Clinical trial results:
A Randomized, Multicenter, Open-Label, Phase III Clinical Trial to Evaluate the Efficacy, Safety, and Pharmacokinetics of Prophylactic Emicizumab Versus no Prophylaxis in Hemophilia A Patients With Inhibitors

Summary

EudraCT number	2015-002866-21
Trial protocol	DE ES GB PL FR IT
Global end of trial date	

Results information

Result version number	v1
This version publication date	04 November 2017
First version publication date	04 November 2017

Trial information

Trial identification

Sponsor protocol code	BH29884

Additional study identifiers

ISRCTN number	-
ClinicalTrials.gov id (NCT number)	NCT02622321
WHO universal trial number (UTN)	-

Notes:

Sponsors

Sponsor organisation name	F. Hoffmann-La Roche AG
Sponsor organisation address	Grenzacherstrasse 124, Basel, Switzerland, CH-4070
Public contact	Roche Trial Information Hotline, F. Hoffmann-La Roche AG, +41 61 6878333, global.trial_information@roche.com
Scientific contact	Roche Trial Information Hotline, F. Hoffmann-La Roche AG, +41 61 6878333, global.trial_information@roche.com

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	Interim
Date of interim/final analysis	25 October 2016
Is this the analysis of the primary completion data?	Yes
Primary completion date	25 October 2016
Global end of trial reached?	No

Notes:

General information about the trial

Main objective of the trial:

The main objective of this study was to evaluate the safety, efficacy and pharmacokinetics of prophylactic emicizumab treatment in participants previously treated with episodic or prophylactic bypassing agents.

Protection of trial subjects:

The study was conducted in accordance with the principles of the "Declaration of Helsinki" and Good Clinical Practice (GCP) according to the regulations and procedures described in the protocol.

Background therapy: -

Evidence for comparator: -

Actual start date of recruitment	18 November 2015
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	Australia: 4
Country: Number of subjects enrolled	Costa Rica: 5
Country: Number of subjects enrolled	France: 7
Country: Number of subjects enrolled	Germany: 6
Country: Number of subjects enrolled	United Kingdom: 5
Country: Number of subjects enrolled	Italy: 6
Country: Number of subjects enrolled	Japan: 12
Country: Number of subjects enrolled	New Zealand: 2
Country: Number of subjects enrolled	Poland: 9
Country: Number of subjects enrolled	South Africa: 6
Country: Number of subjects enrolled	Korea, Republic of: 1
Country: Number of subjects enrolled	Spain: 6
Country: Number of subjects enrolled	Taiwan: 4
Country: Number of subjects enrolled	United States: 36
Worldwide total number of subjects	109
EEA total number of subjects	39

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)	32
Adults (18-64 years)	73
From 65 to 84 years	4
85 years and over	0

Subject disposition

Recruitment

Recruitment details: -

Pre-assignment

Screening details:

A total of 114 participants were screened, of which 5 were screen failure and 109 were enrolled in this study. Participants in Arm A and Arm B were randomized in a 2:1 ratio; participants in Arm C and Arm D were enrolled without randomization.

Period 1

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

Arms

Are arms mutually exclusive?	Yes
Arm title	Arm A (Episodic Treatment): Emicizumab

Arm description:

Participants, who received episodic treatment with bypassing agents prior to study entry, received prophylactic emicizumab. Emicizumab was administered at a loading dose of 3 milligrams per kilogram per week (mg/kg/week) subcutaneously (SC) for the first 4 weeks followed by a maintenance dose of 1.5 mg/kg/week SC up to the end of study. Participants continued to receive episodic bypassing agent therapy to treat breakthrough bleeds, with recombinant activated factor VII (rFVIIa) and/or activated prothrombin complex concentrate (aPCC).

Arm type	Experimental
Investigational medicinal product name	Emicizumab
Investigational medicinal product code	RO5534262
Other name	ACE910
Pharmaceutical forms	Solution for injection
Routes of administration	Subcutaneous use

Dosage and administration details:

Emicizumab was administered at a loading dose of 3 milligrams per kilogram per week (mg/kg/week) for the first 4 weeks followed by a maintenance dose of 1.5 mg/kg/week up to the end of study.

Arm title	Arm B (Episodic Treatment): No Emicizumab

Arm description:

Participants, who received episodic treatment with bypassing agents prior to study entry, did not receive emicizumab prophylaxis. Participants in this arm could switch to emicizumab prophylaxis after completing at least 24 weeks on-study. Participants continued to receive bypassing agent therapy to treat breakthrough bleeds, with rFVIIa and/or aPCC.

Arm type	Active comparator
Investigational medicinal product name	Emicizumab
Investigational medicinal product code	RO5534262
Other name	ACE910
Pharmaceutical forms	Solution for injection
Routes of administration	Subcutaneous use

Dosage and administration details:

Emicizumab was administered at a loading dose of 3 mg/kg/week for the first 4 weeks followed by a maintenance dose of 1.5 mg/kg/week up to the end of study.

Arm title	Arm C (Prophylactic Treatment): Emicizumab

Arm description:

Participants, who received prophylactic bypassing agents prior to study entry, received prophylactic emicizumab. Emicizumab was administered at a loading dose of 3 mg/kg/week SC for the first 4 weeks

followed by a maintenance dose of 1.5 mg/kg/week SC up to the end of study. Participants continued to receive bypassing agent therapy to treat breakthrough bleeds, with rFVIIa and/or aPCC.

Arm type	Experimental
Investigational medicinal product name	Emicizumab
Investigational medicinal product code	RO5534262
Other name	ACE910
Pharmaceutical forms	Solution for injection
Routes of administration	Subcutaneous use

Dosage and administration details:

Emicizumab was administered at a loading dose of 3 mg/kg/week for the first 4 weeks followed by a maintenance dose of 1.5 mg/kg/week up to the end of study.

Arm title	Arm D (Episodic or Prophylactic Treatment): Emicizumab

Arm description:

Participants, who received episodic bypassing agents prior to study entry, who participated in Study BH29768 but were unable to enroll in Arms A or B, were enrolled in this arm to receive prophylactic emicizumab. Emicizumab was administered at a loading dose of 3 mg/kg/week SC for the first 4 weeks followed by a maintenance dose of 1.5 mg/kg/week SC up to the end of study. Participants continued to receive bypassing agent therapy to treat breakthrough bleeds, with rFVIIa and/or aPCC.

Arm type	Experimental
Investigational medicinal product name	Emicizumab
Investigational medicinal product code	RO5534262
Other name	ACE910
Pharmaceutical forms	Solution for injection
Routes of administration	Subcutaneous use

Dosage and administration details:

Emicizumab was administered at a loading dose of 3 mg/kg/week for the first 4 weeks followed by a maintenance dose of 1.5 mg/kg/week up to the end of study.

