



Narrowing the gap for hematopoietic stem cell transplantation in the East-Mediterranean/African region: comparison with global HSCT indications and trends

Helen Baldomero¹ · Mahmoud Aljurf² · Syed Z. A. Zaidi³ · Shahrukh K. Hashmi² · Ardeshir Ghavamzadeh⁴ · Alaa Elhaddad⁵ · Rose-Marie Hamladji⁶ · Parvez Ahmed⁷ · Lamia Torjemane⁸ · Miguel Abboud⁹ · Abdelghani Tbakhi¹⁰ · Murtadha Al Khabori¹¹ · Asma El Quessar¹² · Nosa Bazuaye¹³ · Mohamed Amine Bekadja¹⁴ · Salman Adil¹⁵ · Omar Fahmy¹⁶ · Mani Ramzi¹⁷ · Ahmed Ibrahim¹⁸ · Amal Alseraihy² · Nour Ben Abdejalil⁸ · Mahmoud Sarhan¹⁰ · Mohammed Al Huneini¹¹ · Lahoucine Mahmal¹⁹ · Hassan ElSolh² · Fazal Hussain² · Amr Nassar⁵ · Hani Al-Hashmi²⁰ · Amir Ali Hamidieh⁴ · Marcelo Pasquini²¹ · Yoshihisa Kodera²² · Nicolaus Kröger²³ · Mohamed Mohty²⁴ · Gregorio Jaimovich²⁵ · Juliana Martinez Rolon²⁶ · Kristjan Paulson²⁷ · Hildegard Greinix²⁸ · Daniel Weisdorf²⁹ · Mary Horowitz²⁰ · José Nunez³⁰ · Alois Gratwohl¹ · Jacob Passweg¹ · Mickey Koh³¹ · Jeff Szer³² · Dietger Niederwieser³³ · Nicolas Novitzky³⁴ · On behalf of the East-Mediterranean (EMBT) and African (AFBMT) Blood and Marrow Transplantation Groups and the Worldwide Network for Blood and Marrow Transplantation (WBMT)

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Abstract

Hematopoietic Stem Cell Transplantation (HSCT) activity was evaluated in the African (AFR)/EMRO region and compared to the global activity for the years 2006–2013. Data were obtained from 1570 teams in the 6 WHO continental regions. Of these, 29 (1.85%) of all teams were active in 12 of the 68 AFR/EMRO countries. They reported 2.331 (3.3%) of the worldwide 71.036 HSCT, and a transplant rate of 32.8 (TR; HSCT/10 million inhabitants; worldwide 128.5). This reflects still the lowest regional TR despite an increase of 90% since 2006. HSCT activity in AFR/EMRO countries was characterized by a higher use of allogeneic compared to autologous HSCT, an almost exclusive use of family donors, including haploidentical family donors. These findings contrast with the prevalence of autologous over allogeneic HSCT, and a higher frequency of unrelated HSCT in other parts of the world. Of note, the increase by 200% in HSCT for hemoglobinopathies from 2006 to 2013 (72 per year) in the AFR/EMRO region. This reflects the specific role of HSCT for these disease categories with high prevalence and incidence in the AFR/EMRO region. This report provides information for the competent authorities to foster adequate infrastructure. It urges transplant organization to optimize their cooperation.

Introduction

Hematopoietic stem cell transplantation (HSCT) has evolved from the beginnings of experimental bone marrow transplantation 60 years ago to a globally accepted

successful therapy [1]. Transplantation of hematopoietic stem cells and tissues has extended the lifespan and enhanced the quality of life of hundreds of thousands of patients worldwide. Over the last two decades, global HSCT has seen a constant evolution in technology, a decrease in transplant-related mortality and rapid expansion. HSCT is no longer limited to younger patients or to patients with a matched donor. Novel conditioning regimens with lower intensity and new techniques have expanded the use of HSCT to older patients, to patients with comorbidities and to patients with haploidentical donors [1, 2]. Today, HSCT is an established but still complex form of therapy for patients with chemo- and immune-sensitive diseases, for the replacement of deficient cells or cellular components

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✉ Dietger Niederwieser
dietger@medizin.uni-leipzig.de

Extended author information available on the last page of the article

and other life-threatening disorders. Its use has also been extended to severe inherited or acquired disorders of the hematopoietic system.

However, HSCT is still associated with significant morbidity and mortality and remains an example of high-cost and highly specialized medicine. It requires extensive experience, significant infrastructure and a network of specialists from all fields of medicine. It also requires the ability to provide specialist continued follow-up and management of patients. The accumulated experience covering a range of past errors and successes should therefore be used to improve access for all patients in need and serve as a model for the application of medical products of human origin in general.

Information on indications, the use of specific technologies, and trends in HSCT is essential for correct patient counseling and to allow health care agencies to prepare the necessary infrastructure and to avoid errors in planning. In addition, the guiding principles of the World Health Organization (WHO; www.who.org) declare the transplantation of organs, cells and tissues to be a global task, with the collection of activity data being one of the prime prerequisites [3]. The Worldwide Network for Blood and Marrow Transplantation (WBMT; www.wbmt.org), as an umbrella organization in the field of HSCT and a non-governmental organization in working relation with the WHO, has taken up the challenge of collecting and disseminating worldwide HSCT data on a regular basis. The first report was based on the global HSCT activity in 2006 [4], and was followed by a report on the data available in 2010 and thereafter a retrospective view of the first one million HSCTs in the year 2015 [5, 6]. The fourth report was focused on the HSCT activity in 2012 and looked at major trends since 2006 [7]. The report included a SWOT analysis of the current WBMT policy by key personnel in the field, to identify the strengths, weaknesses, opportunities, and threats of the current perspectives in HSCT.

In the current study, we analyzed the global HSCT activities reported between 2006 and 2013 concentrating on the African (AFR)/EMRO region in the global context regarding frequency, indication, donor type, and geographical distribution in 2013.

Patients and methods

Study design

This was a retrospective survey involving all HSCT teams known to the investigators, organized by WBMT through established international and/or regional organizations. No individual patient data were used, thus no ethics committee approval was mandated.

Participating groups, continents, countries, and teams

In 2013, 29 teams in 12 of the 68 countries of the AFR/EMRO region reported their activities. In contrast, the global survey included reports from 1570 teams in 78 reporting countries over 6 WHO continental regions ((www.who.int/about/regions/en/) America (AMR/PAH; WHO regions North-, Middle, and South America, and Canada); Asia (SEAR/WPR; WHO regions South East Asia and Western Pacific Region, which includes Australia and New Zealand); Europe (EUR; includes Turkey and Israel); and AFR/EMRO (WHO regions Eastern Mediterranean and Africa)). Analyses were performed as previously described [7].

Data were provided by the Australasian Bone Marrow Transplant Recipient Registry ABMTRR (www.abmtrr.org), the African Blood and Marrow Transplant Group AfBMT, the Asian Pacific Blood and Marrow Transplant Group APBMT (www.apbmt.org), the Canadian Blood and Marrow Transplant Group CBMTG (www.cbmtg.org), the Center for International Blood and Marrow Transplantation CIBMTR (www.cibmtr.org), the Eastern Mediterranean Blood and Marrow Transplant Group EMBMT (www.embmt.org), the European Group for Blood and Marrow Transplantation EBMT (www.ebmt.org), and the Latin American Blood and Marrow Transplantation Group LABMT (LABMT@wbmt.org).

Collection system and data validation were obtained as previously described [7]. Data were validated by different independent systems; through confirmation by the reporting teams, following receipt of a computer printout of the entered data, by selective comparison with MED-A/TED datasets in the EBMT or CIBMTR data system or by cross-checking with national registries. On-site visits to selected teams were part of the quality-control program within CIBMTR and EBMT teams. Based on quality controls and contacts with regulatory agencies or national offices, the response rate for allogeneic HSCT was estimated to be >95% and for autologous HSCT 80–90%. The survey focuses on the numbers of patients treated for the first time with HSCT. Transplant rates (TRs) were computed as the number of HSCT per 10 million inhabitants not corrected for population age. Population data were obtained from the US census office (<http://www.census.gov>).

Results

Transplant activities in the AFR/EMRO region from 2006 to 2013

Up to 34 centers from the AFR/EMRO region were noted to have HSCT activity during the period from 2006 to 2013

Table 1 Trends of HSCT worldwide and in the AFRICAN/EMRO region in 2006 and 2013

	African/EMRO region				Worldwide				
	2006		2013		2006		2013		Δ 2006–2013
	Total	Related	Unrelated	Total	Total	Related	Unrelated		
Allogeneic HSCT									
<i>Leukemias</i>									
AML	492	670	50	720	14,392	11,424	12,912	24,336	69%
ALL	186	336	26	362	6611	5592	6334	11,926	80%
CML	132	226	16	242	3488	2926	2753	5679	63%
MDS/MPS	139	48	0	48	1334	554	496	1050	−21%
CLL	33	52	6	58	2268	1957	2745	4702	107%
Other leukemia	2	8	2	10	556	298	476	774	39%
<i>Lymphoproliferative disorders</i>	0	0	0	0	135	97	108	205	52%
Plasma cell disorders	28	53	7	60	3219	2111	2471	4582	42%
Lymphomas	2	17	0	17	773	450	445	895	16%
Other lymphoma/type unknown	26	36	17	43	2446	1639	2006	3645	49%
Solid tumors	0	0	0	0	0	22	20	42	0
<i>Non-malignant disorders</i>	1	0	0	0	150	85	45	130	−13%
Bone marrow failures	277	531	38	569	2360	2624	1756	4380	86%
Hemoglobinopathies	154	234	8	242	1292	1316	766	2082	61%
Immune deficiencies	72	213	3	216	392	805	228	1033	164%
Inherited diseases of metabolism	41	74	16	90	445	381	470	851	91%
Autoimmune disorders	10	10	11	21	177	63	154	217	23%
Other non-malignant disorders	0	0	0	0	16	18	22	40	150%
Others	0	0	0	0	38	41	116	157	313%
Total	5	3	2	5	212	61	83	144	−32%
	803	1257	97	1354	20,333	16,305	17,267	33,572	65%
						48.6%	51.4%	47.3%	
Autologous HSCT									
Leukemias	58	n.a.	n.a.	34	1726	n.a.	n.a.	910	−47%
<i>Lymphoproliferative disorders</i>	338	n.a.	n.a.	840	21,655	n.a.	n.a.	33,447	65%
Plasma cell disorders	127	n.a.	n.a.	404	10,675	n.a.	n.a.	18,766	76%
Lymphomas	211	n.a.	n.a.	436	10,980	n.a.	n.a.	14,681	34%
Solid tumors	29	n.a.	n.a.	101	2560	n.a.	n.a.	2779	9%
Non-malignant disorders	2	n.a.	n.a.	2	193	n.a.	n.a.	290	50%

Table 1 (continued)

	African/EMRO region				Worldwide			
	2006	2013	Δ 2006–2013		2006	2013	Δ 2006–2013	
	Total	Related	Unrelated	Total	Total	Related	Unrelated	Total
Others	0	n.a.	n.a.	0	96	n.a.	n.a.	38
Total	427	n.a.	n.a.	977	26,230	n.a.	n.a.	37,464
Total all HSCT	1230	n.a.	n.a.	2331	46,563	n.a.	n.a.	71,036

n.a. not applicable

with fluctuations reflecting challenges in some centers that resulted in inconsistent activity over the years (Table 1 and Figs. 1 and 2). In 2013, a total of 29 teams from 12 countries in the AFR/EMRO region provided activity data on a total of 2331 patients. The TR in active countries ranged from 0.1 to 109 for allogeneic HSCT compared to 0–173 for autologous HSCT. Several countries had no HSCT activity (Fig. 1). Allogeneic TR ranged between 0 and 44 with the exception of Oman, Saudi Arabia, Jordan, and Lebanon (69.8, 96.1, 101.1, and 108.8 TR, respectively). For autologous HSCT, the TR ranged between 0 and 37 with the exception of Tunisia, Jordan, and Lebanon (52.6, 61.0, and 172.8 TR, respectively). These figures reflect the limited availability of transplant teams and limited logistic support in many countries of the region.

