



## Clinical trial results:

**Prevention of severe GVHD after allogeneic hematopoietic stem cell transplantation, applied as consolidation immunotherapy in patients with hematological malignancies. A prospective randomized phase III trial.**

### Summary

EudraCT number	2008-003540-11
Trial protocol	NL BE
Global end of trial date	07 January 2021

### Results information

Result version number	v1 (current)
This version publication date	25 December 2022
First version publication date	25 December 2022

### Trial information

#### Trial identification

Sponsor protocol code	HO96GVHD
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#### Additional study identifiers

ISRCTN number	-
ClinicalTrials.gov id (NCT number)	-
WHO universal trial number (UTN)	-

Notes:

### Sponsors

Sponsor organisation name	HOVON
Sponsor organisation address	De Boelelaan 1117, Amsterdam, Netherlands,
Public contact	HOVON Data Center, HOVON, hdc@erasmusmc.nl
Scientific contact	HOVON Data Center, HOVON, hdc@erasmusmc.nl

Notes:

### Paediatric regulatory details

Is trial part of an agreed paediatric investigation plan (PIP)	No
Does article 45 of REGULATION (EC) No 1901/2006 apply to this trial?	No
Does article 46 of REGULATION (EC) No 1901/2006 apply to this trial?	No

Notes:

## Results analysis stage

Analysis stage	Final
Date of interim/final analysis	05 July 2019
Is this the analysis of the primary completion data?	Yes
Primary completion date	02 July 2019
Global end of trial reached?	Yes
Global end of trial date	07 January 2021
Was the trial ended prematurely?	No

Notes:

## General information about the trial

Main objective of the trial:

Objectives:

- to increase the proportion of patients with non severe GVHD within 180 days post-allo-SCT,
  - to reduce the progression rate and
  - to improve the progression free survival
- using a time restricted immunosuppressive regimen or a short-course post-transplant GVHD prophylaxis consisting of high-dose cyclophosphamide as compared to a prolonged, standard immunosuppressive regimen.

Protection of trial subjects:

Monitoring and Insurance

Background therapy: -

Evidence for comparator: -

Actual start date of recruitment	14 April 2010
Long term follow-up planned	No
Independent data monitoring committee (IDMC) involvement?	Yes

Notes:

## Population of trial subjects

### Subjects enrolled per country

Country: Number of subjects enrolled	Netherlands: 491
Country: Number of subjects enrolled	Belgium: 3
Worldwide total number of subjects	494
EEA total number of subjects	494

Notes:

### Subjects enrolled per age group

In utero	0
Preterm newborn - gestational age < 37 wk	0
Newborns (0-27 days)	0
Infants and toddlers (28 days-23 months)	0
Children (2-11 years)	0

Adolescents (12-17 years)	0
Adults (18-64 years)	418
From 65 to 84 years	76
85 years and over	0

## Subject disposition

### Recruitment

Recruitment details: -

### Pre-assignment

Screening details:

All subjects gave written informed consent and were screened according to the inclusion- and exclusion criteria.

### Period 1

Period 1 title	Overall period (overall period)
Is this the baseline period?	Yes
Allocation method	Randomised - controlled
Blinding used	Not blinded

### Arms

Are arms mutually exclusive?	Yes
<b>Arm title</b>	Arm A

Arm description:

Standard immunosuppression with Cyclosporin A and Myfortic.

Arm type	Standard treatment
Investigational medicinal product name	Cyclosporine A
Investigational medicinal product code	
Other name	
Pharmaceutical forms	Capsule, soft, Powder for infusion
Routes of administration	Infusion , Oral use

Dosage and administration details:

Cyclosporine A (CyA) immunosuppression: 9 mg/kg p.o. (in 2 doses) OR 3 mg/kg i.v. (in 2 doses) from day -5/-3 (depending on local procedures) till day 180.

Investigational medicinal product name	Myfortic
Investigational medicinal product code	
Other name	
Pharmaceutical forms	Tablet
Routes of administration	Oral use

Dosage and administration details:

Myfortic immunosuppression: (2x 16 mg/kg p.o.) from day 0 till day 84. Myfortic will be given with a maximum of 2160 mg/day.

<b>Arm title</b>	Arm B
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Arm description:

Time-restricted immunosuppression with Cyclosporin A and Myfortic.