Number of subjects in period 1	Arm A (Episodic Treatment): Emicizumab	Arm B (Episodic Treatment): No Emicizumab	Arm C (Prophylactic Treatment): Emicizumab
Started	35	18	49
Treated	34	18	49
Completed	0	0	0
Not completed	35	18	49
Ongoing treatment with no emicizumab	-	5	-
Consent withdrawn by subject	1	-	-
Ongoing in safety follow-up	3	-	-
Ongoing treatment with emicizumab	31	13	49

Number of subjects in period 1	Arm D (Episodic or Prophylactic Treatment): Emicizumab
Started	7
Treated	7
Completed	0
Not completed	7
Ongoing treatment with no emicizumab	-

Consent withdrawn by subject	-
Ongoing in safety follow-up	-
Ongoing treatment with emicizumab	7

Baseline characteristics

Reporting groups	
Reporting group title	Arm A (Episodic Treatment): Emicizumab

Reporting group description:

Participants, who received episodic treatment with bypassing agents prior to study entry, received prophylactic emicizumab. Emicizumab was administered at a loading dose of 3 milligrams per kilogram per week (mg/kg/week) subcutaneously (SC) for the first 4 weeks followed by a maintenance dose of 1.5 mg/kg/week SC up to the end of study. Participants continued to receive episodic bypassing agent therapy to treat breakthrough bleeds, with recombinant activated factor VII (rFVIIa) and/or activated prothrombin complex concentrate (aPCC).

Reporting group title	Arm B (Episodic Treatment): No Emicizumab

Reporting group description:

Participants, who received episodic treatment with bypassing agents prior to study entry, did not receive emicizumab prophylaxis. Participants in this arm could switch to emicizumab prophylaxis after completing at least 24 weeks on-study. Participants continued to receive bypassing agent therapy to treat breakthrough bleeds, with rFVIIa and/or aPCC.

Reporting group title	Arm C (Prophylactic Treatment): Emicizumab

Reporting group description:

Participants, who received prophylactic bypassing agents prior to study entry, received prophylactic emicizumab. Emicizumab was administered at a loading dose of 3 mg/kg/week SC for the first 4 weeks followed by a maintenance dose of 1.5 mg/kg/week SC up to the end of study. Participants continued to receive bypassing agent therapy to treat breakthrough bleeds, with rFVIIa and/or aPCC.

Reporting group title	Arm D (Episodic or Prophylactic Treatment): Emicizumab

Reporting group description:

Participants, who received episodic bypassing agents prior to study entry, who participated in Study BH29768 but were unable to enroll in Arms A or B, were enrolled in this arm to receive prophylactic emicizumab. Emicizumab was administered at a loading dose of 3 mg/kg/week SC for the first 4 weeks followed by a maintenance dose of 1.5 mg/kg/week SC up to the end of study. Participants continued to receive bypassing agent therapy to treat breakthrough bleeds, with rFVIIa and/or aPCC.

Reporting group values	Arm A (Episodic Treatment): Emicizumab	Arm B (Episodic Treatment): No Emicizumab	Arm C (Prophylactic Treatment): Emicizumab
Number of subjects	35	18	49
Age Categorical Units: Subjects			
Age Continuous Units: years			
arithmetic mean	35.8	37.2	25.6
standard deviation	± 13.9	± 13.7	± 16.8
Gender Categorical Units: Subjects			
Female	0	0	0
Male	35	18	49

Reporting group values	Arm D (Episodic or Prophylactic Treatment): Emicizumab	Total	
Number of subjects	7	109	
Age Categorical Units: Subjects			

Age Continuous Units: years			
arithmetic mean	30.3		
standard deviation	± 10.8	-	
Gender Categorical Units: Subjects			
Female	0	0	
Male	7	109	

End points

End points reporting groups

Reporting group title	Arm A (Episodic Treatment): Emicizumab

Reporting group description:

Participants, who received episodic treatment with bypassing agents prior to study entry, received prophylactic emicizumab. Emicizumab was administered at a loading dose of 3 milligrams per kilogram per week (mg/kg/week) subcutaneously (SC) for the first 4 weeks followed by a maintenance dose of 1.5 mg/kg/week SC up to the end of study. Participants continued to receive episodic bypassing agent therapy to treat breakthrough bleeds, with recombinant activated factor VII (rFVIIa) and/or activated prothrombin complex concentrate (aPCC).

Reporting group title	Arm B (Episodic Treatment): No Emicizumab

Reporting group description:

Participants, who received episodic treatment with bypassing agents prior to study entry, did not receive emicizumab prophylaxis. Participants in this arm could switch to emicizumab prophylaxis after completing at least 24 weeks on-study. Participants continued to receive bypassing agent therapy to treat breakthrough bleeds, with rFVIIa and/or aPCC.

Reporting group title	Arm C (Prophylactic Treatment): Emicizumab

Reporting group description:

Participants, who received prophylactic bypassing agents prior to study entry, received prophylactic emicizumab. Emicizumab was administered at a loading dose of 3 mg/kg/week SC for the first 4 weeks followed by a maintenance dose of 1.5 mg/kg/week SC up to the end of study. Participants continued to receive bypassing agent therapy to treat breakthrough bleeds, with rFVIIa and/or aPCC.

Reporting group title	Arm D (Episodic or Prophylactic Treatment): Emicizumab

Reporting group description:

Participants, who received episodic bypassing agents prior to study entry, who participated in Study BH29768 but were unable to enroll in Arms A or B, were enrolled in this arm to receive prophylactic emicizumab. Emicizumab was administered at a loading dose of 3 mg/kg/week SC for the first 4 weeks followed by a maintenance dose of 1.5 mg/kg/week SC up to the end of study. Participants continued to receive bypassing agent therapy to treat breakthrough bleeds, with rFVIIa and/or aPCC.

Subject analysis set title	Arm Anis: Episodic Bypassing Agents in NIS BH29768
Subject analysis set type	Sub-group analysis

Subject analysis set description:

This arm includes data up to 52 weeks before study entry (assessed retrospectively at baseline) from Arm A participants who participated in NIS BH29768 before study entry and received episodic bypassing agents (rFVIIa or/and aPCC) during NIS BH29768.

Subject analysis set title	Arm Cnis: Prophylactic Bypassing Agents in NIS BH29768
Subject analysis set type	Sub-group analysis

Subject analysis set description:

This arm includes data up to 52 weeks before study entry (assessed retrospectively at baseline) from Arm C participants who participated in NIS BH29768 before study entry and received prophylactic bypassing agents (rFVIIa or/and aPCC) during NIS BH29768.

Subject analysis set title	Arm Bemi: Emicizumab after Week 24
Subject analysis set type	Sub-group analysis

Subject analysis set description:

This arm includes Arm B participants who switched to emicizumab prophylaxis after completing at least 24-week no prophylaxis. Emicizumab was administered at a loading dose of 3 mg/kg/week SC for the first 4 weeks (after at least Week 24) followed by a maintenance dose of 1.5 mg/kg/week SC up to the end of study.

Primary: Arms A and B: Annualized Bleed Rate (ABR) for Treated Bleeds

End point title	Arms A and B: Annualized Bleed Rate (ABR) for Treated

End point description:

Number of treated bleeds over the efficacy period was assessed through ABR using a negative binomial (NB) regression model. Treated bleeds were defined as a bleed for which coagulation factors were administered. Bleeds due to surgery/procedure were excluded. Intent-to-treat (ITT) population defined as all participants who were randomized to Arm A or Arm B.