In contrast to other world regions, more allogeneic (58%) than autologous (42%) HSCT were noted in the region (Fig. 2). The AFR/EMRO region showed overall 90% increase in HSCT activity from 2006 to 2013 (1,230 to 2,331 transplants per year, respectively) with 69% increase in allogeneic HSCT and 129% increase in autologous HSCT (Table 1). Furthermore, 93% of patients undergoing allogeneic HSCT had a family donor and received peripheral blood stem cells (PBSC, 62%) or bone marrow (BM, 30%) as stem cell source. Cord blood (CB) transplants were in the range of 4% of all allogeneic HSCT. Major increases in allogeneic HSCT were seen for hemoglobinopathies (200%), lymphoproliferative diseases (114%), non-malignant disorders in general (105%), and acute leukemias (89%; Table 1). Autologous HSCT was performed almost exclusively with PBSC and increased from 2006 in the African/EMRO region more than it did worldwide for patients with solid tumors (248% vs 9% respectively), plasma cell disorders (218% vs 76%, respectively), and lymphomas (107% vs 34%, respectively). As in the global survey, decreases were observed only in the use of autologous HSCT for leukemia (−41%). Interestingly, the HSCT per center/year was higher in Africa/EMRO than global (80 vs 45 HSCT/center/year, respectively; see Fig. 2). In comparison to the global survey, differences were noted in indications and donor types. The most striking differences include a more frequent use of allogeneic HSCT for bone marrow failure (17.9% of all allogeneic HSCT in Africa/EMRO as compared to 6.2% globally) and in autologous HSCT for lymphomas (44.6% of all autologous HSCT in Africa/EMRO as compared to 39.2% globally) and almost exclusive use of family donors in allogeneic HSCT. Centers in the AFR/EMRO region more frequently used haploidentical donors rather than cord blood to perform alternative donor HSCT (Fig. 3). The proportion of HSCT using haploidentical donors as graft source started rising from 2009 ($n = 41$) to 2010 ($n = 60$), fell marginally in 2011, yet increased again in 2012 to peak in 2013

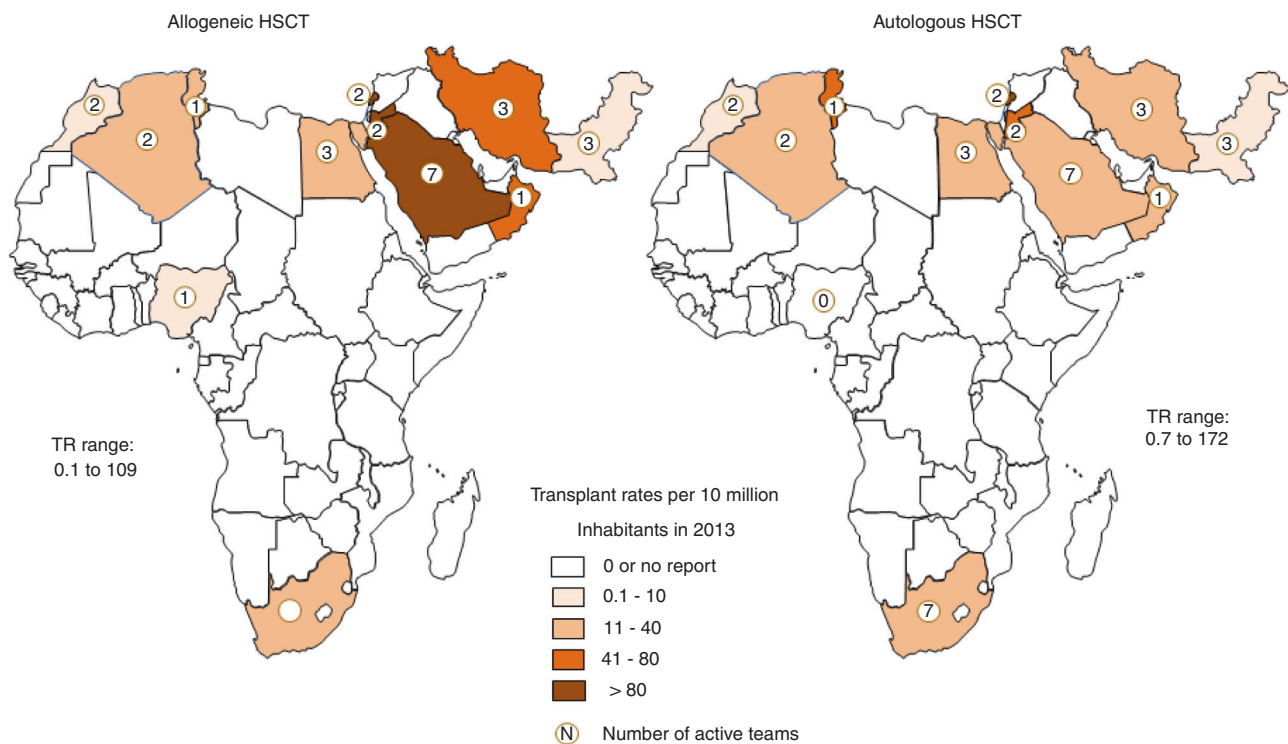


Fig. 1 Transplant rates for allogeneic and autologous hematopoietic stem cell transplantation and number of national transplant centers in the African/EMRO region in 2013

($n = 74$). This was in contrast to the global activity, in which the use of haploidentical HSCT overtook the use of unrelated CB HSCT in 2012. Use of unrelated cord blood remained limited with 40 and 49 CB transplants in 2009 and 2013, respectively. PSC = peripheral blood stem cells; NHL = non-hodgkin lymphoma; CB = cord blood

Global HSCT activity, main indications, and donor type in 2013

The global HSCT activity in 2013 reached a new high of 71,036 transplants (Table 1). Most of the HSCT in 2013 were performed in Europe, followed by AMR/PAH, SEA/WPR, and AFR/EMRO (47%, 30%, 20%, and 3%, respectively) with a steady and constant increase in activity in all 4 WHO regions. There was a slightly higher frequency of autologous (52.7%) compared to allogeneic (47.3%) HSCT. The main indications were lymphoproliferative disorders ($n = 38,029$; 53%) of which 88% ($n = 33,447$) were autologous and 12% ($n = 4,582$) allogeneic HSCT; leukemias ($n = 25,246$; 35%) of which 96% ($n = 24,336$) were allogeneic and 4% ($n = 910$) autologous HSCT; solid tumors ($n = 2,909$; 4%) of which 4% ($n = 130$) were allogeneic and 96% ($n = 2779$) autologous HSCT; non-malignant disorders ($n = 4,670$; 7%) of which 94% ($n = 4,380$) were allogeneic and 6% ($n = 290$) autologous HSCT.

The median TR for all HSCT in 2013 fluctuated between regions and between participating countries from 401.7 in Europe (median; range 1.0–735.7), 162 in Asia (median; range 0.7–610.5), 73.6 in the Americas (median; range 17.8–538.9), and 67.7 in AFR/EMRO (median; range 0.1–281.6). Transplant rates for allogeneic HSCT ranged from 0.1 in Nigeria to 450.8 in Israel (median 104.4) and TRs for autologous HSCT from 0.1 in the Philippines to 437.0 in Italy (median 159.7).

The annual HSCT activity increased from 2006 to 2013 by 52.6% (Table 1), while the number of reporting centers increased by 17.3% and plateaued in the years 2012–2013 (Fig. 2). More importantly, HSCT per center increased from 35.1 to 45.2, confirming increased activity per center (Fig. 2). Activity increased primarily for allogeneic HSCT (+65% from 2006) and, among these, especially for non-malignant disorders (+86%), acute leukemias, MDS/MPS (+80%), and lymphoproliferative disorders (+42%; Table 1). Of all allogeneic HSCT, 51.4% were performed using an unrelated donor. Frequencies of autologous HSCT increased (+43%) most markedly in the PCD (+76%), non-malignant disorders (+50%), and lymphoma (+34%) subgroups. Decreased activity was reported only in the use of autologous HSCT for leukemias (−47%).

Special attention was given to hemoglobinopathies as indication for HSCT in the AFR/EMRO region and worldwide. A total of 1033 HSCT were performed for these

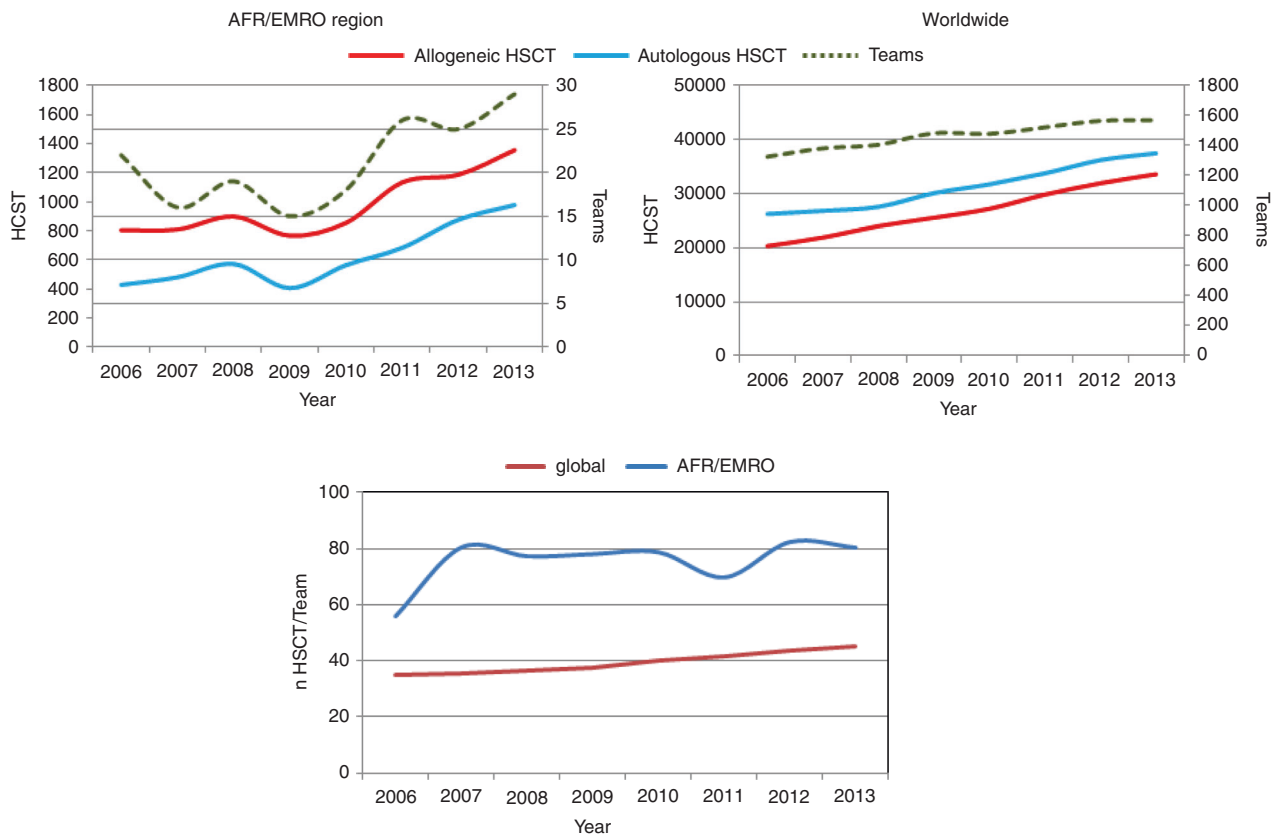


Fig. 2 Worldwide trends 2006–2013 in numbers of allogeneic and autologous hematopoietic stem cell transplantations and number of reporting teams in the African/EMRO region and worldwide (upper

panel). Numbers of median HSCT/team in the African/EMRO region and worldwide (lower panel)

indications worldwide in 2013, of which 216 (21%) were reported from the AFR/EMRO region representing a considerable increase from the 123 HSCT in 2012. HSCT were performed in SEAR/WPR ($n = 287$), Europe ($n = 283$), and Americas ($n = 247$; Fig. 3).

Two major changes were observed during the period 2006–2013. Firstly, HSCT from unrelated donors became more frequent than from related donors (Fig. 3). Secondly, mismatched family or “haploidentical” donors increased from 1,186 (6% of allogeneic HSCT) in 2006 to 3,830 (11.8% of allogeneic HSCT) in 2013. Worldwide, the use of haploidentical transplants became more common than that of unrelated cord blood in 2012 (Fig. 3).

Discussion

The current analysis is based on information on >464,100 HSCT reported to the WBMT over an 8-year period and explores distribution, donor choices, and HSCT techniques over time in the AFR/EMRO region and worldwide. The results allow several important conclusions.

Firstly, HSCT activity has been steadily increasing since 2006 in all world regions (even in high-HSCT performance

regions) but to different degrees. For the first time, the number of HSCT per year exceeded 70,000, while there continue to be significant differences in TRs between the world regions. The relative increase was more prominent in countries with restricted resources, including AFR/EMRO, than in those with a high TR, but the TR still remains the lowest rate worldwide. Many countries, especially in central Africa do not have an active HSCT program.

Second, there is no indication of a plateau in activity. This continuing lack of saturation indicates underuse and implies that more patients would have been treated by HSCT had they had access and had donors been available. Obviously, this is more notable for hemoglobinopathies, which are highly prevalent in AFR/EMRO regions.