Arm type	Experimental
Investigational medicinal product name	Cyclosporine A
Investigational medicinal product code	
Other name	
Pharmaceutical forms	Capsule, soft, Powder for infusion
Routes of administration	Infusion , Oral use

Dosage and administration details:

Cyclosporine A time-restricted immunosuppression: 9 mg/kg p.o. (in 2 doses) OR 3 mg/kg i.v. (in 2 doses) from day -5/-3 (depending on local procedures) till day 84.

Investigational medicinal product name	Myfortic
Investigational medicinal product code	
Other name	

Pharmaceutical forms	Tablet
Routes of administration	Oral use

Dosage and administration details:

Myfortic time-restricted immunosuppression:(2x 16 mg/kg p.o.) from day 0 till day 28. Myfortic will be given with a maximum of 2160 mg/day.

<b>Arm title</b>	Arm C
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Arm description:

Post-transplant cyclophosphamide

Arm type	Experimental
Investigational medicinal product name	Cyclophosphamide
Investigational medicinal product code	
Other name	
Pharmaceutical forms	Powder for infusion
Routes of administration	Intravenous use

Dosage and administration details:

Cyclophosphamide during conditioning: 14.5 mg/kg i.v. (day -6 and -5).

Cyclophosphamide during post-transplant immunosuppression: 50 mg/kg i.v. (day +3 and +4)

Investigational medicinal product name	Fludarabine
Investigational medicinal product code	
Other name	
Pharmaceutical forms	Powder for infusion
Routes of administration	Intravenous use

Dosage and administration details:

Fludarabine during conditioning: 30 mg/m<sup>2</sup> i.v. (day -6 to -2) 5 days.

Investigational medicinal product name	Cyclosporine A
Investigational medicinal product code	
Other name	
Pharmaceutical forms	Capsule, soft, Powder for infusion
Routes of administration	Infusion , Oral use

Dosage and administration details:

Cyclosporine A during post-transplant immunosuppression: 9 mg/kg p.o. (in 2 doses) OR 3 mg/kg i.v. (in 2 doses) during day +5 till +70.

<b>Number of subjects in period 1</b>	Arm A	Arm B	Arm C
Started	195	194	105
Completed	35	38	40
Not completed	160	156	65
Adverse Reaction	82	84	39
Other	21	15	7
At patients request	1	-	-
Lack of efficacy	56	57	19

## Baseline characteristics

### Reporting groups

Reporting group title	Overall period
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Reporting group description: -

Reporting group values	Overall period	Total	
Number of subjects	494	494	
Age categorical			
Units: Subjects			
In utero	0	0	
Preterm newborn infants (gestational age < 37 wks)	0	0	
Newborns (0-27 days)	0	0	
Infants and toddlers (28 days-23 months)	0	0	
Children (2-11 years)	0	0	
Adolescents (12-17 years)	0	0	
Adults (18-64 years)	418	418	
From 65-84 years	76	76	
85 years and over	0	0	
Age continuous			
Units: years			
median	56		
full range (min-max)	18 to 71	-	
Gender categorical			
Units: Subjects			
Female	201	201	
Male	293	293	

## End points

### End points reporting groups

Reporting group title	Arm A
Reporting group description: Standard immunosuppression with Cyclosporin A and Myfortic.	
Reporting group title	Arm B
Reporting group description: Time-restricted immunosuppression with Cyclosporin A and Myfortic.	
Reporting group title	Arm C
Reporting group description: Post-transplant cyclophosphamide	

### Primary: Primary endpoint

End point title	Primary endpoint <sup>[1]</sup>
End point description:	
End point type	Primary
End point timeframe:	
See publication	
Notes: [1] - No statistical analyses have been specified for this primary end point. It is expected there is at least one statistical analysis for each primary end point. Justification: Statistical analysis has been uploaded in the chart section.	

End point values	Arm A	Arm B	Arm C	
Subject group type	Reporting group	Reporting group	Reporting group	
Number of subjects analysed	184	185	99	
Units: Whole	184	185	99	

<b>Attachments (see zip file)</b>	Statistical data section from publication/HO96_Statistical data List of reported non-SAE's/nonsaedata96-28Nov2022.pdf List of reported SAE's/saedata96-28Nov2022.pdf
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### Statistical analyses

No statistical analyses for this end point

## Adverse events

### Adverse events information

Timeframe for reporting adverse events:

All AEs CTCAE grade  $\geq 2$  have to be reported (with the exception of progression). However, GVHD of all grades has to be reported on the GVHD forms.