End point type	Primary

End point timeframe:

From Baseline up to clinical cut-off date (25 Oct 2016) (up to approximately 1 year)

Notes:

[1] - The end point is not reporting statistics for all the arms in the baseline period. It is expected all the baseline period arms will be reported on when providing values for an end point on the baseline period.
Justification: The endpoint is applicable only for the reported arms; hence, other arms are not included.

End point values	Arm A (Episodic Treatment): Emicizumab	Arm B (Episodic Treatment): No Emicizumab		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	35	18		
Units: treated bleeds per year				
number (confidence interval 95%)	2.9 (1.69 to 5.02)	23.3 (12.33 to 43.89)		

Statistical analyses

Statistical analysis title	Statistical Analysis 1

Statistical analysis description:

Analysis was performed using an NB regression model, which accounted for different follow-up times, with the participant's number of bleeds as a function of randomization and the time that each participant stays in the study included as an offset in the model. The model also included the number of bleeds (less than [<] 9 or greater than or equal to [>/=] 9) in the last 24 weeks prior to study entry as a stratification factor in the randomization.

Comparison groups	Arm B (Episodic Treatment): No Emicizumab v Arm A (Episodic Treatment): Emicizumab
Number of subjects included in analysis	53
Analysis specification	Pre-specified
Analysis type	superiority
P-value	< 0.0001 [2]
Method	Stratified Wald Test
Parameter estimate	ABR Ratio
Point estimate	0.13
Confidence interval	
level	95 %
sides	2-sided
lower limit	0.057
upper limit	0.277

Notes:

[2] - Statistical significance was controlled at a two-sided alpha level of 0.05 based on a Wald testing procedure.

Secondary: Arms A and B: ABR for All Bleeds

End point title	Arms A and B: ABR for All Bleeds[3]

End point description:

Number of all bleeds over the efficacy period was assessed through ABR using an NB regression model. All bleeds included both treated (with coagulation factors) and not treated bleeds. Bleeds due to surgery/procedure were excluded. ITT population.

End point type	Secondary

End point timeframe:

From Baseline up to clinical cut-off date (25 Oct 2016) (up to approximately 1 year)

Notes:

[3] - The end point is not reporting statistics for all the arms in the baseline period. It is expected all the baseline period arms will be reported on when providing values for an end point on the baseline period.
Justification: The endpoint is applicable only for the reported arms; hence, other arms are not included.

End point values	Arm A (Episodic Treatment): Emicizumab	Arm B (Episodic Treatment): No Emicizumab		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	35	18		
Units: all bleeds per year				
number (confidence interval 95%)	5.5 (3.58 to 8.60)	28.3 (16.79 to 47.76)		

Statistical analyses

Statistical analysis title	Statistical Analysis 1

Statistical analysis description:

Analysis was performed using an NB regression model, which accounted for different follow-up times, with the participant's number of bleeds as a function of randomization and the time that each participant stays in the study included as an offset in the model. The model also included the number of bleeds (<9 or >/=9) in the last 24 weeks prior to study entry as a stratification factor in the randomization.

Comparison groups	Arm A (Episodic Treatment): Emicizumab v Arm B (Episodic Treatment): No Emicizumab
Number of subjects included in analysis	53
Analysis specification	Pre-specified
Analysis type	superiority
P-value	< 0.0001 [4]
Method	Stratified Wald Test
Parameter estimate	ABR Ratio
Point estimate	0.2
Confidence interval	
level	95 %
sides	2-sided
lower limit	0.102
upper limit	0.375

Notes:

[4] - Statistical significance was controlled at a two-sided alpha level of 0.05 based on a Wald testing procedure.

Secondary: Arms A and Anis: ABR for All Bleeds

End point title	Arms A and Anis: ABR for All Bleeds[5]

End point description:

Number of all bleeds over the efficacy period was assessed through ABR using an NB regression model. All bleeds included both treated (with coagulation factors) and not treated bleeds. Bleeds due to surgery/procedure were excluded. Intra-participant comparison of ABR of all bleeds prior to study entry, while receiving episodic bypassing agents during non-interventional study (NIS) BH29768 (NCT02476942) (Arm Anis), with ABR of all bleeds on emicizumab prophylaxis (in this study) (Arm A) was reported. Arm A NIS population included all Arm A participants who participated in NIS BH29768 before study entry and received episodic bypassing agents during NIS BH29768.

End point type	Secondary

End point timeframe:

For Arm Anis: up to 52 weeks before study entry (assessed retrospectively at baseline); for Arm A: From Baseline up to clinical cut-off date (25 Oct 2016) (up to approximately 1 year)

Notes:

[5] - The end point is not reporting statistics for all the arms in the baseline period. It is expected all the baseline period arms will be reported on when providing values for an end point on the baseline period.
Justification: The endpoint is applicable only for the reported arms; hence, other arms are not included.

End point values	Arm A (Episodic Treatment): Emicizumab	Arm Anis: Episodic Bypassing Agents in NIS BH29768		
Subject group type	Reporting group	Subject analysis set		
Number of subjects analysed	24	24		
Units: all bleeds per year				
number (confidence interval 95%)	4.1 (2.10 to 8.02)	37.7 (28.40 to 50.04)		

Statistical analyses

Statistical analysis title	Statistical Analysis 1

Statistical analysis description:

This intra-participant comparison of ABR for all bleeds was performed using an NB regression model. There was a total of 24 participants (not 48) analyzed over two different periods: before study entry (Arm Anis) and on study (Arm A).

Comparison groups	Arm A (Episodic Treatment): Emicizumab v Arm Anis: Episodic Bypassing Agents in NIS BH29768
Number of subjects included in analysis	48
Analysis specification	Pre-specified
Analysis type	superiority
P-value	< 0.0001 [6]
Method	Non-Stratified Wald Test
Parameter estimate	ABR Ratio
Point estimate	0.11
Confidence interval	
level	95 %
sides	2-sided
lower limit	0.055
upper limit	0.218

Notes:

[6] - Statistical significance was controlled at a two-sided alpha level of 0.05 based on a Wald testing procedure.

Secondary: Arms A and Anis: ABR for Treated Bleeds

End point title	Arms A and Anis: ABR for Treated Bleeds[7]

End point description:

Number of treated bleeds over the efficacy period was assessed through ABR using an NB regression model. Treated bleeds were defined as a bleed for which coagulation factors were administered. Bleeds due to surgery/procedure were excluded. Intra-participant comparison of ABR of treated bleeds prior to study entry, while receiving episodic bypassing agents during NIS BH29768 (Arm Anis), with ABR of treated bleeds on emicizumab prophylaxis (in this study) (Arm A) was reported. Arm A NIS population included all Arm A participants who participated in NIS BH29768 before study entry and received episodic bypassing agents during NIS BH29768.

End point type	Secondary

End point timeframe:

For Arm Anis: up to 52 weeks before study entry (assessed retrospectively at baseline); for Arm A: From Baseline up to clinical cut-off date (25 Oct 2016) (up to approximately 1 year)

Notes:

[7] - The end point is not reporting statistics for all the arms in the baseline period. It is expected all the baseline period arms will be reported on when providing values for an end point on the baseline period.
Justification: The endpoint is applicable only for the reported arms; hence, other arms are not included.