Third, the activity increase worldwide is mainly caused by augmented team activity with the median number of HSCT per team increasing from 29 to 41 between 2006 and 2013. Interestingly, the existing centers in the AFR/EMRO region have a median transplant activity higher than the corresponding global level, indicating the need for more HSCT centers. However, there was no increase in HSCT/center in the analyzed region after 2007. This is probably a reflection of the low density of centers and a possible saturation for the center activity. The increase is only in part

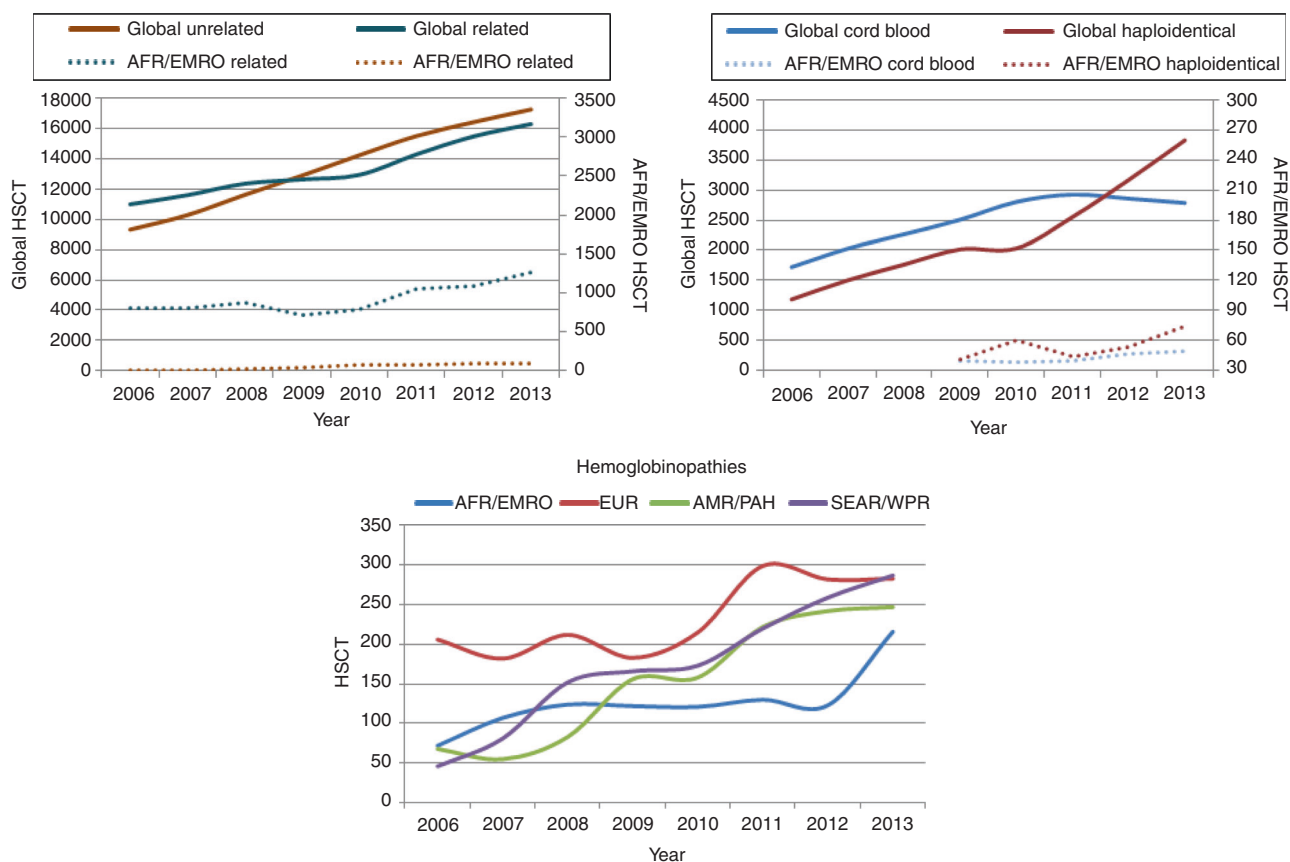


Fig. 3 Frequencies of allogeneic hematopoietic stem cell transplantation according to related or unrelated donors and frequencies of alternative HSCT in the AFR/EMRO region and worldwide (upper panel). In the lower panel, HSCT for hemoglobinopathies in the four WHO regions

a consequence of increased reporting from 2006 to 2013. The proportion of uncaptured data, estimated to be <5% for allogeneic and <15% for autologous HSCT, also varied between the regions and was estimated to be lowest in the regions with the highest absolute numbers. Despite these limitations, it is unlikely that missing data would alter the overall interpretation.

Significant changes were observed during the study period regarding donor type and graft source. Overall, unrelated HSCT exceeded related donor HSCT worldwide, particularly in Europe [8], while related HSCT remained the almost exclusive graft source in the AFR/EMRO region [9,10,11]. Also, the incidence of haploidentical-related HSCT was consistently higher than CB HSCT in the AFR/EMRO region, while globally this was observed only in 2012. From 2012 onwards, worldwide interest in the use of unrelated CB seems to have started decreasing, while use of haploidentical donors is consistently increasing over this period with a steep rise after 2012. This may reflect a learning curve with some teams reducing the use of CB in favor of adopting the newer haploidentical transplant strategies. With fine tuning of haploidentical transplant techniques, this may have been perceived as a more

cost-effective and logistically simpler strategy by some teams in this region. Double CB transplant, commonly used for adults, is associated with extra cost. This may also be a reflection of lack of unrelated donor registries and public CB banks in most of the AFR/EMRO region. Interestingly, the prominent use of allogeneic HSCT in comparison to autologous HSCT is a characteristic of the AFR/EMRO region.

Overall, only 1,033 HSCT were performed worldwide for hemoglobinopathies, of which only 216 were in the AFR/EMRO region. Considering the high prevalence and incidence of thalassemia (40,000 born annually and 80 million carriers; Modell, WHO Bulletin 2008) and of sickle cell anemia (e.g., 91,011 in Nigeria and 39,743 in Congo) in the AFR/EMRO region, this is clearly still lagging behind demand despite the recent increase [12].

Ten years after its formation, WBMT has established itself as a global umbrella organization for HSCT. It has accomplished one of the prime prerequisites of WHO guiding principles on cell, organ, and tissue transplants: to collect, analyze, and disseminate information on global transplantation activity [3]. More than 1500 teams from 78 countries over all 6 continents contributed to the survey.

Lack of a regional organization in some regions remains a clear limitation to the global survey and is an area in which support and expertise from the societies of the WBMT has helped since the establishment of the organization. In fact, two major societies were founded with the help of the WBMT: the LABMT and the AfBMT. While the LABMT has already published their first survey [13], the AFR/EMRO region is publishing its first report. Still many countries are without HSCT activities and this publication may aid in the development of further activity in the region.

Initiatives of WBMT involve not only registries, but also regional WBMT workshops such as the most recent workshop organized at King Faisal Specialist Hospital and Research Center, Riyadh, Saudi Arabia in January 2017, under the auspices of the WHO. Telemedicine approaches have been tested for their efficacy in supporting program initiation and are now ready to be used on a larger scale. The WBMT has also been involved in counseling African countries planning to start an HSCT program.

The special position the WBMT has come to occupy as coordinator of global information in HSCT, has created a unique opportunity to build up a truly comprehensive worldwide network of standardized and quality controlled data collection and analysis. Further activities aim to collect outcome data on a global level, representing a major step toward the realization of the WHO principle that “data collection and data analysis remain integral parts of the therapy.” WBMT will continue to interact with competent regulatory authorities to pursue the goal that costs and reimbursement for HSCT should include a component for comprehensive data and quality management. Obviously, in the AFR/EMRO region, there is a need for more HSCT centers in addition to progressive growth of existing centers.

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Hospital (peds), Rawalpindi Armed Forces Bone Marrow Transplant Center; Saudi Arabia, Dammam King Fahad Specialist Hospital, Jeddah King Faisal Specialist Hospital and Research Center (ads), King Faisal Specialist Hospital and Research Center (peds), Riyadh King Faisal Specialist Hospital and Research Center (ads), KING FAISAL Specialist Hospital and Research Center (peds); South Africa, Cape Town Constantiaberg Medical Clinic, Groot Schuur Hospital, University of Cape Town Private Academic Hospital; Durban, Albert Luthuli Hospital; Johannesburg, Flora Private Clinic; Pretoria; Albert Cellular Therapy, East Hospital; Tunisia, Tunis Centre National de Greffe de Moelle.

APBMT China, Beijing: 307 Hospital of PLA, 309th. Hospital of PLA (The 309th Hospital of Chinese People’s Liberation Army), Beijing Cancer Hospital. Beijing Chao-Yang Hospital, Beijing Friendship Hospital (Youyi Hospital), Chinese PLA General Hospital, Peking University Third Hospital, PLA Navy General Hospital (Navy General Hospital), PLA. The Military General Hospital of Beijing (General Hospital of Beijing Military Region), The First Affiliated Hospital of China PLA General Hospital, The Second Artillery General Hospital of Chinese PLA. Changsha: Xiangya Hospital Central-South University. Chengdu: West China Hospital of Sichuan University, West China Women’s and Children’s Hospital. Chongqing: Xinqiao Hospital of the Third Military Medical University. Dalian: The First Affiliated Hospital of Dalian Medical University. Fuzhou: Fujian Provincial Hospital, Union Hospital Fujian Medical University (Fujian Medical University Union Hospital). Guangzhou: Guangdong General Hospital, Nanfang Hospital Southern Medical University (Nan Fang Hospital (Pediatric), Sun Yat-sen Memorial Hospital, Sun Yat-sen University, Zhujiang Hospital of Southern Medical University. Guiyang: Hospital of Guizhou Medical University. Haikou: Hainan General Hospital. Hangzhou: The First Affiliated Hospital of Zhejiang University. Harbin: Harbin Hematology and Cancer Institution (Harbin Institute of Hematology & Oncology). Hefei: Anhui Provincial Hospital. Jinan: Jinan Military General Hospital, Qilu Hospital of Shandong University, Shandong Provincial Hospital, Shandong Provincial Qianfoshan Hospital. Langfang: Ludaopei Hematology & Oncology Center. Luoyang: The First Affiliated Hospital of He Nan Science & Technology University. Nanjing: Jiangsu Province Hospital, the First Affiliated Hospital of Nanjing Medical University, Nanjing Drum Tower Hospital. Qingdao: The Affiliated Hospital of Qingdao University. Shanghai: Changhai Hospital of Shanghai, Huashan Hospital, Shanghai Changzheng Hospital, Shanghai Children’s Medical Center, Shanghai Daopei Hospital, Shanghai Ruijin Hospital. Shenyang: The First Hospital of China Medical University, The General Hospital of Shenyang Military. Shijiazhuang: The Second Hospital of Hebei Medical University. Suzhou: Jiangsu Institute of Hematology, The First Affiliated Hospital of Soochow University. Tianjin: CAMS & PUMC, CAMS & PUMC, Tianjin First Central Hospital, Tianjin Medical University Cancer Institute and Hospital. Urumqi: Xinjiang Uygur Autonomous Region People’s Hospital (People’s Hospital of Xinjiang Uygur Autonomous Region). Wuhan: Tongji Hospital, Huazhong University of Science & Technology. Xiamen: Zhongshan Hospital of Xiamen University. Xi’an: The First Affiliated Hospital of Medical College of Xi’an Jiao Tong University, Xijing Hospital. Zhengzhou: He Nan Provincial People’s Hospital, Henan Institute of Hematology, Cancer Hospital of Henan (He Nan Cancer Hospital), The First Affiliated Hospital of Zhengzhou University. Hong Kong: Hong Kong Queen Mary Hospital, The University of Hong Kong, Queen Mary Hospital, The University of Hong Kong, Shatin Prince of Wales Hospital, The Chinese University of Hong Kong. India, Adayar Channai: Cancer Institute (WIA). Ahmedabad: Apollo Hospital, Gujarat Cancer & Research Institute. Bangalore Columbia Asia Referral Hospital, Health Care Global Enterprises, M S Ramaiah Medical College, HCG-MSR Cancer Center, Manipal Hospital, Narayana Multispecialty Hospital and Mazumdar Shaw Cancer Center,