Assessment type	Systematic
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### Dictionary used

Dictionary name	CTCAE
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Dictionary version	3.0
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### Reporting groups

Reporting group title	Control group (standard immunosuppression)
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Reporting group description: -

Reporting group title	Time-restricted immunosuppression
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Reporting group description: -

Reporting group title	Post-transplant cyclophosphamide
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Reporting group description: -

Serious adverse events	Control group (standard immunosuppression)	Time-restricted immunosuppression	Post-transplant cyclophosphamide
Total subjects affected by serious adverse events			
subjects affected / exposed	58 / 184 (31.52%)	70 / 185 (37.84%)	26 / 99 (26.26%)
number of deaths (all causes)	92	97	43
number of deaths resulting from adverse events			
Neoplasms benign, malignant and unspecified (incl cysts and polyps)			
Neoplasms benign, malignant and unspecified	Additional description: All combined, see SAE chart for details		
subjects affected / exposed	1 / 184 (0.54%)	2 / 185 (1.08%)	0 / 99 (0.00%)
occurrences causally related to treatment / all	0 / 1	0 / 2	0 / 0
deaths causally related to treatment / all	0 / 0	0 / 2	0 / 0
Vascular disorders			
Vascular disorders	Additional description: All combined, see SAE chart for details		
subjects affected / exposed	2 / 184 (1.09%)	3 / 185 (1.62%)	1 / 99 (1.01%)
occurrences causally related to treatment / all	1 / 4	1 / 3	0 / 1
deaths causally related to treatment / all	0 / 1	1 / 2	0 / 0
General disorders and administration site conditions			
General disorders and administration site conditions	Additional description: All combined, see SAE chart for details		



subjects affected / exposed	6 / 184 (3.26%)	6 / 185 (3.24%)	4 / 99 (4.04%)
occurrences causally related to treatment / all	2 / 6	1 / 6	1 / 4
deaths causally related to treatment / all	0 / 1	0 / 0	0 / 1
Immune system disorders			
Immune system disorders	Additional description: All combined, see SAE chart for details		
subjects affected / exposed	13 / 184 (7.07%)	14 / 185 (7.57%)	6 / 99 (6.06%)
occurrences causally related to treatment / all	3 / 15	3 / 14	0 / 6
deaths causally related to treatment / all	1 / 3	0 / 2	0 / 1
Respiratory, thoracic and mediastinal disorders			
Respiratory, thoracic and mediastinal disorders	Additional description: All combined, see SAE chart for details		
subjects affected / exposed	2 / 184 (1.09%)	2 / 185 (1.08%)	4 / 99 (4.04%)
occurrences causally related to treatment / all	0 / 2	1 / 2	0 / 4
deaths causally related to treatment / all	0 / 1	1 / 1	0 / 3
Psychiatric disorders			
Psychiatric disorders	Additional description: All combined, see SAE chart for details		
subjects affected / exposed	0 / 184 (0.00%)	0 / 185 (0.00%)	1 / 99 (1.01%)
occurrences causally related to treatment / all	0 / 0	0 / 0	0 / 1
deaths causally related to treatment / all	0 / 0	0 / 0	0 / 1
Investigations			
Investigations	Additional description: All combined, see SAE chart for details		
subjects affected / exposed	10 / 184 (5.43%)	8 / 185 (4.32%)	1 / 99 (1.01%)
occurrences causally related to treatment / all	12 / 12	7 / 8	1 / 1
deaths causally related to treatment / all	0 / 0	0 / 0	0 / 0
Injury, poisoning and procedural complications			
Injury, poisoning and procedural complications	Additional description: All combined, see SAE chart for details		
subjects affected / exposed	2 / 184 (1.09%)	1 / 185 (0.54%)	0 / 99 (0.00%)
occurrences causally related to treatment / all	1 / 2	0 / 1	0 / 0
deaths causally related to treatment / all	0 / 0	0 / 1	0 / 0
Cardiac disorders			
Cardiac disorders	Additional description: All combined, see SAE chart for details		
subjects affected / exposed	4 / 184 (2.17%)	1 / 185 (0.54%)	3 / 99 (3.03%)
occurrences causally related to treatment / all	0 / 4	0 / 1	2 / 3
deaths causally related to treatment / all	0 / 1	0 / 0	0 / 0
Nervous system disorders			