End point values	Arm A (Episodic Treatment): Emicizumab	Arm Anis: Episodic Bypassing Agents in NIS BH29768		
Subject group type	Reporting group	Subject analysis set		
Number of subjects analysed	24	24		
Units: treated bleeds per year				
number (confidence interval 95%)	1.7 (0.71 to 4.06)	21.6 (15.40 to 30.22)		

Statistical analyses

Statistical analysis title	Statistical Analysis 1

Statistical analysis description:

This intra-participant comparison of ABR for treated bleeds was performed using an NB regression model. There was a total of 24 participants (not 48) analyzed over two different periods: before study entry (Arm Anis) and on study (Arm A).

Comparison groups	Arm A (Episodic Treatment): Emicizumab v Arm Anis: Episodic Bypassing Agents in NIS BH29768
Number of subjects included in analysis	48
Analysis specification	Pre-specified
Analysis type	superiority
P-value	< 0.0001 [8]
Method	Non-Stratified Wald Test
Parameter estimate	ABR Ratio
Point estimate	0.08
Confidence interval	
level	95 %
sides	2-sided
lower limit	0.031
upper limit	0.198

Notes:

[8] - Statistical significance was controlled at a two-sided alpha level of 0.05 based on a Wald testing procedure.

Secondary: Arms A and B: ABR for Treated Joint Bleeds

End point title	Arms A and B: ABR for Treated Joint Bleeds[9]

End point description:

Number of treated joint bleeds over the efficacy period was assessed through ABR using an NB regression model. Treated joint bleeds were defined as treated bleeds in a joint associated with unusual sensation (aura) in a joint, in combination with another symptom: unusual sensation, swelling/warmth, pain/decreased range of motion (RoM), difficulty moving the joint. Bleeds due to surgery/procedure were excluded. ITT population.

End point type	Secondary

End point timeframe:

From Baseline up to clinical cut-off date (25 Oct 2016) (up to approximately 1 year)

Notes:

[9] - The end point is not reporting statistics for all the arms in the baseline period. It is expected all the baseline period arms will be reported on when providing values for an end point on the baseline period.
Justification: The endpoint is applicable only for the reported arms; hence, other arms are not included.

End point values	Arm A (Episodic Treatment): Emicizumab	Arm B (Episodic Treatment): No Emicizumab		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	35	18		
Units: treated joint bleeds per year				
number (confidence interval 95%)	0.8 (0.26 to 2.20)	6.7 (1.99 to 22.42)		

Statistical analyses

Statistical analysis title	Statistical Analysis 1

Statistical analysis description:

Analysis was performed using an NB regression model, which accounted for different follow-up times, with the participant's number of bleeds as a function of randomization and the time that each participant stays in the study included as an offset in the model. The model also included the number of bleeds (<9 or >/=9) in the last 24 weeks prior to study entry as a stratification factor in the randomization.

Comparison groups	Arm A (Episodic Treatment): Emicizumab v Arm B (Episodic Treatment): No Emicizumab
Number of subjects included in analysis	53
Analysis specification	Pre-specified
Analysis type	superiority
P-value	= 0.005 [10]
Method	Stratified Wald Test
Parameter estimate	ABR Ratio
Point estimate	0.11
Confidence interval	
level	95 %
sides	2-sided
lower limit	0.025
upper limit	0.52

Notes:

[10] - Statistical significance was controlled at a two-sided alpha level of 0.05 based on a Wald testing procedure.

Secondary: Arms C and Cnis: ABR for All Bleeds

End point title	Arms C and Cnis: ABR for All Bleeds[11]

End point description:

Number of all bleeds over the efficacy period was assessed through ABR using an NB regression model. All bleeds included both treated (with coagulation factors) and not treated bleeds. Bleeds due to surgery/procedure were excluded. Intra-participant comparison of ABR of all bleeds prior to study entry, while receiving prophylactic bypassing agents during NIS BH29768 (Arm Cnis), with ABR of all bleeds on emicizumab prophylaxis (in this study) (Arm C) was reported. Arm C NIS population included all Arm C participants who participated in NIS BH29768 before study entry and received prophylactic bypassing agents during NIS BH29768.

End point type	Secondary

End point timeframe:

For Arm Cnis: up to 52 weeks before study entry (assessed retrospectively at baseline); for Arm C: From Baseline up to clinical cut-off date (25 Oct 2016) (up to approximately 1 year)

Notes:

[11] - The end point is not reporting statistics for all the arms in the baseline period. It is expected all the baseline period arms will be reported on when providing values for an end point on the baseline period.
Justification: The endpoint is applicable only for the reported arms; hence, other arms are not included.

End point values	Arm C (Prophylactic Treatment): Emicizumab	Arm Cnis: Prophylactic Bypassing Agents in NIS BH29768		
Subject group type	Reporting group	Subject analysis set		
Number of subjects analysed	24	24		
Units: all bleeds per year				
number (confidence interval 95%)	5.5 (2.98 to 10.26)	24.3 (18.11 to 32.67)		

Statistical analyses

Statistical analysis title	Statistical Analysis 1

Statistical analysis description:

This intra-participant comparison of ABR for all bleeds was performed using an NB regression model. There was a total of 24 participants (not 48) analyzed over two different periods: before study entry (Arm Cnis) and on study (Arm C).

Comparison groups	Arm C (Prophylactic Treatment): Emicizumab v Arm Cnis: Prophylactic Bypassing Agents in NIS BH29768
Number of subjects included in analysis	48
Analysis specification	Pre-specified
Analysis type	superiority
P-value	< 0.0001 [12]
Method	Non-Stratified Wald Test
Parameter estimate	ABR Ratio
Point estimate	0.23
Confidence interval	
level	95 %
sides	2-sided
lower limit	0.119
upper limit	0.435

Notes:

[12] - Statistical significance was controlled at a two-sided alpha level of 0.05 based on a Wald testing procedure.

Secondary: Arms C and Cnis: ABR for Treated Bleeds

End point title	Arms C and Cnis: ABR for Treated Bleeds[13]

End point description:

Number of treated bleeds over the efficacy period was assessed through ABR using an NB regression model. Treated bleeds were defined as a bleed for which coagulation factors were administered. Bleeds due to surgery/procedure were excluded. Intra-participant comparison of ABR of treated bleeds prior to study entry, while receiving prophylactic bypassing agents during NIS BH29768 (Arm Cnis), with ABR of treated bleeds on emicizumab prophylaxis (in this study) (Arm C) was reported. Arm C NIS population included all Arm C participants who participated in NIS BH29768 before study entry and received prophylactic bypassing agents during NIS BH29768.

End point type	Secondary

End point timeframe:

For Arm Cnis: up to 52 weeks before study entry (assessed retrospectively at baseline); for Arm C: From Baseline up to clinical cut-off date (25 Oct 2016) (up to approximately 1 year)

Notes:

[13] - The end point is not reporting statistics for all the arms in the baseline period. It is expected all the baseline period arms will be reported on when providing values for an end point on the baseline period.
Justification: The endpoint is applicable only for the reported arms; hence, other arms are not included.