St. John's Medical College & Hospital. Chandigarh: Postgraduate Institute of Medical Education & Research. Chennai: Apollo Cancer Speciality Hospital. Coimbatore: G Kuppusamy Naidu Memorial Hospital, Kovai Medical College & Hospital. Delhi: Indraprastha Apollo Hospital, Gurgaon: Artemis Hospital, Fortis Memorial Research Institute. Jaipur: RK Birla Cancer Centre, SMS Medical College & Hospital. Kerala: Malabar Cancer Centre. Kochi: Amrita Institute of Medical Sciences and Research Centre. Kolkata: Institute of Haematology & Transfusion Medicine Institute: Medical College, Netaji Subhaschandra Bose Cancer Research Institute, Saroj Gupta Cancer Centre & Research Institute, Tata Medical Center. Lucknow: Sanjay Gandhi Post Graduate Institute of Medical Sciences. Ludhiana: Christian Medical College. Mumbai: Jaslok Hospital and Research Center, Kokilaben Hospital, Prince Aly Khan Hospital, Tata Memorial Centre. Nashik: Lotus Hospital. New Delhi: All India Institute of Medical Science, Army Research & Referral Hospital, BLK Super Speciality Hospital, Institute Rotary Cancer Hospital, Max Super Speciality Hospital, Rajiv Gandhi Cancer Institute & Research Center. Pune: Deenanath Mangeshkar Hospital, Sahyadri Speciality Hospital. Vadodara: Sterling Hospital. Vellore: Christian Medical College. Japan, Akashi: Akashi Municipal Hospital, Hyogo Cancer Center. Akita: Akita University School of Medicine, Nakadoori General Hospital. Anjo: Anjo Kosei Hospital. Aoba-ku: Yokohama Showa University Fujigaoka Hospital. Aomori City: Aomori Prefectural Central Hospital. Asahikawa: Asahikawa City Hospital, Asahikawa Medical College Hospital, Red Cross Hospital, Asahikawa-Kosei general Hospital. Asahi-ku Yokohama: Kanagawa Cancer Center, St. Marianna University School of Medicine Yokohama City Seibu Hospital. Ashiya-shi: Ashiya Municipal Hospital. Azumino: Nagano Children's Hospital. Beppu: Kyusyu University Hospital at Beppu, Oita Kouseiren Tsurumi Hospital. Bunkyo-ku, Tokyo: Faculty of Medicine Hospital Tokyo Medical and Dental University, Nippon Medical School, Tokyo Metropolitan Cancer and Infectious Disease Center, Komagome Hospital, Tokyo Metropolitan Cancer and Infectious Diseases Center-Komagome Hospital, University of Tokyo Hospital, Faculty of Medicine Hospital Tokyo Medical and Dental University, Nippon Medical School, Juntendo University School of Medicine, Juntendo University School of Medicine, Tokyo Metropolitan Cancer and Infectious Disease Center, Komagome Hospital. Chiba: Chiba Aoba Municipal Hospital, Chiba University Hospital. Chuo: University of Yamanashi, Faculty of Medicine. Chuo-ku, Chiba: Chiba University Hospital. Chuo-ku, Tokyo: St. Luke's International Hospital. Date-City: Kita-Fukushima Medical Center. Fuchu, Tokyo: Tokyo Metropolitan Fuchu Hospital. Fuchu-shi, Tokyo: Tokyo Metropolitan Kiyose Children's Hospital. Fukuoka: Fukuoka University School of Medicine, Fukuoka University School of Medicine, Hamanomachi Hospital, Harasanshin Hospital, Kokura Memorial Hospital, Kurume University School of Medicine, Kyushu University, Kyushu University Hospital, National Hospital Organization Kyusyu Medical Center, National Kyushu Cancer Center, Our Lady Of Snow medical juridical corporation St. Mary's Hospital. Fukushima City: Fukushima Medical University Hospital, Fukushima Medical University School of Medicine. Fukuyama: Cyugoku Central Hospital. Gifu: Gifu Municipal Hospital, Gifu Red Cross Hospital, Gifu University Graduate School of Medicine. Gifu-City: Gifu University Graduate School of Medicine. Haeburu-cho: Shimajiri-gun Okinawa Prefectural Nanbu Medical Center and Children's Medical Center. Hakodate: Hakodate Municipal Hospital. Hamamatsu: Hamamatsu Medical Center, Hamamatsu University School of Medicine, Seirei Hamamatsu General Hospital. Hidaka: Comprehensive Cancer Center, International Medical Center, Saitama Medical University. Hidaka-shi: Saitama Medical University International Medical Center. Higashiyama-ku, Kyoto: Kyoto First Red Cross Hospital. Hirakata: Kansai Medical University Hirakata Hospital. Hirosaki: Hirosaki University Hospital. Hiroshima: Hiroshima Red Cross Hospital & Atomic-bomb Survivors Hospital, Hiroshima Red Cross Hospital & Atomic-bomb

Survivors Hospital, Hiroshima University Hospital, Hiroshima University Hospital. Hitachi-City: Hitachi General Hospital. Hodogaya-ku, Yokohama: Yokohama Municipal Citizen's Hospital. Honjo: Kumamoto University School of Medicine. Ibaraki-machi, Ibaraki-gun: National Hospital Organization, Mito Medical Center. Ichihara-shi: Teikyo University Chiba Medical Center. Iizuka-City: Iizuka Hospital. Ikoma Kinki: Daigaku Igakubu Nara Hospital. Inzei-shi: Nippon Medical School Chiba Hokusoh Hospital. Ise-City: Yamada Red Cross Hospital. Isehara: Tokai University School of Medicine, Tokai University School of Medicine. Ishinomaki: Ishinomaki Red Cross Hospital. Itabashi-ku: Tokyo Nihon University Itabashi Hospital, Teikyo University School of Medicine, Teikyo University School of Medicine, Tokyo Metropolitan Geriatric Hospital. Iwaki-City: Iwaki Kyoritsu General Hospital. Iwatsuki-ku, Saitama City: Saitama Children's Medical Center. Izumisano: Rinku General Medical Center Izumisano Municipal Hospital. Izumi-shi: Fuchu Hospital. Izumo: Shimane Prefectural Central Hospital, Shimane University, Faculty of Medicine, Shimane University, Faculty of Medicine. Izunokuni City: Juntendo University Shizuoka Hospital. Kagoshima: Imamura Bun-in Hospital, Kagoshima City Hospital, Kagoshima University Medical and Dental Hospital, Kagoshima University Medical and Dental Hospital, National Hospital Organization Kagoshima Medical Center. Kahoku: Kanazawa Medical University Hospital. Kahoku-gun: Kanazawa Medical University. Kamigyo-ku, Kyoto: Kyoto Prefectural University of Medicine, Kyoto second Red Cross Hospital, Kyoto Prefectural University of Medicine, Graduate School of Medical Science. Kamogawa-shi: Kameda General Hospital. Kanazawa: Ishikawa Prefectural Central Hospital, Kanazawa University Hospital. Kanazawa-ku, Yokohama: Yokohama City University Hospital. Kanazawa-shi: Kanazawa University Hospital. Kase-machi: Saga-Ken Medical Centre Koseikan. Kashihara: Nara Medical University, Nara Medical University. Kashiwa-City: National Cancer Center Hospital East. Kashiwa-shi: Jikei University, Kashiwa Hospital. Kawagoe: Saitama Medical Center, Saitama Medical University. Kawasaki: Federation of National Public Service Personnel Mutual Aid Associations, Toranomon Hospital, Kajigaya. Kishiwada: Kishiwada City Hospital. Kita-adachi-Gun: Saitama Prefectural Cancer Center. Kita-ku, Kyoto: Social Insurance Kyoto Hospital. Kitakyushu: Kitakyushu Municipal Medical Center, Kyushu Kosei-nenkin Hospital, University of Occupational and Environmental Health, University of Occupational and Environmental Health. Kobe: Hyogo Children's Hospital, Kobe Central Hospital of Insurance, Kobe City Medical Center General Hospital, Kobe University Graduate School of Medicine, Kobe University Hospital, Shinko Hospital. Kochi: Kochi Health Sciences Center. Kofu City: Yamanashi Prefectural Central Hospital. Komatsushima: Tokushima Red Cross Hospital. Komatsushima-City: Tokushima Red Cross Hospital. Konan: Konan Kosei Hospital. Koriyama-City: Ohta General Hospital, Ohta Nishinouchi Hospital. Kumamoto-City: Kumamoto University School of Medicine, National Hospital Organization, Kumamoto Medical Center, National Hospital Organization, Kumamoto Medical Center. Kurahshiki: Kawasaki Medical School, Kurashiki Central Hospital. Kure: National Hospital Organization Kure Medical Center. Kurobe City: Kurobe City Hospital. Maebashi: Gunma University Graduate School of Medicine, Saiseikai Maebashi Hospital. Matsudo: Matsudo City Hospital. Matsue: Matsue Red Cross Hospital. Matsumoto: Shinshu University School of Medicine. Matsuyama: Ehime Prefectural Central Hospital, Ehime Prefectural Central Hospital, Matsuyama Red Cross Hospital, National Hospital Organization, Shikoku Cancer Center. Meguro-ku, Tokyo: National Hospital Organization Tokyo Medical Center. Mibumachi, Shimotsuga-gun: Dokkyo Medical University, Dokkyo Medical University School of Medicine. Midori-Ku, Chiba: Chiba Children's Hospital. Miki-cho, Kita-gun: Kagawa University. Kagawa University Faculty of Medicine. Minami-ku, Yokohama: Kanagawa Children's Medical Center, Yokohama City University Medical Center. Minato-ku, Tokyo: The Jikei University school of Medicine,

University of Tokyo Hospital, Toranomon Hospital, Saiseikai Central Hospital. Mitaka Kyorin: University School of Medicine. Mito-City: Ibaraki Children's Hospital, KKR Suifu Hospital. Miyamae-ku, Kawasaki: St. Marianna University School of Medicine. Miyazaki: Miyazaki Prefectural Miyazaki Hospital, University of Miyazaki Hospital, University of Miyazaki Hospital. Moriguchi: Matsushita Memorial Hospital, Matsushita Memorial Hospital. Morioka: Iwate Medical University, Iwate Medical University School of Medicine. Moriyama-shi: Shiga Medical Center for Children. Moroyama-machi, Iruma-gun: Saitama Medical University Hospital. Muroran: Steel Memorial Muroran Hospital. Nagaizumicho, Suntougun: Sizuoka Cancer Center. Nagakute-shi: Aichi Medical University Hospital, Aichi Medical University School of Medicine. Nagano-City: Nagano Red Cross Hospital. Nagasaki-City: Japanese Red Cross Nagasaki Genbaku Hospital, University Graduate School of Biomedical Sciences, National Hospital Organization, Nagasaki Medical Center, Sasebo City General Hospital. Nagoya: Aichi Cancer Center Hospital, Japanese Red Cross Nagoya First Hospital, Meitetsu Hospital, Nagoya City University, Nagoya City University Hospital, Nagoya Daini Red Cross Hospital, Nagoya Ekisaikai Hospital, Nagoya Memorial Hospital, Nagoya University Graduate School of Medicine, National Hospital Organization, Nagoya Medical Center, Social Insurance Chukyo Hospital. Naha: Okinawa Red Cross Hospital. Nakagusukuson, Nakagami-gun: Heart Life Hospital. Nakagyo-ku, Kyoto: Kyoto City Hospital. Nankoku-City: Kochi Medical School, Kochi University, Kochi University. Nara: Takanohara Central Hospital, Tenri Hospital. Narita: Japanese Red Cross Narita Hospital. Natori: Miyagi Cancer Center. Niigata: Nagaoka Red Cross Hospital, Niigata Cancer Center, Niigata Cancer Center, Niigata University Medical and Dental Hospital, Niigata University Medical and Dental Hospital. Nishihara-cho, Nakagami-gun: Ryukyu University Hospital, University of the Ryukyus Faculty of Medicine. Nishikyoku-ku, Kyoto: Kyoto Katsura Hospital. Nishinomiya: Hyogo College of Medicine, Hyogo Prefectural Nishinomiya Hospital. Nishinomiya-shi: Meiwa Hospital. Nishio: Nishio Municipal Hospital. Oita: Oita Prefectural Hospital. Okayama: National Hospital Organization Okayama Medical Center, Okayama Citizens' Hospital, Okayama University Hospital. Okayama-City: Okayama Rosai Hospital. Omihachiman-City: Omihachiman Community Medical Center. Osaka: Children's Medical Center, City General Hospital, KKR Otemae Hospital, National Hospital Organization Osaka National Hospital, National Hospital Organization, Nissay Hospital, Osaka City University Graduate School of Medicine, Osaka Medical Center and Research Institute for Material and Child Health, Osaka Medical Center For Cancer And Cardiovascular Diseases, Osaka Red Cross Hospital, PL General Hospital, Sumitomo Hospital, The Tazuke Kofukai Medical Research Institute Kitano Hospital, Yodogawa Christian Hospital. Osakaaayama-City: Kinki University School of Medicine, Kinki University School of Medicine. Osaki-shi: Osaki Citizen Hospital. Otake: Hiroshima-Nishi Medical Center. Ota-ku, Tokyo: Toho University Omori Medical Center. Ota-shi: Gunma Prefectural Cancer Center. Otsu: Otsu Red Cross Hospital, Shiga University of Medical Science. Saga-City: Saga University Hospital. Saitama City: Saitama Medical Center Jichi Medical University. Sakai: Sakai Hospital, Kinki University School of Medicine. Sakyo-ku, Kyoto: Kyoto University Hospital. Sapporo: Hokkaido Medical Center for Child Health and Rehabilitation, Hokkaido University Hospital, National Hospital Organization Hokkaido Cancer Center, Sapporo City General Hospital, Sapporo Hokuyu Hospital, Sapporo Medical University, Teine Keijinkai Hospital. Sendai Miyagi: Children's Hospital, National Hospital Organization Sendai Medical Center, Tohoku University Hospital. Setagaya-ku, Tokyo: National Center for Child Health and Development. Shibukawa-City: Gunma Children's Medical Center, National Hospital Organization Nishigunma National Hospital. Shibuya-ku, Tokyo: Japanese Red Cross Medical Center. Shimonoseki: Shimonoseki Kosei General Hospital. Shimotsuke-City: Jichi Medical University Hospital.