Nervous system disorders subjects affected / exposed occurrences causally related to treatment / all deaths causally related to treatment / all	Additional description: All combined, see SAE chart for details		
	4 / 184 (2.17%)	10 / 185 (5.41%)	0 / 99 (0.00%)
	3 / 4	8 / 10	0 / 0
	0 / 0	1 / 1	0 / 0
Blood and lymphatic system disorders Blood and lymphatic disorders subjects affected / exposed occurrences causally related to treatment / all deaths causally related to treatment / all	Additional description: All combined, see SAE chart for details		
	4 / 184 (2.17%)	9 / 185 (4.86%)	3 / 99 (3.03%)
	4 / 6	5 / 9	3 / 3
	0 / 0	0 / 0	1 / 1
Gastrointestinal disorders Gastrointestinal disorders subjects affected / exposed occurrences causally related to treatment / all deaths causally related to treatment / all	Additional description: All combined, see SAE chart for details		
	17 / 184 (9.24%)	15 / 185 (8.11%)	3 / 99 (3.03%)
	14 / 20	10 / 16	1 / 4
	0 / 0	0 / 0	0 / 0
Hepatobiliary disorders Hepatobiliary disorders subjects affected / exposed occurrences causally related to treatment / all deaths causally related to treatment / all	Additional description: All combined, see SAE chart for details		
	2 / 184 (1.09%)	2 / 185 (1.08%)	0 / 99 (0.00%)
	0 / 2	1 / 2	0 / 0
	0 / 0	1 / 1	0 / 0
Skin and subcutaneous tissue disorders Skin and subcutaneous tissue disorders subjects affected / exposed occurrences causally related to treatment / all deaths causally related to treatment / all	Additional description: All combined, see SAE chart for details		
	1 / 184 (0.54%)	0 / 185 (0.00%)	0 / 99 (0.00%)
	0 / 1	0 / 0	0 / 0
	0 / 0	0 / 0	0 / 0
Renal and urinary disorders Renal and urinary disorders subjects affected / exposed occurrences causally related to treatment / all deaths causally related to treatment / all	Additional description: All combined, see SAE chart for details		
	1 / 184 (0.54%)	2 / 185 (1.08%)	2 / 99 (2.02%)
	1 / 1	0 / 2	2 / 2
	0 / 0	0 / 0	0 / 0
Infections and infestations Infections and infestations subjects affected / exposed occurrences causally related to treatment / all deaths causally related to treatment / all	Additional description: All combined, see SAE chart for details		
	11 / 184 (5.98%)	12 / 185 (6.49%)	1 / 99 (1.01%)
	1 / 12	2 / 14	0 / 1
	0 / 2	2 / 3	0 / 0
Metabolism and nutrition disorders			

Metabolism and nutrition disorders	Additional description: All combined, see SAE chart for details		
subjects affected / exposed	5 / 184 (2.72%)	3 / 185 (1.62%)	1 / 99 (1.01%)
occurrences causally related to treatment / all	2 / 5	0 / 3	0 / 1
deaths causally related to treatment / all	0 / 0	0 / 0	0 / 0