End point values	Arm C (Prophylactic Treatment): Emicizumab	Arm Cnis: Prophylactic Bypassing Agents in NIS BH29768		
Subject group type	Reporting group	Subject analysis set		
Number of subjects analysed	24	24		
Units: treated bleeds per year				
number (confidence interval 95%)	3.3 (1.33 to 8.08)	15.7 (11.08 to 22.29)		

Statistical analyses

Statistical analysis title	Statistical Analysis 1

Statistical analysis description:

This intra-participant comparison of ABR for treated bleeds between arms was performed using an NB regression model. There was a total of 24 participants (not 48) analyzed over two different periods: before study entry (Arm Cnis) and on study (Arm C).

Comparison groups	Arm C (Prophylactic Treatment): Emicizumab v Arm Cnis: Prophylactic Bypassing Agents in NIS BH29768
Number of subjects included in analysis	48
Analysis specification	Pre-specified
Analysis type	superiority
P-value	= 0.0003 [14]
Method	Non-Stratified Wald Test
Parameter estimate	ABR Ratio
Point estimate	0.21
Confidence interval	
level	95 %
sides	2-sided
lower limit	0.089
upper limit	0.486

Notes:

[14] - Statistical significance was controlled at a two-sided alpha level of 0.05 based on a Wald testing procedure.

Secondary: Arms A and B: ABR for Treated Spontaneous Bleeds

End point title	Arms A and B: ABR for Treated Spontaneous Bleeds[15]

End point description:

Number of treated spontaneous bleeds over the efficacy period was assessed through ABR using an NB regression model. Treated spontaneous bleeds were defined as treated (with coagulation factors) bleeds with no known contributing factor (e.g., trauma, surgery). ITT population.

End point type	Secondary

End point timeframe:

From Baseline up to clinical cut-off date (25 Oct 2016) (up to approximately 1 year)

Notes:

[15] - The end point is not reporting statistics for all the arms in the baseline period. It is expected all the baseline period arms will be reported on when providing values for an end point on the baseline period.
Justification: The endpoint is applicable only for the reported arms; hence, other arms are not included.

End point values	Arm A (Episodic Treatment): Emicizumab	Arm B (Episodic Treatment): No Emicizumab		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	35	18		
Units: treated spontaneous bleeds per year				
number (confidence interval 95%)	1.3 (0.73 to 2.19)	16.8 (9.94 to 28.30)		

Statistical analyses

Statistical analysis title	Statistical Analysis 1

Statistical analysis description:

Analysis was performed using an NB regression model, which accounted for different follow-up times, with the participant's number of bleeds as a function of randomization and the time that each participant stays in the study included as an offset in the model. The model also included the number of bleeds (<9 or >/=9) in the last 24 weeks prior to study entry as a stratification factor in the randomization

Comparison groups	Arm A (Episodic Treatment): Emicizumab v Arm B (Episodic Treatment): No Emicizumab
Number of subjects included in analysis	53
Analysis specification	Pre-specified
Analysis type	superiority
P-value	< 0.0001 [16]
Method	Stratified Wald Test
Parameter estimate	ABR Ratio
Point estimate	0.08
Confidence interval	
level	95 %
sides	2-sided
lower limit	0.037
upper limit	0.154

Notes:

[16] - Statistical significance was controlled at a two-sided alpha level of 0.05 based on a Wald testing procedure.

Secondary: Arms A and B: ABR for Treated Target Joint Bleeds

End point title	Arms A and B: ABR for Treated Target Joint Bleeds[17]

End point description:

Number of treated target joint bleeds over the efficacy period was assessed through ABR using an NB regression model. Treated target joint bleeds included treated (with coagulation factors) joint bleeds in a target joint, defined as a joint in which greater than or equal to (>/=) 3 treated joint bleeds occurred during the last 24 weeks prior to study entry. Bleeds due to surgery/procedure are excluded. ITT population.

End point type	Secondary

End point timeframe:

From Baseline up to clinical cut-off date (25 Oct 2016) (up to approximately 1 year)

Notes:

[17] - The end point is not reporting statistics for all the arms in the baseline period. It is expected all the baseline period arms will be reported on when providing values for an end point on the baseline period.
Justification: The endpoint is applicable only for the reported arms; hence, other arms are not included.

End point values	Arm A (Episodic Treatment): Emicizumab	Arm B (Episodic Treatment): No Emicizumab		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	35	18		
Units: treated target joint bleeds per year				
number (confidence interval 95%)	0.1 (0.03 to 0.58)	3.0 (0.96 to 9.13)		

Statistical analyses

Statistical analysis title	Statistical Analysis 1

Statistical analysis description:

Analysis was performed using an NB regression model, which accounted for different follow-up times, with the participant's number of bleeds as a function of randomization and the time that each participant stays in the study included as an offset in the model. The model also included the number of bleeds (<9 or >/=9) in the last 24 weeks prior to study entry as a stratification factor in the randomization.

Comparison groups	Arm A (Episodic Treatment): Emicizumab v Arm B (Episodic Treatment): No Emicizumab
Number of subjects included in analysis	53
Analysis specification	Pre-specified
Analysis type	superiority
P-value	= 0.0002 [18]
Method	Stratified Wald Test
Parameter estimate	ABR Ratio
Point estimate	0.05
Confidence interval	
level	95 %
sides	2-sided
lower limit	0.009
upper limit	0.227

Notes:

[18] - Statistical significance was controlled at a two-sided alpha level of 0.05 based on a Wald testing procedure.

Secondary: Arm A and B: Hemophilia-Specific Quality of Life (Haem-A-QoL) Questionnaire Physical Health Score in Adult Participants (>/=18 Years Old)

End point title	Arm A and B: Hemophilia-Specific Quality of Life (Haem-A-QoL) Questionnaire Physical Health Score in Adult Participants (>/=18 Years Old)[19]

End point description:

Haem-A-QoL questionnaire has been developed and used in hemophilia A participants. As a hemophilia-specific questionnaire, this measure assesses very specific aspects of dealing with hemophilia. This questionnaire consists of items pertaining to 10 domains specific to living with hemophilia. The 10 domains are: physical health, sports and leisure, school and work, dealing with hemophilia, family

planning, feeling, relationships, treatment, view of yourself, and outlook for the future. The total score for each domain range from 0 to 100 with lower scores reflective of better quality of life. Physical Health domain score is reported. Physical Health domain score is reported (range 0 to 100, with lower scores reflective of better physical health). ITT population. Number of subjects analyzed=participants with available data for this endpoint.

End point type	Secondary

End point timeframe:

Week 25

Notes:

[19] - The end point is not reporting statistics for all the arms in the baseline period. It is expected all the baseline period arms will be reported on when providing values for an end point on the baseline period.
Justification: The endpoint is applicable only for the reported arms; hence, other arms are not included.

End point values	Arm A (Episodic Treatment): Emicizumab	Arm B (Episodic Treatment): No Emicizumab		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	26	14		
Units: units on a scale				
arithmetic mean (standard deviation)	30.19 (± 26.59)	57.14 (± 23.35)		

Statistical analyses

Statistical analysis title	Statistical Analysis 1

Statistical analysis description:

Actual number of participants included for inferential statistics in Arm A is 25. Means adjusted for covariates: baseline score, treatment group and treatment by baseline interaction term. Analysis was performed using Analysis of Covariance (ANCOVA).