Shinagawa-ku, Tokyo: NTT Kanto Medical Center, Showa University School of Medicine. Shinjuku, Tokyo: International Medical Center of Japan. Shinjuku-ku Tokyo: Women's Medical University, Shinjuku-ku Tokyo, Keio University School of Medicine. Shinjuku-ku, Tokyo: Tokyo Medical University Hospital. Shizuoka: Shizuoka Children's Hospital, Shizuoka City Shimizu Hospital, Shizuoka General Hospital, Shizuoka Red Cross Hospital, Shizuoka Saiseikai General Hospital. Suita City, Osaka: Osaka University Hospital, Osaka University Hospital. Suzuka: Suzuka General Hospital, Suzuka Kaisei Hospital. Takamatsu: Kagawa Prefectural Central Hospital, Takamatsu Red Cross Hospital. Takaoka: Kouseiren Takaoka Hospital. Takatsuki: Osaka Medical College Hospital, Takatsuki Red Cross Hospital. Tanabe: Insurance Social Kinan Hospital. Tochigi: Jichi Medical University Hospital. Tokorozawa: National Defence Medical College. Tokushima-City: Tokushima University Hospital. Tokyo: National Cancer Center Hospital, Nihon University of School of Medicine, St Luke's International Hospital, the Institute of Medical Science, The University of Tokyo. Tomakomai: Oji General Hospital. Toon-City: Ehime University Graduate School of Medicine. Tottori-shi: Tottori Prefectural Central Hospital. Toyama: Toyama Red Cross Hospital, Toyama University Hospital. Toyama-City: Toyama Prefectural Central Hospital, University of Toyama. Toyooka: Fujita Health University School of Medicine. Toyohashi: Toyohashi Municipal Hospital. Toyota: Kosei Hospital. Toyota-shi: Toyota Memorial Hospital. Tsu: Mie University Hospital. Tsuchiura-City: Tsuchiura Kyodo General Hospital. Tsukuba-City: Tsukuba Memorial Hospital, Tsukuba University Hospital, University of Tsukuba. Tsukuba-gun, Okayama: National Hospital Organization, Minami-Okayama Medical Center. Ube: Yamaguchi University School of Medicine. Urayasu-shi: Juntendo University Urayasu Hospital. Utsunomiya: Tochigi Cancer Center. Wakayama; Japanese Red Cross Society Wakayama Medical Center. Wakayama-City: Wakayama Medical University, Wakayama Medical University School of Medicine. Yamagata-city: Yamagata Prefectural Central Hospital, Yamagata University School of Medicine. Yamagata-shi: Yamagata University Hospital. Yamashina-ku Kyoto: Aiseikai Yamashina Hospital. Yokohama: Yokohama City Minato Red Cross Hospital, Yokohama Minami Kyosai Hospital. Yokohama Kanagawa: Cancer Center. Yonago: National Hospital Organization, Yonago Medical Center, Tottori University Faculty of Medicine, Tottori University Faculty of Medicine. Yoshida-Gun: University of Fukui Hospital. Yufu: Oita University Faculty of Medicine, Oita University Hospital. Zentsuji-city: Kagawa National Children's Hospital. Korea, Bucheon: Soonchunhyang University Bucheon Hospital. Busan: Dong-A University Hospital, Kosin University Gospel Hospital, Inje University Haeundae Paik Hospital, Pusan National University Hospital. Busan: Korea University Anam Hospital. Chuncheon: Hallym University Hospital. Daegu: Daegu Fatima Hospital, Keimyung University Dongsan Medical Center, Kyungpook National University Hospital, Daegu Catholic University Hospital, Yeungnam University Hospital. Daejeon: Chungnam National University Hospital, the Catholic University Daejeon St. Mary's Hospital. Gwangju: Chosun University Hospital. Gyeonggi: National Cancer Center. Gyeonggi: Gyeonggi National University Hospital. Iksan: Wonkwang University Hospital. Incheon: Gachon University Gil Hospital, the Catholic University Our Lady Mercy Hospital. Jeju: Jeju Halla General Hospital. Jeonju: Chonbuk National University Hospital. Kwangju: Chonnam National University Hwasun Hospital. Pusan: Pusan National University Yangsan Hospital. Seoul: Chung-Ang University Hospital, Ewha Womans University Mokdong Hospital, Hanyang University Hospital, Inha University Hospital, Konkuk University Medical Center, Korea University Guro Hospital, Seoul National University Hospital, the Catholic University Seoul St. Mary's Hospital, Ulsan University Asan Medical Center, Inje University Paik Hospital, Korea Cancer Center Hospital, Kyung Hee University Hospital, Soonchunhyang University Seoul Hospital, Yonsei University Hospital. Suwon: Sungkyunkwan University Hospital, the

Catholic University St. Vincent's Hospital, Ajou University Hospital. Sungnam: Pochon Univesity Bundang CHA Hospital. Ulsan: Ulsan University Hospital. Wonju: Yonsei University Wonju Christian Hospital. Philippines, Grobal City: St. Luke's Medical Center, Global City. Quezon City: St. Luke's Medical Center, Quezon City. Singapore, Singapore: KK Hospital Women's and Children's Hospital, National Cancer Center, Singapore, National University Hospital, Singapore General Hospital. Taiwan, Changhua: Changhua Christian Hospital. Chiayi: Chang-Gung Memorial Hospital, Chia-Yi Christian Hospital. Hualien: Hualien Tzu Chi Hospital, Buddhist Tzu Chi Medical Foundation. Kaohsiung: Chang-Gung Memorial Hospital, Medical University Hospital, Veterans General Hospital. New Taipei City: Far Eastern Memorial Hospital, Taipei Medical University-Shuang Ho Hospital. Taichung: China Medical University Hospital, Taichung Veterans General Hospital. Tainan: National Cheng Kung University Hospital. Taipei: Koo Foundation Sun Yat-Sen Cancer Center, National Taiwan University Hospital, Taipei Veterans General Hospital, Tri Service General Hospital. Taoyuan: Chang-Gung Memorial Hospital Linko. Thailand, Bangkok: Faculty of Medicine Ramathibodi Hospital, Faculty of medicine Siriraj Hospital, King Chulalongkorn Memorial Hospital, Phramongkutklao Hospital. Khon Kaen: Srinagarind Hospital, Khon Kaen University. Muang: Naresuan University. Songkla: Prince of Songkla University Hospital. Vietnam, Hanoi: National Institute of Blood Transfusion and Hematology. Ho Chi Minh City: Blood Transfusion and Hematology Hospital, Itabashi Hospital.

ABBMT Australia, Adelaide: Adelaide Cancer Centre, Flinders Medical Centre, Royal Adelaide Hospital, The Queen Elizabeth Hospital, Women's & Children's Hospital. Brisbane: Greenslopes Private Hospital, Cilento Children's Hospital, Mater Medical Centre, Mater Misericordiae Public Hospital, Princess Alexandra Hospital, Royal Brisbane & Women's Hospital, Wesley Medical Centre. Canberra: The Canberra Hospital. Fremantle: Fremantle Hospital. Geelong: Geelong Hospital. Gosford: Gosford Hospital. Hobart: Royal Hobart Hospital. Melbourne: Alfred Hospital, Austin Hospital, Box Hill Hospital, Peter MacCallum Cancer Institute, Royal Children's Hospital, Royal Melbourne Hospital, St Vincent's Hospital Melbourne. Newcastle: Calvary Mater Newcastle, John Hunter Children's Hospital. Perth: Fiona Stanley Hospital, Princess Margaret Hospital, Royal Perth Hospital, Sir Charles Gairdner Hospital. Southport: Gold Coast University Hospital. Sydney: Concord Hospital, Liverpool Hospital, Nepean Hospital, Prince of Wales Hospital, Royal North Shore Hospital, Royal Prince Alfred Hospital, St George Hospital, St Vincent's Hospital, Sydney Children's Hospital, The Children's Hospital at Westmead, Westmead Hospital. Townsville: Townsville General Hospital. Wollongong: Wollongong Hospital. New Zealand, Auckland: Auckland City Hospital, Starship Hospital. Christchurch: Christchurch Hospital. Hamilton: Waikato Hospital. Palmerston North: Palmerston North Hospital. Wellington: Wellington Hospital.

CBMTG Alberta: Alberta Children's Hospital, University of Calgary. Calgary: Tom Baker Cancer Centre, University of Calgary. Edmonton: Cross Cancer Institute, University of Alberta. Halifax: QEII Health Sciences Centre, Dalhousie University. Hamilton: Hamilton Health Sciences, McMaster University. Kingston: Kingston General Hospital, Queen's University. London: London Health Sciences Centre, Schulich School of Medicine. Manitoba: CancerCare Manitoba, University of Manitoba. Montreal: McGill University Health Centre Adult, McGill University Health Centre. Montreal: McGill University Health Centre Pediatric, McGill University Health Centre. Montreal: Maisonneuve-Rosemont Hospital, University of Montreal. Montreal: Hôpital Sainte-Justine, University of Montreal. Ottawa: The Ottawa Hospital, University of Ottawa. Quebec: Hôtel-Dieu de Québec. Quebec: Hôpital de l'Enfant-Jésus. St. John's: New Brunswick Stem Cell Transplant Program, Horizon Health Network. St. John's:

Memorial Health Sciences Centre Blood and Marrow Transplant Program, Memorial University of Newfoundland. Saskatoon: Saskatchewan Cancer Agency, University of Saskatchewan. Toronto: Autologous BMT Program, Princess Margaret Hospital, University of Toronto. Toronto: Allogeneic BMT Program, Princess Margaret Hospital, University of Toronto. Toronto: The Hospital for Sick Children, University of Toronto. Vancouver: BC Children's Hospital, University of British Columbia. Vancouver: Vancouver General Hospital, University of British Columbia.

CIBMTR Akron: Akron Children's Hospital. Amarillo: Texas Oncology, Ann Arbor: The University of Michigan. Atlanta: Children's Healthcare of Atlanta at Egleston, Emory University, The Blood and Marrow Transplant Program at Northside Hospital. Augusta: Georgia Cancer Center at Augusta University Health. Aurora: The Children's Hospital of Denver, University of Colorado Hospital. Baltimore: The Sidney Kimmel Comprehensive Cancer Center at Johns Hopkins, University of Maryland School of Medicine. Bethesda: NIH-NCI Experimental Transplantation and Immunology Branch (Related NIH-NCI Matched Unrelated Donor Program), National Heart Lung & Blood Institute, National Institutes of Allergy & Infectious Disease, National Institutes of Health. Billings: Billings Clinic Cancer Center. Birmingham: University of Alabama Birmingham. Boise: St. Luke's Mountain States Tumor Institute. Boston: Beth Israel Deaconess Medical Center, Dana Farber Cancer Institute & Boston Children's Hospital, Dana Farber Cancer Institute at Brigham and Women's Hospital - Adults, Massachusetts General Hospital, Tufts New England Medical Center. Bronx: Childrens Hospital at Montefiore, Montefiore Medical Center. Buffalo: Roswell Park Cancer Institute. Burlington: Lahey Clinic Medical Center, University of Vermont Cancer Center. Chapel Hill: University of North Carolina Hospitals. Charleston: Charleston Hematology Oncology, Medical University of South Carolina. Charlotte: BMT Program at Levine Children's Hospital/Carolinas Medical Center, Levine Cancer Institute. Charlottesville: University of Virginia Health System. Chicago: Ann & Robert H. Lurie Children's Hospital of Chicago, Northwestern Memorial Hospital, Northwestern University-Dept of Immunotherapy, The Coleman Foundation Blood and Marrow Transplant Center, Rush University, University of Chicago Medical Center, University of Illinois at Chicago Medical Center. Cincinnati: Cincinnati Children's Hospital Medical Center, Jewish Hospital Blood and Marrow Transplant Center, University of Cincinnati Medical Center. Cleveland: Cleveland Clinic, Seidman Cancer Center - University Hospitals Cleveland Medical Center. Columbus: Nationwide Children's Hospital, The Ohio State University Medical Center. Dallas: Baylor University Medical Center, Children's Medical Center, Medical City Dallas Hospital, UT Southwestern Medical Center. Danville: Geisinger Medical Center. Dayton: Miami Valley Hospital. Denver: Colorado Blood Cancer Institute. Detroit: Children's Hospital of Michigan, Henry Ford Hospital Bone Marrow Transplant Program, Karmanos Cancer Institute. Duarte: City of Hope National Medical Center. Durham: Duke University adult BMT, Duke University Medical Center; Pediatric BMT, Duke University, Immunology/BMT, Peds. Fairfax: Fairfax-Northern Virginia Hospital. Fort Worth: Cook Children's Medical Center. Gainesville: Shands HealthCare & University of Florida. Gilbert: Banner MD Anderson Cancer Center. Grand Rapids: Helen DeVos Children's Hospital, Spectrum Health. Greenville: GHS Cancer Institute, Saint Francis Hospital. Hackensack: Hackensack University Medical Center. Hawthorne: Westchester Medical Center. Hershey: Penn State Hershey Medical Center. Honolulu: Kapi'olani Medical Center for Women and Children. Houston: Baylor College of Medicine, MD Anderson Cancer Center. Indianapolis: Indiana Blood & Marrow Transplantation, Indiana University Hospital/Riley Hospital for Children. Iowa City: University of Iowa Hospital & Clinics. Jackson: University of Mississippi Medical Center. Jacksonville: BMT Program of Mayo Clinic/Nemours and Wolfson