Frequency threshold for reporting non-serious adverse events: 0 %

Non-serious adverse events	Control group (standard immunosuppression)	Time-restricted immunosuppression	Post-transplant cyclophosphamide
Total subjects affected by non-serious adverse events			
subjects affected / exposed	149 / 184 (80.98%)	165 / 185 (89.19%)	89 / 99 (89.90%)
Vascular disorders			
Vascular	Additional description: All combined, see SAE chart for details		
subjects affected / exposed	9 / 184 (4.89%)	7 / 185 (3.78%)	4 / 99 (4.04%)
occurrences (all)	12	8	4
Surgical and medical procedures			
Surgery/intra-operative injury	Additional description: All combined, see SAE chart for details		
subjects affected / exposed	1 / 184 (0.54%)	0 / 185 (0.00%)	0 / 99 (0.00%)
occurrences (all)	1	0	0
General disorders and administration site conditions			
Constitutional symptoms	Additional description: All combined, see SAE chart for details		
subjects affected / exposed	27 / 184 (14.67%)	33 / 185 (17.84%)	6 / 99 (6.06%)
occurrences (all)	35	37	7
Pain	Additional description: All combined, see SAE chart for details		
subjects affected / exposed	14 / 184 (7.61%)	19 / 185 (10.27%)	10 / 99 (10.10%)
occurrences (all)	14	20	11
Death	Additional description: All combined, see SAE chart for details		
subjects affected / exposed	0 / 184 (0.00%)	1 / 185 (0.54%)	0 / 99 (0.00%)
occurrences (all)	0	1	0
Secondary malignancy	Additional description: All combined, see SAE chart for details		
subjects affected / exposed	0 / 184 (0.00%)	1 / 185 (0.54%)	0 / 99 (0.00%)
occurrences (all)	0	1	0
Syndromes	Additional description: All combined, see SAE chart for details		
subjects affected / exposed	0 / 184 (0.00%)	2 / 185 (1.08%)	1 / 99 (1.01%)
occurrences (all)	0	3	1
Immune system disorders			

Allergy/immunology subjects affected / exposed occurrences (all)	Additional description: All combined, see SAE chart for details		
	2 / 184 (1.09%)	0 / 185 (0.00%)	3 / 99 (3.03%)
	2	0	5
Reproductive system and breast disorders Sexual/reproductive function subjects affected / exposed occurrences (all)	Additional description: All combined, see SAE chart for details		
	0 / 184 (0.00%)	1 / 185 (0.54%)	1 / 99 (1.01%)
	0	1	1
Respiratory, thoracic and mediastinal disorders Pulmonary/upper respiratory subjects affected / exposed occurrences (all)	Additional description: All combined, see SAE chart for details		
	8 / 184 (4.35%)	12 / 185 (6.49%)	8 / 99 (8.08%)
	9	15	11
Cardiac disorders Cardiac arrhythmia subjects affected / exposed occurrences (all)  Cardiac general subjects affected / exposed occurrences (all)	Additional description: All combined, see SAE chart for details		
	4 / 184 (2.17%)	4 / 185 (2.16%)	3 / 99 (3.03%)
	4	4	3
	Additional description: All combined, see SAE chart for details		
	42 / 184 (22.83%)	43 / 185 (23.24%)	24 / 99 (24.24%)
	45	46	24
Nervous system disorders Neurology subjects affected / exposed occurrences (all)	Additional description: All combined, see SAE chart for details		
	26 / 184 (14.13%)	22 / 185 (11.89%)	11 / 99 (11.11%)
	31	28	13
Blood and lymphatic system disorders Blood/bone marrow subjects affected / exposed occurrences (all)  Coagulation subjects affected / exposed occurrences (all)  Hemorrhage/bleeding subjects affected / exposed occurrences (all)  Lymphatics subjects affected / exposed occurrences (all)	Additional description: All combined, see SAE chart for details		
	51 / 184 (27.72%)	42 / 185 (22.70%)	9 / 99 (9.09%)
	90	92	15
	Additional description: All combined, see SAE chart for details		
	3 / 184 (1.63%)	2 / 185 (1.08%)	1 / 99 (1.01%)
	3	3	1
	Additional description: All combined, see SAE chart for details		
	4 / 184 (2.17%)	4 / 185 (2.16%)	1 / 99 (1.01%)
	5	4	1
	Additional description: All combined, see SAE chart for details		
	4 / 184 (2.17%)	8 / 185 (4.32%)	2 / 99 (2.02%)
	4	8	2
Ear and labyrinth disorders			