Comparison groups	Arm A (Episodic Treatment): Emicizumab v Arm B (Episodic Treatment): No Emicizumab
Number of subjects included in analysis	40
Analysis specification	Pre-specified
Analysis type	superiority
P-value	= 0.0029 [20]
Method	ANCOVA
Parameter estimate	Adjusted Mean Difference
Point estimate	21.55
Confidence interval	
level	95 %
sides	2-sided
lower limit	7.89
upper limit	35.22

Notes:

[20] - Statistical significance was controlled at a two-sided alpha level of 0.05.

Secondary: Arm A and B: Haem-A-QoL Questionnaire Total Score in Adult Participants (>/=18 Years Old)

End point title	Arm A and B: Haem-A-QoL Questionnaire Total Score in Adult Participants (>/=18 Years Old)[21]

End point description:

Haem-A-QoL questionnaire has been developed and used in hemophilia A participants. As a hemophilia-specific questionnaire, this measure assesses very specific aspects of dealing with hemophilia. This questionnaire consists of items pertaining to 10 domains specific to living with hemophilia. The 10 domains are: physical health, sports and leisure, school and work, dealing with hemophilia, family planning, feeling, relationships, treatment, view of yourself, and outlook for the future. The total score for each domain range from 0 to 100 with lower scores reflective of better quality of life. Haem-A-QoL Questionnaire Total Score is the average of the all domain scores and range from 0 to 100, with lower scores reflective of better quality of life. ITT population. Number of subjects analyzed=participants with available data for this endpoint.

End point type	Secondary

End point timeframe:

Week 25

Notes:

[21] - The end point is not reporting statistics for all the arms in the baseline period. It is expected all the baseline period arms will be reported on when providing values for an end point on the baseline period.
Justification: The endpoint is applicable only for the reported arms; hence, other arms are not included.

End point values	Arm A (Episodic Treatment): Emicizumab	Arm B (Episodic Treatment): No Emicizumab		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	26	14		
Units: units on a scale				
arithmetic mean (standard deviation)	26.465 (± 18.666)	47.504 (± 17.435)		

Statistical analyses

Statistical analysis title	Statistical Analysis 1

Statistical analysis description:

Actual number of participants included for inferential statistics in Arm A is 25. Means adjusted for covariates: baseline score, treatment group and treatment by baseline interaction term.

Comparison groups	Arm A (Episodic Treatment): Emicizumab v Arm B (Episodic Treatment): No Emicizumab
Number of subjects included in analysis	40
Analysis specification	Pre-specified
Analysis type	superiority
P-value	= 0.0019 [22]
Method	ANCOVA
Parameter estimate	Adjusted Mean Difference
Point estimate	14.01
Confidence interval	
level	95 %
sides	2-sided
lower limit	5.56
upper limit	22.45

Notes:

[22] - Statistical significance was controlled at a two-sided alpha level of 0.05.

Secondary: Arm A and B: European Quality of Life-5 Dimensions-5 Levels (EQ-5D-

5L) Visual Analog Scale Score

End point title	Arm A and B: European Quality of Life-5 Dimensions-5 Levels (EQ-5D-5L) Visual Analog Scale Score[23]

End point description:

EQ-5D-5L is a standardized, participant-rated questionnaire to assess health-related quality of life. The EQ-5D-5L includes 2 components: the EQ-5D-5L health state profile (descriptive system) and the EQ-5D-5L Visual Analog Scale. The Visual Analogue Scale is designed to rate the participant's current health state on a scale from 0 to 100, where 0 represents the worst imaginable health state and 100 represents the best imaginable health state. ITT population. Number of subjects analyzed=participants with available data for this endpoint.

End point type	Secondary

End point timeframe:

Week 25

Notes:

[23] - The end point is not reporting statistics for all the arms in the baseline period. It is expected all the baseline period arms will be reported on when providing values for an end point on the baseline period.
Justification: The endpoint is applicable only for the reported arms; hence, other arms are not included.

End point values	Arm A (Episodic Treatment): Emicizumab	Arm B (Episodic Treatment): No Emicizumab		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	30	16		
Units: units on a scale				
arithmetic mean (standard deviation)	83.8 (± 12.9)	76.4 (± 15.7)		

Statistical analyses

Statistical analysis title	Statistical Analysis 1

Statistical analysis description:

Actual number of participants included for inferential statistics in Arm A is 29. Means adjusted for covariates: baseline score, treatment group and treatment by baseline interaction term.

Comparison groups	Arm A (Episodic Treatment): Emicizumab v Arm B (Episodic Treatment): No Emicizumab
Number of subjects included in analysis	46
Analysis specification	Pre-specified
Analysis type	superiority
P-value	= 0.0171 [24]
Method	ANCOVA
Parameter estimate	Adjusted Mean Difference
Point estimate	-9.72
Confidence interval	
level	95 %
sides	2-sided
lower limit	-17.62
upper limit	-1.82

Notes:

[24] - Statistical significance was controlled at a two-sided alpha level of 0.05.

Secondary: Arm A and B: EQ-5D-5L Index Utility Score

End point title	Arm A and B: EQ-5D-5L Index Utility Score[25]

End point description:

EQ-5D-5L is a standardized, participant-rated questionnaire to assess health-related quality of life. The EQ-5D-5L includes 2 components: the EQ-5D-5L health state profile (descriptive system) and the EQ-5D-5L Visual Analog Scale. The EQ-5D-5L health state profile is designed to record the participant's current health state in 5 domains: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Responses from the five domains are used to calculate a single utility index value ranging from 1 to 5, where 1 indicates better health state (no problems) and 5 indicates worst health state (confined to bed). ITT population. Number of subjects analyzed=participants with available data for this endpoint.

End point type	Secondary

End point timeframe:

Week 25

Notes:

[25] - The end point is not reporting statistics for all the arms in the baseline period. It is expected all the baseline period arms will be reported on when providing values for an end point on the baseline period.
Justification: The endpoint is applicable only for the reported arms; hence, other arms are not included.

End point values	Arm A (Episodic Treatment): Emicizumab	Arm B (Episodic Treatment): No Emicizumab		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	30	16		
Units: units on a scale				
arithmetic mean (standard deviation)	0.83 (± 0.22)	0.60 (± 0.35)		

Statistical analyses

Statistical analysis title	Statistical Analysis 1

Statistical analysis description:

Actual number of participants included for inferential statistics in Arm A is 29. Means adjusted for covariates: baseline score, treatment group and treatment by baseline interaction term.

Comparison groups	Arm A (Episodic Treatment): Emicizumab v Arm B (Episodic Treatment): No Emicizumab
Number of subjects included in analysis	46
Analysis specification	Pre-specified
Analysis type	superiority
P-value	= 0.0014 [26]
Method	ANCOVA
Parameter estimate	Adjusted Mean Difference
Point estimate	-0.16
Confidence interval	
level	95 %
sides	2-sided
lower limit	-0.25
upper limit	-0.07

Notes:

[26] - Statistical significance was controlled at a two-sided alpha level of 0.05.