Children's Hospital, Mayo Clinic Florida. Kansas City: The Children's Mercy Hospitals and Clinics, University of Kansas. Knoxville: Thompson Cancer Survival Center. La Jolla: Scripps Blood & Marrow Transplant Program, University of California, San Diego Medical Center. Lackland: AFB Wilford Hall Medical Center. Lake Success: North Shore University Hospital. Lebanon: Dartmouth-Hitchcock Medical Center. Lexington: University of Kentucky Medical Center. Little Rock: University of Arkansas for Medical Sciences. Loma Linda: Loma Linda University Cancer Center. Los Angeles: Cedars-Sinai Medical Center, Children's Hospital of Los Angeles, UCLA Hematologic Malignancy/Stem Cell Transplantation Program, USC BMT Program. Louisville: University of Louisville Hospital/James Brown Cancer Center. Lubbock: Covenant Health System Hematopoietic Transplant Program, Texas Tech University Medical Center. Madison: University of Wisconsin Hospital and Clinics. Marshfield: Marshfield Clinic. Maywood: Loyola University Medical Center. Memphis: Baptist Blood and Marrow Transplant, St Jude Children's Research Hospital, West Cancer Center/Methodist Healthcare Blood and Marrow Transplant. Miami: Nicklaus Children's Hospital, University of Miami, University of Miami/Jackson Memorial Hospital. Milwaukee: Aurora St Luke's Medical Center, Children's Hospital of Wisconsin, Froedtert & Medical College of Wisconsin. Minneapolis: Masonic Cancer Center University of Minnesota. Mobile: Providence Hospital HPC Transplant Center. Morgantown: Osborn Hematopoietic Malignancy & Transplantation Program. Nashville: Sarah Cannon BMT Center at Centennial Medical Center, Vanderbilt University, Vanderbilt University Veterans Center. New Brunswick: Cancer Institute of New Jersey. New Haven: Yale New Haven Hospital. New Hyde Park: Steven and Alexandra Cohen Children's Medical Center of New York. New Orleans: Louisiana State University Children's Hospital, Ochsner Medical Center, Tulane University Medical Center. New York: Memorial Sloan Kettering Cancer Center Adults, Memorial Sloan Kettering Cancer Center Peds, Morgan Stanley Children's Hospital of New York, Mount Sinai Medical Center, New York Presbyterian Hospital, New York Presbyterian Hospital/Columbia University Medical Center, New York University Medical Center. Newark: Christiana Care. Norfolk: Virginia Oncology Associates. Oakland: UCSF Benioff Children's Hospital. Oklahoma City: Oklahoma University Medical Center. Omaha: CHI Health Bergan Mercy, CHI Health Immanuel, University of Nebraska Medical Center. Orange: CHOC Children's. Orlando: Blood & Marrow Transplant Center, Florida Hospital Medical Group. Palo Alto: Lucile Packard Children's Hospital. Park Ridge: Advocate Lutheran General Hospital. Pembroke Pines: Memorial Cancer Institute. Philadelphia: Abramson Cancer Center University - Pennsylvania Medical Center, Eastern Regional Medical Center, Fox Chase Temple University Hospital Bone Marrow Transplant Program, Hahnemann University Hospitals, Philadelphia Children's Hospital, St. Christopher's Hospital for Children, Thomas Jefferson University. Phoenix: Mayo Clinic Arizona and Phoenix Children's Hospital. Pittsburgh: Children's Hospital of Pittsburgh of UPMC, University of Pittsburgh Medical Center, West Penn Hospital. Portland: Legacy Good Samaritan Hospital and Medical Center, Oregon Health and Science University, Pediatric BMT Program, Doernbecher Children's Hospital (OHSU), Providence Portland Medical Center. Providence: Roger Williams Medical Center. Richmond: Virginia Commonwealth University Massey Cancer Center BMT Program. Rochester: Mayo Clinic Rochester, University of Rochester Medical Center. Sacramento: Sutter Cancer Center, University of California-Davis Cancer Center. Salt Lake City: Latter Day Saints Hospital, Utah Blood and Marrow Transplant Program Adults, Utah Blood and Marrow Transplant Program Peds. San Antonio: South Texas Veterans Health Care System, Texas Transplant Institute. San Diego: Rady Children's Hospital San Diego. San Francisco: University of California Adults, University of California Pediatrics. Scottsdale: Cancer Transplant Institute at Virginia G. Piper Cancer Center. Seattle: Fred Hutchinson Cancer Center, VA Puget Sound

Healthcare System. Shreveport: Louisiana State University Health Sciences Center. Sioux Falls: Avera McKennan Transplant Institute. St. Louis: Cardinal Glennon Children's Hospital, SSM Health Saint Louis University Hospital, Washington University School of Medicine, Washington University/St. Louis Children's Hospital. St. Petersburg: Johns Hopkins All Children's Hospital. Stanford: Stanford University Medical Center. Stony Brook: Stony Brook University Hospital. Syracuse: State University of NY Upstate Medical University. Tampa: H Lee Moffitt Cancer Center. Temple: Scott and White Memorial Hospital. Tucson: Banner University Medical Center. Tulsa: Cancer Treatment Centers of America, Saint Francis Hospital -Oklahoma. Washington: Children's National Medical Center, Medstar Georgetown University Hospital. Wichita: Via Christi Hospitals. Wilmington: Alfred I. duPont Hospital for Children. Winston-Salem: Wake Forest Baptist Health. Worcester: UMass Memorial Medical Center. Zion: Cancer Treatment Centers of America - Midwestern Regional Medical Center.

EBMT Austria, Graz: Universitäts Kinderklinik, University of Graz, Innsbruck: University Hospital, Klagenfurt: Klinikum Klagenfurt, Linz: AO Krankenhaus, AOKH der Elisabethinen, Salzburg: LKA Salzburg, Vienna: Donauespital, Hanusch- Krankenhaus, St. Anna Kinderspital, Universitätsklinik für Innere Medizin-AKH, Wilhelminenspital. Azerbaijan, Baku: Central Clinic Hospital. Belarus, Minsk: Belorussian Center. Belgium, Antwerp: Stuivenberg ZH, University Antwerpen, Brugge: A.Z. St. Jan, Brussels: Clinique Universitaire St. Luc, Institut Jules Bordet, Children's Hospital, U.L.B. Hôpital Erasme, University Hospital, Charleroi: CHU Charleroi, Grand Hôpital de Charleroi Notre-Dame, Gent: University Hospital, Haine St. Paul: Hôpital de Jolimont, Hasselt: Jessa Ziekenhuis, Leuven: University Hospital Gasthuisberg, Liège: CHR-Citadelle, University Hospital Sart-Tilman, Roeselare: H. Hart Ziekenhuis, Turnhout: AZ Turnhout, Wilrijk: Sint Agustinus GVA.; Clinique universitaire de Mont-Godinne. Bosnia and Herzegovina, Sarajevo: Clinical Centre, Tuzla: University Clinical Centre. Bulgaria, Sofia: National Centre of Hematology, Pediatric Hospital for Oncohematology and BMT. Croatia, Zagreb: Hospital Merkur, University Hospital Dubrava, University Hospital Rebro. Cyprus, Limassol: General Hospital, Nicosia: Nicosia General Hospital. Czech Republic, Brno: Masaryk University Hospital, Hradec Kralové: Charles University, Olomouc: University Hospital, Ostrava: University Hospital Ostrava. Pilsen: Charles Hospital, Prague: Charles University, Charles University Vinohrady, Institute of Hematology and Blood Transfusion, University Hospital Motol. Denmark, Aalborg: Aalborg Hospital, Aarhus: Amtssygehus, Copenhagen: Herlev Hospital, Rigshospitalet. Estonia, Tallinn: North Estonia Medical Centre, Tartu: University Hospital. Finland, Helsinki: Children's Hospital, University Central Hospital, Oncology University Hospital, Kuopio: University Hospital, Oys Oulu: University Central Hospital, Tampere: University Hospital, Turku: University Central Hospital. France, Amiens: CHU d'Amiens, Angers: Centre Hospitalier, Bayonne: C.H. De la Cote Basque, Besancon: Hôpital Jean Minjoz and St. Jacques, Bordeaux: CHU Hospitalier Pellegrin-Enfants, Boulogne sur Mer: CHU Hôpital Duchenne, Brest: Hôpital Morvan, CHU de Brest, Caen: Centre Reg. Francois Baclesse, CHU Caen Institut d'hématologie de Basse-Normandie, Clermont Ferrand: CRCTCP CHU Estaing, Colmar: Hôpital Civils, Corbeil Essonne: Hopital Gilles de Corbeil, Créteil: Hôpital H. Mondor, Hôpital Henri Mondor, Dijon: Hôpital des Enfants, Dunkerque: Centre Hospitalier, Grenoble: CHU Grenoble, La Réunion: CHU Felix Guyon. Le Chesnay: C.H. De Versailles, Lille: Centre Hospitalier Saint Vincent, Centre Oscar Lambret, Hôpital Claude Huriez, Hôpital Jeanne de Flandre, Limoges: CHU Dupuytren, Lyon: Centre Léon Bérard, Hôpital Edouard Herriot, Institut d'Hématologie et d'Oncologie Pédiatrique, Marseille: Hôpital Timone Enfants, Institute Paoli I. Calmettes, Marseille Bouches du Rhone: Centre Hospitalier Universitaire La Conception, Meaux: CHU de Meaux,

Metz: CHR de Metz-Thionville, Montpellier: CHR Lapeyronie, Mulhouse: Hôpital du Hasenrain, Nantes: Hotel Dieu, CHU Nantes, Nice: Centre Antoine Lacassagne, Hôpital de l'Archet 1, Orleans: CHR Orléans, Hôpital de la Source, Paris: Clarmart, Hôpital d'Instruction des Armées Percy, Hôpital d'enfants Armand Trousseau, Hôpital Cochin, Hôpital Neckar des enfants malades, Hôpital Necker, Hôpital Pitié Salpêtrière, Hôpital Robert Debré, Hôpital St. Antoine, Hôpital St. Louis, Hôpital Tenon, Pessac: Hôpital du Haut Leveque, CHU Bordeaux, Pierre Benite: Centre Hospitalier Lyon-Sud, Poitiers: CHU de Poitiers, Hôpital La Miletie, Pontoise: Hôpital René Dubos, Reims: Hôpital Robert Debré, Rennes: Clinique Médical Infantile, CHRU, Hôpital Pontchaillou, Roubaix: Hôpital V. Provo, Rouen: Centre Henri Becquerel, Hôpital Charles Nicolle, Saint Priest en Jarez: Institut Lucien Neuwirth, Institute de Cancérologie Lucien Neuwirth, Saint Quentin: Centre Hôpital De Saint Quentin, St. Cloud: Institut Curie, Hôpital René Huguenin, Strasbourg: Hôpital de Haute-pierre, Toulouse: Hôpital de Purpan, Tours: Hôpital Bretonneau, Vandoeuvre-les-Nancy: CHU de Brabois, Hôpital d'Enfants, Villejuif: Gustave Roussy Cancer Campus, Hôpital Paul Brousse, Institut G. Roussy. Germany, Aachen: Universitätsklinikum, Augsburg: Klinikum Augsburg, Bayreuth: Klinikum Bayreuth, Berg: Schön Klinik Starnberger See, Berlin: Charite Campus Virchow Klinikum, Charité, Campus Benjamin Franklin, Charité, Campus Virchow Klinikum, HELIOS Klinikum Berlin Buch, Vivantes Klinikum Neukoellen, Bochum: Knappschaftskrankenhaus, Bonn: Universitätsklinikum, Braunschweig: Städtisches Klinikum, Bremen: Evangelistisch Diakonie-Krankenhaus GmbH, Klinikum Bremen-Mitte, Chemnitz: Klinikum Chemnitz GmbH, Cottbus: Carl-Thiem-Klinikum, Dresden: Universitätsklinikum Carl Gustav Carus, Duisburg: HELIOS Klinikum, Düsseldorf: Universitätsklinikum. Erlangen: Universitäts-Klinik für Kinder und Jugendliche, Universitätsklinikum. Essen: Evangelisches Krankenhaus Essen-Werden GmbH, Universitätsklinikum, West German Cancer Center, Flensburg: St. Franziskus Hospital, Frankfurt: J. W. Goethe Universität, KH Bethanien, KH Nordwest, Klinikum Frankfurt Oder, Universitätsklinikum d. J.W. Goethe. Freiburg: Universitätsklinikum. Giessen: Universitätsklinikum, Göttingen: Universitätsklinikum, Greifswald: Universitätsklinikum, Hagen: St. Marien Hospital, Halle: Universitätsklinikum, Hamburg: Asklepios Klinik Altona, Asklepios Klinik St. Georg, Universitätsklinikum Eppendorf, Universitätsklinikum Eppendorf - Onkologisches Zentrum, Hameln: Sana Klinikum Hameln-Pyrmont, Hamm: Evangelisches Krankenhaus, St. Marien Hospital, Hannover: Klinikum Region Siloah, Medizinische Hochschule. Heidelberg: Angelika Lautenschläger-Klinik, Universitätsklinikum, Homburg/Saar: Universität des Saarlandes, Jena: FS Universitäts-Kinderklinik, Universitätsklinikum. Kaiserslautern: WestpfalzKlinikum, Karlsruhe: Städtische Klinik, Kassel: Klinikum Kassel, Kiel: Universitätsklinikum Schleswig-Holstein, Koblenz: Stiftungsklinikum Mittelrhein. Köln: Universitätsklinikum. Leipzig: Universitätsklinikum, Lemgo: Klinikum Lippe, Lübeck: Sana Klinikum, Universitätsklinikum Schleswig Holstein, Universitätsklinikum Schleswig Holstein, Ludwigshafen: klinikum der Stadt. Magdeburg: Universitätsklinikum. Mainz: Universitätsklinikum, Mannheim: Universitätsklinikum, Marburg: Universitätsklinikum, Minden/Westfalen: Klinikum Minden, Möchengladbach: Klinikum Maria Hilf II, KH St. Franziska, Munich: KH München Schwabing, Kinderklinikum Universität München Grosshadern, Klinikum Innenstadt der LMU, Klinikum Rechts der Isar, Klinikum Schwabing, SKH München-Harlaching, Universitätsklinikum Grosshadern, Münster: Universitätsklinikum Münster, W.-W Universitätsklinikum. Nürnberg: Klinikum Nord, Oldenburg: Universitätsklinikum, Osnabrück: Klinikum Osnabrück, Potsdam: Klinikum Ernst von Bergmann, Regensburg: Universitätsklinikum. Rostock: Universitätsklinikum. Rotenburg-Wümme: Diakoniekrankenhaus. Siegen: St. Marien-Krankenhaus, Stuttgart: DiakonissenKH, Klinikum Stuttgart, Katharinenhospital, Robert Bosch Krankenhaus, Universitätsklinikum, Tübingen: Universitätsklinikum, Ulm: Kinderklinik Universitätsklinikum, Villingen: Schwarzwald-Baar