Auditory/ear subjects affected / exposed occurrences (all)	Additional description: All combined, see SAE chart for details		
	3 / 184 (1.63%) 3	1 / 185 (0.54%) 1	1 / 99 (1.01%) 1
Eye disorders Ocular/visual subjects affected / exposed occurrences (all)	Additional description: All combined, see SAE chart for details		
	6 / 184 (3.26%) 7	6 / 185 (3.24%) 6	6 / 99 (6.06%) 6
Gastrointestinal disorders Gastrointestinal subjects affected / exposed occurrences (all)	Additional description: All combined, see SAE chart for details		
	53 / 184 (28.80%) 65	50 / 185 (27.03%) 70	27 / 99 (27.27%) 29
Hepatobiliary disorders Hepatobiliary/pancreas subjects affected / exposed occurrences (all)	Additional description: All combined, see SAE chart for details		
	4 / 184 (2.17%) 4	1 / 185 (0.54%) 2	0 / 99 (0.00%) 0
Skin and subcutaneous tissue disorders Dermatology/skin subjects affected / exposed occurrences (all)	Additional description: All combined, see SAE chart for details		
	10 / 184 (5.43%) 10	21 / 185 (11.35%) 25	10 / 99 (10.10%) 12
Renal and urinary disorders Renal/genitourinary subjects affected / exposed occurrences (all)	Additional description: All combined, see SAE chart for details		
	11 / 184 (5.98%) 12	11 / 185 (5.95%) 11	4 / 99 (4.04%) 6
Endocrine disorders Endocrine subjects affected / exposed occurrences (all)	Additional description: All combined, see SAE chart for details		
	3 / 184 (1.63%) 3	7 / 185 (3.78%) 7	2 / 99 (2.02%) 2
Musculoskeletal and connective tissue disorders Musculoskeletal/soft tissue subjects affected / exposed occurrences (all)	Additional description: All combined, see SAE chart for details		
	6 / 184 (3.26%) 7	6 / 185 (3.24%) 6	7 / 99 (7.07%) 7
Infections and infestations Infection subjects affected / exposed occurrences (all)	Additional description: All combined, see SAE chart for details		
	87 / 184 (47.28%) 202	104 / 185 (56.22%) 226	71 / 99 (71.72%) 154
Metabolism and nutrition disorders			

Metabolic/laboratory subjects affected / exposed occurrences (all)	Additional description: All combined, see SAE chart for details		
	74 / 184 (40.22%)	72 / 185 (38.92%)	40 / 99 (40.40%)
	185	156	75

## More information

### Substantial protocol amendments (globally)

Were there any global substantial amendments to the protocol? Yes

Date	Amendment
13 October 2010	The study objective and statistical analysis of quality of life assessment are changed; Reporting of pregnancies is added; The grading of acute GvHD is corrected.
17 May 2011	Change of principal investigator; The registration of patients receiving a T-cell depleted allogeneic SCT was added; An extra inclusion criterion for the second randomization was added; dose adjustment of cyclosporin A was added; deletion of a off protocol reason (infusion of donor lymphocytes);
13 March 2012	Change of principal investigator; Deletion of the section 'severe GvHD; The registration of patients receiving a T-cell depleted allogeneic SCT and that will be treated with immunosuppression according to local hospital policy is deleted from protocol. It was added in version 3, but has not been implemented; correction with regards to reporting of GvHD; Information requested at registering patient is corrected from "patient's initials or code" into "local patient code (optional)".
17 July 2013	Addition of an additional treatment arm with a short-course post-transplant GVHD prophylaxis consisting of high-dose cyclophosphamide. (introduction, objectives, study design, treatment, statistical considerations); Changed inclusion criterion regarding age; Changes in reason for going off protocol treatment with regards to development of GVHD; Added is the use of a Summary of Product Characteristics (SPC) for an authorized medicinal product in the definition of SUSAR.
22 April 2014	<ul style="list-style-type: none"><li>• Arm 3 Post transplant cyclophosphamide: Cyclosporine A treatment is extended to +70 days</li><li>• Arm 3: Added option of cyclosporine A p.o. dose.</li><li>• Arm 1 and 2: Date start cyclosporine A is changed to day -5 –day -3 (depending on local procedures).</li><li>• Period of reporting adverse events is corrected (in accordance to earlier amendment</li><li>• Exemptions of SAE reporting are clarified</li><li>• Exemption of SAE reporting of chronic GvHD is limited to chronic GvHD not requiring systemic treatment.</li><li>• Added is a monitoring of overall mortality to detect possible differences in relapse rate between arm 1 and arm 3.</li></ul>

Notes:

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### Interruptions (globally)

Were there any global interruptions to the trial? No

### Limitations and caveats

None reported