Secondary: Arm A and B: Hemophilia-Specific Quality of Life – Short Form (Haemo-QoI-SF) Questionnaire Total Score in Adolescents Participants (12-17 Years Old)

End point title	Arm A and B: Hemophilia-Specific Quality of Life – Short Form (Haemo-Qol-SF) Questionnaire Total Score in Adolescents Participants (12-17 Years Old)[27]

End point description:

The Haemo-QoL-SF contains 35 items, which cover nine domains considered relevant for the children's health-related quality of life (physical health, feelings, view of yourself, family, friends, other people, sports and school, dealing with hemophilia and treatment). Items are rated with five respective response options: never, seldom, sometimes, often, and always. Haemo-QoL-SF total score range from 0 to 100, where lower scores reflect better health-related quality of life. Data for this outcome was to be analyzed only if >3 participant (in each arm) have available data. ITT population. Number of subjects analyzed=participants with available data for this endpoint. Here, '99999' represents data not analysed as the criterion for data analysis not met. Data was to be analyzed only if >3 participants have available data.

End point type	Secondary

End point timeframe:

Week 25

Notes:

[27] - The end point is not reporting statistics for all the arms in the baseline period. It is expected all the baseline period arms will be reported on when providing values for an end point on the baseline period.
Justification: The endpoint is applicable only for the reported arms; hence, other arms are not included.

End point values	Arm A (Episodic Treatment): Emicizumab	Arm B (Episodic Treatment): No Emicizumab		
Subject group type	Reporting group	Reporting group		
Number of subjects analysed	3	2		
Units: units on a scale				
arithmetic mean (standard deviation)	99999 (± 99999)	99999 (± 99999)		

Statistical analyses

No statistical analyses for this end point

Secondary: Percentage of Participants With Anti-Emicizumab Antibodies

End point title	Percentage of Participants With Anti-Emicizumab Antibodies[28]

End point description:

All emicizumab participants, referred to as all participants 2, included Arms A, C, and D and Arm B participants who switched to receive emicizumab (Arm Bemi). Number of subjects analyzed=participants with at least one post-baseline antibody assessment.

End point type	Secondary

End point timeframe:

Baseline up to approximately 1 year

Notes:

[28] - The end point is not reporting statistics for all the arms in the baseline period. It is expected all the baseline period arms will be reported on when providing values for an end point on the baseline period.
Justification: The endpoint is applicable only for the reported arms; hence, other arms are not included.

End point values	Arm A (Episodic Treatment): Emicizumab	Arm C (Prophylactic Treatment): Emicizumab	Arm D (Episodic or Prophylactic Treatment): Emicizumab	Arm Bemi: Emicizumab after Week 24
Subject group type	Reporting group	Reporting group	Reporting group	Subject analysis set
Number of subjects analysed	33	49	6	8
Units: percentage of participants				
number (not applicable)	0	0	0	0

Statistical analyses

No statistical analyses for this end point

Secondary: Plasma Trough Concentration of Emicizumab

End point title	Plasma Trough Concentration of Emicizumab[29]

End point description:

Plasma concentrations of emicizumab were analyzed using a validated Enzyme Linked Immunosorbent Assay (ELISA). The lower limit of quantification (LLOQ) was 100 nanograms per milliliter (ng/mL). Pharmacokinetic (PK) evaluable population included all participants who received at least one dose of emicizumab and had at least one post-dose emicizumab concentration result. Here, n=participants with available data for this endpoint at specified timepoints, each arm, respectively. Here, '99999' represents data not calculable due to single participant; '9999' represents data collection not planned for this arm at this time-point; and '999' represents no data available as the measurements were below LLOQ.

End point type	Secondary

End point timeframe:

Arm A: Pre-dose (0 hour [hr]) on Weeks 1-5, 7, 9, 13, 17, 21, 25, 33, 41, 49; Arm B: Pre-dose (0 hr) on Weeks 25-29, 31, 33, 37, 41; Arm C: Pre-dose (0 hr) on Weeks 1-5, 7, 9, 13, 17, 21, 25, 33, 41; Arm D: Pre-dose (0 hr) on Weeks 1-5, 7, 9, 13

Notes:

[29] - The end point is not reporting statistics for all the arms in the baseline period. It is expected all the baseline period arms will be reported on when providing values for an end point on the baseline period.
Justification: The endpoint is applicable only for the reported arms; hence, other arms are not included.

End point values	Arm A (Episodic Treatment): Emicizumab	Arm C (Prophylactic Treatment): Emicizumab	Arm D (Episodic or Prophylactic Treatment): Emicizumab	Arm Bemi: Emicizumab after Week 24
Subject group type	Reporting group	Reporting group	Reporting group	Subject analysis set
Number of subjects analysed	34	48	7	13
Units: micrograms per milliliter (mcg/mL)				
arithmetic mean (standard deviation)				
Week 1 (n=33, 0, 48, 7)	999 (± 999)	999 (± 999)	999 (± 999)	9999 (± 9999)
Week 2 (n=34, 0, 47, 6)	16.2 (± 4.4)	15.7 (± 5.6)	19.8 (± 7.2)	9999 (± 9999)
Week 3 (n=34, 0, 48, 7)	31.6 (± 7.3)	31.4 (± 8.5)	34.7 (± 15.3)	9999 (± 9999)
Week 4 (n=32, 0, 47, 7)	43.8 (± 12.2)	44.4 (± 11.7)	53.0 (± 13.0)	9999 (± 9999)
Week 5 (n=33, 0, 46, 6)	53.5 (± 15.1)	54.0 (± 13.2)	65.8 (± 13.1)	9999 (± 9999)
Week 7 (n=33, 0, 46, 4)	52.8 (± 16.2)	53.6 (± 14.3)	58.2 (± 9.1)	9999 (± 9999)
Week 9 (n=32, 0, 40, 3)	50.4 (± 12.4)	54.4 (± 15.6)	67.0 (± 10.2)	9999 (± 9999)
Week 13 (n=32, 0, 34, 1)	49.3 (± 13.4)	53.8 (± 14.9)	63.6 (± 99999)	9999 (± 9999)
Week 17 (n=32, 0, 27, 0)	50.7 (± 15.0)	51.9 (± 12.4)	9999 (± 9999)	9999 (± 9999)
Week 21 (n=32, 0, 22, 0)	52.6 (± 17.4)	53.2 (± 14.5)	9999 (± 9999)	9999 (± 9999)

Week 25 (n=30, 13, 19, 0)	54.9 (± 19.3)	47.3 (± 10.2)	9999 (± 9999)	999 (± 999)
Week 26 (n=0, 12, 0, 0)	9999 (± 9999)	9999 (± 9999)	9999 (± 9999)	22.6 (± 12.5)
Week 27 (n=0, 13, 0, 0)	9999 (± 9999)	9999 (± 9999)	9999 (± 9999)	32.2 (± 12.3)
Week 28 (n=0, 13, 0, 0)	9999 (± 9999)	9999 (± 9999)	9999 (± 9999)	46.1 (± 21.6)
Week 29 (n=0, 13, 0, 0)	9999 (± 9999)	9999 (± 9999)	9999 (± 9999)	54.1 (± 15.8)
Week 31 (n=0, 10, 0, 0)	9999 (± 9999)	9999 (± 9999)	9999 (± 9999)	55.2 (± 22.7)
Week 33 (n=13, 7, 10, 0)	52.7 (± 19.3)	54.0 (± 19.0)	9999 (± 9999)	54.6 (± 23.6)
Week 37 (n=0, 3, 0, 0)	9999 (± 9999)	9999 (± 9999)	9999 (± 9999)	53.6 (± 19.0)
Week 41 (n=3, 1, 4, 0)	44.2 (± 16.8)	51.9 (± 6.6)	9999 (± 9999)	46.0 (± 99999)
Week 49 (n=1, 0, 0, 0)	32.5 (± 99999)	9999 (± 9999)	9999 (± 9999)	9999 (± 9999)

Statistical analyses

No statistical analyses for this end point

Adverse events

Adverse events information

Timeframe for reporting adverse events:

From Baseline up to clinical cut-off date (25 Oct 2016) (up to approximately 1 year)

Adverse event reporting additional description:

Safety population 1 included for Arms A, C, and D, all participants who received at least one dose of emicizumab, and for Arm B, all participants who started the study period. Safety population 2 is exactly the same for Arms A, C, and D, but for Arm B it included only participants who received at least one dose of emicizumab (Arm Bemi).