Klinikum, Westerstede: Ammerland Klinik, Wiesbaden: Deutsche Klinik für Diagnostik, Dr. Horst Schmidt Klinikum, Würzburg: Universitätsklinikum. Greece, Alexandroupolis: Thrace University Med. School, Athens: Aghia Sophia Children's Hospital, Alexandra Hospital, University of Athens, Athens Medical Center, Diagnostic & Therapeutic Center 'Hygeia', Evangelismos Hospital, Hellenic Cancer Institute St. Savas, Laikon General Hospital, University of Athens, Crete: University Hospital, Patras: University Medical School Hospital, Thessaloniki: The George Papanicolaou General Hospital. Hungary, Budapest: St Istvan & St. Lazlo Hospitals, Szent Laszlo Hospital, Debrecen: University of Debrecen, Miskolc: GYEK, Postgraduate Medical School, Pécs: University of Pécs. Iceland, Reykjavik: National University Hospital. Ireland, Dublin: Our Lady's Hospital of Sick Children, Crumlin, St. Vincent's Hospital, St. James Hospital. Galway: University College Hospital. Israel, Haifa: Rambam Medical Center, Jerusalem: Hadassah University Hospital, Petach-Tikva: Beilinson Hospital, Children's Medical center, Revohot: Kaplan Hospital, Tel Aviv: Dana-Dwek Children's Hospital, Sourasky Medical Centre, Sourasky Medical Center, Tel Hashomer: Chaim Sheba Medical Center, Sheba Medical Center. Italy, Alessandria: S.S. Antonio e Biagio e C. Arrigo. Ancona: Ancona University, Azienda Ospedale Salesi Riuniti, Ascoli Piceno: Mazzoni Hospital, Avellino: A.O.S. Guiseppe Moscati, Aviano: CRO Aviano, Bari: Università degli Studi di Bari. Bergamo: ASST Papa Giovanni XXIII, Bologna: Istituto Ortopedico Rizzoli, Poli. S. Orsola, San Orsola-Malpighi Hospital, Bolzano: Ospedale S. Maurizio, Brescia: Azienda Spedali Civili, Azienda Spedali Civili, Università degli Studi di Brescia, Brindisi: Perrino Hospital, Busto Arsizio: Ospedale di circolo di Busto Arsizio, Cagliari: Binaghi BMT Centre, Ospedale A. Businco, Ospedale per le Microcitemie. Catania: Ospedale Ferrarotto, University of Catania, Ospedale Ferrarotto, University of Catania. Civitanove Marche: Ospedale di Civitanova Marche, Cremona: U.O. Ematologia CTMO, Cuneo: Azienda Ospedale 'S. Croce e Carle', Ferrara: University of Ferrara, Florence: Ospedaliaria Universitaria di Careggi, Foggia: Azienda Ospedaliera Universitaria, Genova: Istituto Giannina Gaslini, Ospedale San Martino, Ospedale San Martino, Latina: Ospedale S. Maria Goretti, Lecce: Ospedale Vito Fazzi de Lecce, Medola: Istituto Scientifico Romagnolo, IRST, Messina: Policlinico Universitario Messina. Milan: Ist. Clinico Humanitas, Istituto Europeo di Oncologia, Ist. Nazionale Tumori di Milano, Istituto Scientifico H.S. Raffaele, Ospedale di Niguarda, S. Carlo Borromeo Hospital, University of Milan IRCCS, Mirano: Ospedale Civile di Mirano, Modena: University of Modena, Monza: Ospedale San Gerardo, Ospedale San Gerardo, Università Di Milano-Bicocca, Naples: Cardarelli Hospital, Federico II University, Hospital Pausilipon, National Cancer Institute IRCCS, Novara: Ospedale Maggiore della Carità. Nuoro: Ospedale San Francesco, Padova: Centro Leucemie Infantili, Istituto Oncologia Veneto IOV-IRCCS, Padua: University Hospital, Pagani: Hospital A. Tortora, Palermo: ARNAS Civico Di Cristina, Ospedale die Bambini, Ospedale 'La Maddalena', Ospedale V. Cervello-USL 60, Uni delgi Studi di Palermo, Parma: Università degli studi, Pavia: Fondazione Clinica del Lavoro, S. Maugeri, IRCCS Policlinico S. Matteo, Policlinico IRCCS St. Matteo, Perugia: Ospedale Santa Maria della Misericordia, Pesaro: Ospedale San Salvatore, Pescara: Ospedale Civile, Piacenza: Hospital Guglielmo da Saliceto, Pisa: University of Pisa, Potenza: San Carlo Hospital, Ravenna: Ospedale Civile, Reggio di Calabria: Grande Ospedale Metropolitanano, Bianchi Melacrino Morelli, Reggio Emilia: Arcispedale S. Maria Nuova, Rimini: Ospedale Infermi Rimini, Rionero in Vulture: IRCCS/CROB, Rome: IRRCS Ospedale Bambino Gesù, Ospedale S. Camillo, Policlinico Tor Vergata, Rome Transplant Network, Università 'La Sapienza', Università Cattolica, Salerno: AOU San Giovanni di Dio e Ruggi D' Aragona, San Giovanni Rotondo: Hospital Casa Sollievo Sofferenza, Sassari: Università Di Sassari, Siena: Ospedale Sclavo, Taranto: Institute of Haematologie, Ospedale Nord, Torino: Ospedale Magg. S. G. Battista, Ospedale Ordine Mauriziano Umberto I, University Hospital, Treviso: Presidio

Ospedaliero Treviso, Tricase (Lecce): Hospital C. Panico, Istituto per l'Infanzia, IRCCS Burlo Garofolo. Udine: Policlinico Universitario & General Hospital. Varese: Ospedale di Circolo e Fondazione Macchi, Venice: Ospedale dell'Angelo, Verbania Pallanza: Ospedale di Verbania, Vercelli: S. Andrea Hospital, Verona: Policlinico G. B. Rossi, Vicenza: Ospedale S. Bortolo. Kazakhstan, Astana: National Research Center for Oncology and Transplantation. Latvia, Riga: Clinic Linezers. Lithuania, Vilnius: Santariskiu Klinikos. Lithuania, Vilnius: University Children's Hospital. Luxemburg, Luxemburg, Center Hospitalier. Macedonia, Skopje: Medical Faculty. Netherlands, Amsterdam: Academic Med Centre, Antoni Van Leeuwenhoek Cancer Institute, VU University Medical Center. Enschede: Medisch Spectrum Twente. Groningen: University Hospital. Leiden: University Hospital. Maastrich: University Hospital. Nieuwegein: St. Antonius Hospital. Nijmegen: University Hospital. Rotterdam: Dr. Daniel den Hoed Cancer Center, Sophia Children's Hospital. The Hague: Haga Hospital. Utrecht: University Hospital for Children, WKZ, Utrecht University Hospital UMCU. Zwolle: Isala klinieken. Norway, Bergen: Haukelands Sjukhus. Oslo: Oslo University Hospital, Rikshospitalet-Radiumhospitalet. Tromsø: University Hospital North Norway. Trondheim: St. Olavs Hospital. Poland, Bydgoszcz: Nicolaus Copernicus University. Cracow: University Hospital CMUJ, University Children's Hospital JUMC. Gdansk: Medical University. Gliwice: Maria Curie Memorial Cancer Centre. Katowice: Silesian Medical Academy. Lodz: Medical University of Lodz. Lublin: Children's University Hospital, University Medical School. Poznan: Institute of Pediatrics, Pozan Medical Academy. Warsaw: Central Clinical Hospital, Central Hospital Military Medical Academy, Institute of Haematology and Blood Transfusion, Marie Curie Institute. Wrocław: Lower Silesian Center/BM Donor Registry, Medical Academy, University of Medicine. Portugal, Coimbra: University Hospital. Lisbon: H. St. Antonio dos Capuchos, Hospital de Santa Maria, Instituto Portugues de Oncologia. Porto: Hospital St. Joao, Instituto Portugues de Oncologia. Romania, Bucharest: Coltea Clinical Hospital, Fundeni Clinical Institute. Targu-Mures: Sectia Clinica de Hematologie. Timisoara: Children's Hospital Louis Turcanu. Russia, Ekaterinburg: Regional Hospital No. 1. Moscow: Burnasyan Fed. Med. Biophysical Centre, Cancer Research Center, Cancer Research Centre, Federal Research Center for Pediatric Hematology, Main Military Clinical Hospital, National Pirogov Medical Centre, Research Haematology Center of RAS, The Russian Children's Research Hospital. St. Petersburg: Federal Centre V.A. Almazov, First State Pavlov Medical University, Russian Scientific and Research Institute of Haematology. Serbia, Belgrade: Clinical Center of Serbia, Military Medical Academy, Mother and Child Health Institute. Slovak Republic, Banská Bystrica: Roosevelt Hospital. Bratislava: National Cancer Institute, University Hospital. Kosice: University Hospital. Slovenia, Ljubljana: University Medical Centre. Spain, Alicante: Hospital General. Barakaldo Vizcaya: Hospital de Cruces. Barcelona: Hospital Clinic, Hospital General Vall d'Hebron, Hospital Germans Trias i Pujol, Hospital M. Infantil, Vall d'Hebron, Hospital Mutua de Terrassa, Hospital Sant Joan de Deu, Institue Catala d'Oncologia, Hospital Duran i Reynals, Santa Creu i Sant Pau, Santa Creu i San Pau. Caceres: Hospital San Pedro de Alcantara. Cadiz: Hospital de Jerez, Hospital Universitario Puerta del Mar. Castellon de La Plana: Hospital General de Castellon. Cordoba: Hospital Reina Sofia. Galdakao: Hospital de Galdakao. Girona: Institut Catala d'Oncologia, Josep Trueta. Granada: Hospital Virgen de la Nieves. Jaen: Hospital Cuidad de Jaen. La Coruna: Complejo Hosp. Uni. A Coruna. La Laguna, Tenerife: University Hospital Canary Isles, Hospital N. S. De la Candelaria. Las Palmas Canary Isles: Hospital Insular, Hospital Materno Infantil, Hospital Universitario de Gran Canaria 'Dr. Negrin'. Leon: Hospital Universitario de Leon. Lleida: Hospital Arnau de Vilanova. Logrono: Hospital San Pedro, La Rioja. Lugo: Hospital Lucus Augusti. Madrid: Clinica Moncloa, Fundacion Jimenez Diaz, Hospital de la Princesa, Hospital Doce de Octubre, Hospital General

Universitario Gregorio Maranon, Hospital La Paz, Hospital Niño Jesus, Hospital Principe Asturias, Alcala de Henares, Hospital Quiron, Hospital Ramon y Cajal, Hospital Severo Ochoa, Leganés, Hospital Universitario Materno Infantil Gregorio Maranon, Hospital Universitario de Getafe, Hospital Universitario Puerta de Hierro, Hospital Universitario San Carlos. Malaga: Carlos Haya Hospital. Murcia: Hospital General Universitario Morales Meseguer, Hospital Virgen de la Arrixaca. Orense: Com. Hospital Cristal-Pinor. Oviedo: Hospital Covadonga, Central Asturias. Palma de Mallorca: Hospital son Llatzer, Hospital Universitario Son Espases (Son Dureta). Pamplona: Clinica Universitaria de Navarra, Hospital de Navarra. Pontevedra: Hospital Montecelo. Salamanca: Complejo Hospital. San Sebastian: Hospital Universitario Donostia. Santander: Hospital Universitario M. de Valdecilla. Santiago de Compostela: Hospital Clinico Universitario. Sevilla: Hospital Universitario Virgen del Rocío. Valencia: Hospital Arnau de Vilanova de Valencia, Hospital Clinico Universitario, Hospital Doctor Peset, Hospital Universitario La Fe, Instituto Valenciano de Oncologia. Valladolid: Hospital Rio Hortega. Vigo: CHUVI Hospital Alvaro Cunqueiro. Zaragoza: Clinico Universitario Lozano Blesa, Hospital Miguel Servet. Sweden, Goteborg: CHECT Sahlgrenska University Hospital. Linköping: University Hospital. Lund: University Hospital. Örebro: Medical Center Hospital. Stockholm: Karolinska University Hospital. Umea: University Hospital. Uppsala: University Hospital. Switzerland, Aarau: Kantonsspital Aarau. Basel: University Hospital Basel. Bellinzona: Ospedale San Giovanni. Bern: Inselspital. Geneva: Hôpital Cantonal Universitaire. Lausanne: Centre Hospitalier Universitaire Vaudois. St. Gallen: Kantonsspital. Zurich: University Hospital, Universitäts Kinderklinik. Turkey, Adana: Baskent University Adana, Cukurova University Balcali Hospital. Ankara: Ankara Bayindir Hospital, Ankara University Faculty of Medicine, Dikimevi, Ankara Children's Hospital, GATA BMT Center, Etlik, Gazi University Medical School, Besevler, Gazi University Medical School, Besevler, Hacettepe University Medical School, Sihhiye, Ihsan Dogramaci Children's Hospital (Hacettepe), Numune Education and Research Hospital, Private Medicana International Hospital, University Faculty of Medicine, Cebeçi, University of Ankara, Cebeçi. Antalya: Akdeniz University School of Medicine, Medical Park Antalya Hospital, Lara, Medical Park Hospitals, Medstar Antalya Hospital, Cakirlar. Atakum Samsun: Medicalpark Hospital. Aydin: Adnan Menderes University Medical Faculty. Bursa: Uludag University School of Medicine. Eskisehir: Osmangazi University. Gaziantep: University Medical School. Istanbul: Acibadem Altunizade Hospital, Acibadem University Atakent Hospital, Bahcelievler Medical Park Hospital, Cerrahpasa Medical Faculty, Florence Nightingale Sisli Hospital, Istanbul Medipol University, Medical Park Goztepe, University of Istanbul, Hisar Intercontinental Hospital Izmir: Dokuz Eylul University, Ege University Medical Faculty, Bornova, Tepecik Research and Educational Hospital. Kayseri: Erciyes University Faculty of Medicine, Erciyes University Hospital. Kocaeli: Anadolu Medical Center Hospital. Konya: Necmettin Erbakan, Meram University Medical Hospital. Malatya: Inonu University Targut Özal Medical Centre, Samsun: Ondokuz Mayıs University. Trabzon: Karadeniz Technical University. Ukraine, Kiev: City BMT Center, National Pediatric Specialized Hospital, OHMATDYT. United Kingdom, Aberdeen: The Royal Infirmary. Bangor: Ysbyty Gwynedd. Bath: Royal United Hospital. Belfast: Belfast City Hospital Trust. Birmingham: Heartlands Hospital, Queen Elizabeth Hospital, The Birmingham Children's Hospital. Blackpool: Victoria Hospital. Bournemouth: Royal Bournemouth Hospital. Bristol: Avon and Royal Hospital for Sick Children. Cambridge: Addenbrooke's Hospital. Cardiff/Swansea: University Hospital of Wales. Cheltenham: Cheltenham General Hospital. Coventry: University Hospital & Warwickshire NHS Trust. Dudley: Dudley NHS Trust. Dundee: Ninewells Hospital. Edinburgh: The Western General Hospital. Exeter: Royal Devon and Exeter Hospital. Glasgow: Beatson, West of Scotland Cancer Centre, Royal Hospital for Sick Children: Ipswich: Ipswich

