27. Impact Factor: 32.9

139. 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. 11(4):82. Epub 2021 Apr 29. Impact Factor: 8.0

140. 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 Center for International Blood and Marrow Transplant Research Late Effects and Quality of Life Working Committee. Bone Marrow Transplantation. doi:10.1038/s41409-021-01316-8. Epub 2021 May 3. Impact Factor: 4.7

141. 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

142. 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

143. 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

144. 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

145. 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

146. 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

147. 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: 6.68

148. 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

149. 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

150. 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

151. 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

152. 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

153. 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

154. 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/cncr.33755. Epub 2021 Jul 13. N/A. Impact Factor: 6.07

155. 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

156. 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

157. 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

158. 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

159. 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

160. 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

161. 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

162. 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

163. 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

164. 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

165. 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

166. 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

167. 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

168. 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

169. 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

170. 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

171. 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

172. 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

173. 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

174. 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: Impact Factor: 5.67

* 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.