Hospital. Leeds: Leeds Teaching Hospitals Trust. Leicester: Royal Infirmary Hospital. Liverpool: Alder Hay Children's Hospital, Royal Liverpool University Hospital. London: Great Ormond, Street Hospital, Hammersmith Hospitals NHS Trust, King's College Hospital, Parkside Hospital, London, Royal Marsden Hospital, Mary's Hospital, St. Bartholomew's and the Royal London Hospital, St. George's Hospital, The Harley Street Clinic, The London Clinic, The Royal Free Hospital, University College Hospital. Manchester: Central Manchester NHS Trust, Christie Hospital, The Royal Infirmary. Newcastle upon Tyne: Freeman Hospital. Norwich: Norfolk and Norwich Hospital. Nottingham: Nottingham City Hospital. Churchill, Stoke Manderville Hospitals. Plymouth: Plymouth Hospitals NHS Trust. Poole: Poole Hospital NHS Foundation Trust. Salisbury: Salisbury NHS Foundation Trust. Sheffield: Teaching Hospitals NHS Trust, Children's Hospital. Southampton: CRC Wessex. Stoke-on-Trent: University Hospital of North Staffordshire. Swindon: Great Western Hospital. Taunton: Taunton and Somerset Hospital.

LABMT Argentina, Buenos Aires: Hospital Universitario Fundacion Favalaro, Hospital Italiano de Buenos Aires, FUNDALEU, Hospital de Clinicas J de San Martín, Hospital Aleman, Instituto Alexander Fleming, Sanatorio Anchorena, Hospital Británico de Buenos Aires, Hospital Rodolfo Rossi, Sagrado Corazón, Hospital Italiano de La Plata, Hospital San Martín de La Plata, CEMIC. Córdoba: Sanatorio Allende, Hospital Privado de Córdoba. Pilar: Hospital Universitario Austral, El Hospital de Niños Sor María Ludovica (HNSML). Santa Fe: CETRAMOR. Brazil, Salvador: Monte Tabor Centro Ítalo Brasileiro de Promoção Sanitário - Hospital São Rafael, Hospital das Clinicas UFBA. Fortaleza: Hospital Universitário Walter Cantídeo - UFC - SAMEAC. Belo Horizonte: Hospital Socor. Juiz de Fora: Hospital Universitário da Juiz da Fora UFJF. Curitiba: Hospital das Clinicas Universitário Fed. Do Parana. Niteroi: Hospital Das Clinicas de Niteroi. Rio de Janeiro: Centre de transplante de Medula Ossea INCA, Hospital Universitário Clementino Fraga Filho, Hospital Universitário Pedro Ernesto HUPE UERJ. Porto Alegre: Hospital das Clinicas de Porto Algra UFRG, Hospital das Clinicas de Porto Algra UFRG peds. Barretos: Hospital de Câncer de Barretos - Fundação Pio XII. Campinas: Centro de Hematologia e Hemoterapia de Campinas (Hemocentro) da Universidade Estadual de Campinas (Unicamp), Centro Infantil de Investigações Hematológicas Dr. Domingos A. Boldrini, Real Soc. Beneficência Portuguesa de Campinas, Hospital Vera Cruz S/A. Jau: Hospital Amaral Carvalho - Fundação Dr. Amaral Carvalho. Ribeirao Preto: Hospital de Clínicas FAEPA Ribeirão Preto FMRP USP, Hospital São Lucas de Ribeirão Preto. São Paulo: Fundação Antônio Prudente Hospital A C Camargo, Instituto de Oncologia Pediátrica - GRAACC - UNIFESP, Hospital Israelita Albert Einstein, Hospital Sírio Libanês, Hospital das Clínicas São Paulo - HCFMUSP, Instituto Brasileiro de Controle do Cancer IBCC, Sociedade Hospital Samaritano, HTEJZ - Hospital Brigadeiro - SES (Hospital Dr. Euryclides de Jesus Zerbini), Hospital Santa Helena - Hemome, Hospital Santa Paula, Hospital Bandeirantes, Hospital Nove de Julho, FCM Santa Casa de Misericórdia de São Paulo. Sorocaba: Hospital Unimed Sorocaba. Chile, Santiago: Hospital Del Salvador de Chile adults, Catholic University of Chile Adults, Catholic University of Chile Pediatrics, Clínica Santa Maria Adults and Pediatrics. Colombia, Bogota: Clínica de Marly. Cali: Center Medico Imbanaco. Floridablanca: UNAB FOSCAL. Medellín: Clínicas las Americas IDC, Hospital Pablo Tobin Uribe. Costa Rica, San Jose: Hospital Mexico CCSS, Hospital San Juan de Dios Adults. Ecuador, Guayaquil: OMNI HOSPITAL Guayaquil, SOLCA Guayaquil. Quito: Hospital Metropolitano Quito. Mexico, Guadalajara: Hospital Civil de Pediatría Guadalajara, Juan I Menchaca, Hospital Civil de Guadalajara Frai Antonio Alcalde. Mexico City: Hospital Infantil de Mexico Federico Gomez HIMFG, Hospital Especialidades Centro Medico Nacional Siglo XXI, Instituto Nacional de Cancerología INCAN, Instituto Nacional de Pediatría. Monterrey: Hospital Uni Antonoma de

Nuevo Leon UANL. Puebla: Center de Hematologia y Medicina Interna-Clinica Ruiz, Hospital de Especialidades IMSS. Xalapa: Centro Estatal de Onco (CECAN) Dr. Miguel Dorantes Mesa. Panama, Panama City: Instituto Oncologico Nacional, CHAAM Complejo Hospitalario Metropolitano Dr. Arnulfo Arias Madrid, Hospital del Nino. Paraguay, Asuncion: Instituto de Prevision Social IPS. Peru, Chiclayo: Nacional Almanzor Aguinaga Asenjo. Lima: Hospital Rebagliati, Hospital Almenara, Nacional de Salud del Ninos, Clínica San Borja SANNA. Uruguay, Montevideo: Asociacion Espanola lo de Socorros Mutuos Fundación Pérez-Scremini/Hospital Pereira Rossell, Asociacion Espanola lo de Socorros Mutuos, Hospital Británico, Servicio Médico Integral-SMI, Hospital Maciel. Venezuela: Caracas, Hospital de Clínicas de Caracas. Valencia: Ciudad Hospital Dr. Enrique Tejera CHET.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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Affiliations

Helen Baldomero¹ · Mahmoud Aljur² · Syed Z. A. Zaidi³ · Shahrukh K. Hashmi² · Ardeshir Ghavamzadeh⁴ · Alaa Elhaddad⁵ · Rose-Marie Hamladji⁶ · Parvez Ahmed⁷ · Lamia Torjemane⁸ · Miguel Abboud⁹ · Abdelghani Tbakhi¹⁰ · Murtadha Al Khabori¹¹ · Asma El Quessar¹² · Nosa Bazuaye¹³ · Mohamed Amine Bekadja¹⁴ · Salman Adil¹⁵ · Omar Fahmy¹⁶ · Mani Ramzi¹⁷ · Ahmed Ibrahim¹⁸ · Amal Alseraihy² · Nour Ben Abdejalil⁸ · Mahmoud Sarhan¹⁰ · Mohammed Al Huneini¹¹ · Lahoucine Mahmal¹⁹ · Hassan ElSolh² · Fazal Hussain² · Amr Nassar⁵ · Hani Al-Hashmi²⁰ · Amir Ali Hamidieh⁴ · Marcelo Pasquini²¹ · Yoshihisa Kodera²² · Nicolaus Kröger²³ · Mohamed Mohty²⁴ · Gregorio Jaimovich²⁵ · Juliana Martinez Rolon²⁶ · Kristjan Paulson²⁷ · Hildegard Greinix²⁸ · Daniel Weisdorf²⁹ · Mary Horowitz²⁰ · José Nunez³⁰ · Alois Gratwohl¹ · Jacob Passweg¹ · Mickey Koh³¹ · Jeff Szer³² · Dietger Niederwieser³³ · Nicolas Novitzky³⁴ On behalf of the East-Mediterranean (EMBT) and African (AfBMT) Blood and Marrow Transplantation Groups and the Worldwide Network for Blood and Marrow Transplantation (WBMT)

¹ Department of Medicine, WBMT Global Survey Office, Hematology, University Hospital, Basel, Switzerland

² Department of Hematology, King Faisal Specialist Hospital & Research Centre, Riyadh, Saudi Arabia

³ Department of Adult Hematology and BMT, Comprehensive Cancer Center, King Fahad Medical City, Riyadh, Saudi Arabia

⁴ Tehran University of Medical Sciences, Hematology, Oncology and SCT Research Center, Tehran, Iran

⁵ National Cancer Institute, Cairo University, Cairo, Egypt

⁶ Pierre and Marie Curie Center, Algiers, Algeria

⁷ Armed Forces Institute of Transplantation, Rawalpindi, Pakistan

⁸ Center National de Greffe de Moelle Osseuse de Tunis, Tunis, Tunisia

⁹ American University Beirut Medical Center, Beirut, Lebanon

¹⁰ King Hussein Cancer Center, Amman, Jordan, Saudi Arabia

¹¹ Sultan Qaboos University Hospital, Muscat, Oman

¹² Hôpital 20 Août, Casablanca, Morocco

¹³ University of Benin Teaching Hospital, Benin, Nigeria

¹⁴ University Hospital Establishment 1st Nov, Oran, Algeria

¹⁵ Aga Khan University Hospital, Karachi, Pakistan

¹⁶ Nasser Institute, Cairo University, Cairo, Egypt

¹⁷ Shiraz University of Medical Sciences, Shiraz, Iran

¹⁸ Makassed General Hospital, Beirut, Lebanon

¹⁹ Mohamed VI University Hospital, Marrakech, Morocco

²⁰ King Fahad Specialist Hospital, Dammam, Saudi Arabia

²¹ Center for International Blood and Marrow Transplant Research (CIBMTR), Milwaukee, WI, USA

²² Asia-Pacific Blood and Marrow Transplantation Group, Aichi Medical University, Nagakute, Japan

²³ Department of Stem Cell Transplantation, University Hospital, Hamburg, Germany

²⁴ The European Blood and Marrow Transplant Group (EBMT), Hôpital Saint-Antoine, Paris, France

²⁵ Hospital Universitario Fundacion Favaloro, Buenos Aires, Argentina

²⁶ FUNDALEU, Buenos Aires, Argentina

²⁷ Faculty of Medicine, University of Manitoba, Winnipeg, MB, Canada

²⁸ Division of Hematology, Medical University of Graz, LKH-Univ. Klinikum Graz, Graz, Austria

²⁹ University of Minnesota, Minneapolis, MN, USA

³⁰ WHO, Geneva, Switzerland

³¹ St George's Hospital and Medical School, London, UK

³² Clinical Haematology, Royal Melbourne Hospital, Melbourne, VIC, Australia

³³ Department of Hematology and Medical Oncology, University Hospital, Leipzig, Germany

³⁴ African Blood and Marrow Transplantation Society, Bern, South Africa