Assessment type	Non-systematic

Dictionary used

Dictionary name	MedDRA
Dictionary version	19.1

Reporting groups

Reporting group title	Arm A (Episodic Treatment): Emicizumab

Reporting group description:

Participants, who received episodic treatment with bypassing agents prior to study entry, received prophylactic emicizumab. Emicizumab was administered at a loading dose of 3 mg/kg/week SC for the first 4 weeks followed by a maintenance dose of 1.5 mg/kg/week SC up to the end of study. Participants continued to receive episodic bypassing agent therapy to treat breakthrough bleeds, with rFVIIa and/or aPCC.

Reporting group title	Arm B (Episodic Treatment): No Emicizumab

Reporting group description:

Participants, who received episodic treatment with bypassing agents prior to study entry, did not receive emicizumab prophylaxis. Participants in this arm could switch to emicizumab prophylaxis after completing at least 24 weeks on study. Participants continued to receive bypassing agent therapy to treat breakthrough bleeds, with rFVIIa and/or aPCC. Data reported for this arm represents data collected from all Arm B participants during 'no emicizumab' treatment; data from those participants who switched to emicizumab after at least 24 weeks is reported separately in Arm Bemi.

Reporting group title	Arm C (Prophylactic Treatment): Emicizumab

Reporting group description:

Participants, who received prophylactic bypassing agents prior to study entry, received prophylactic emicizumab. Emicizumab was administered at a loading dose of 3 mg/kg/week SC for the first 4 weeks followed by a maintenance dose of 1.5 mg/kg/week SC up to the end of study. Participants continued to receive bypassing agent therapy to treat breakthrough bleeds, with rFVIIa and/or aPCC.

Reporting group title	Arm D (Episodic or Prophylactic Treatment): Emicizumab

Reporting group description:

Participants, who received episodic bypassing agents prior to study entry, who participated in Study BH29768 but were unable to enroll in Arms A or B, were enrolled in this arm to receive prophylactic emicizumab. Emicizumab was administered at a loading dose of 3 mg/kg/week SC for the first 4 weeks followed by a maintenance dose of 1.5 mg/kg/week SC up to the end of study. Participants continued to receive bypassing agent therapy to treat breakthrough bleeds, with rFVIIa and/or aPCC.

Reporting group title	Arm Bemi: Emicizumab after Week 24

Reporting group description:

This arm includes Arm B participants who switched to emicizumab prophylaxis after completing at least 24-week no prophylaxis. Emicizumab was administered at a loading dose of 3 mg/kg/week SC for the first 4 weeks (after at least 24 weeks) followed by a maintenance dose of 1.5 mg/kg/week SC up to the end of study. Data reported represents data collected during emicizumab treatment only.

Serious adverse events	Arm A (Episodic Treatment): Emicizumab	Arm B (Episodic Treatment): No Emicizumab	Arm C (Prophylactic Treatment): Emicizumab
Total subjects affected by serious adverse events			
subjects affected / exposed	4 / 34 (11.76%)	4 / 18 (22.22%)	4 / 49 (8.16%)
number of deaths (all causes)	0	0	0
number of deaths resulting from adverse events			
Injury, poisoning and procedural complications			
Subdural haemorrhage			
subjects affected / exposed	0 / 34 (0.00%)	1 / 18 (5.56%)	0 / 49 (0.00%)
occurrences causally related to treatment / all	0 / 0	0 / 1	0 / 0
deaths causally related to treatment / all	0 / 0	0 / 0	0 / 0
Vascular disorders			
Thrombophlebitis superficial			
subjects affected / exposed	1 / 34 (2.94%)	0 / 18 (0.00%)	0 / 49 (0.00%)
occurrences causally related to treatment / all	1 / 1	0 / 0	0 / 0
deaths causally related to treatment / all	0 / 0	0 / 0	0 / 0
Nervous system disorders			
Headache			
subjects affected / exposed	0 / 34 (0.00%)	0 / 18 (0.00%)	1 / 49 (2.04%)
occurrences causally related to treatment / all	0 / 0	0 / 0	0 / 1
deaths causally related to treatment / all	0 / 0	0 / 0	0 / 0
Blood and lymphatic system disorders			
Iron deficiency anaemia			
subjects affected / exposed	1 / 34 (2.94%)	0 / 18 (0.00%)	0 / 49 (0.00%)
occurrences causally related to treatment / all	0 / 1	0 / 0	0 / 0
deaths causally related to treatment / all	0 / 0	0 / 0	0 / 0
Thrombotic microangiopathy			
subjects affected / exposed	1 / 34 (2.94%)	0 / 18 (0.00%)	1 / 49 (2.04%)
occurrences causally related to treatment / all	1 / 1	0 / 0	1 / 1
deaths causally related to treatment / all	0 / 0	0 / 0	0 / 0
Gastrointestinal disorders			
Gastric ulcer haemorrhage			
subjects affected / exposed	0 / 34 (0.00%)	0 / 18 (0.00%)	1 / 49 (2.04%)
occurrences causally related to treatment / all	0 / 0	0 / 0	0 / 1
deaths causally related to treatment / all	0 / 0	0 / 0	0 / 0
Gastrointestinal haemorrhage			

subjects affected / exposed	0 / 34 (0.00%)	1 / 18 (5.56%)	0 / 49 (0.00%)
occurrences causally related to treatment / all	0 / 0	0 / 1	0 / 0
deaths causally related to treatment / all	0 / 0	0 / 0	0 / 0
Skin and subcutaneous tissue disorders			
Skin necrosis			
subjects affected / exposed	1 / 34 (2.94%)	0 / 18 (0.00%)	0 / 49 (0.00%)
occurrences causally related to treatment / all	1 / 1	0 / 0	0 / 0
deaths causally related to treatment / all	0 / 0	0 / 0	0 / 0
Renal and urinary disorders			
Haematuria			
subjects affected / exposed	0 / 34 (0.00%)	0 / 18 (0.00%)	1 / 49 (2.04%)
occurrences causally related to treatment / all	0 / 0	0 / 0	0 / 1
deaths causally related to treatment / all	0 / 0	0 / 0	0 / 0
Musculoskeletal and connective tissue disorders			
Haemarthrosis			
subjects affected / exposed	0 / 34 (0.00%)	2 / 18 (11.11%)	0 / 49 (0.00%)
occurrences causally related to treatment / all	0 / 0	0 / 2	0 / 0
deaths causally related to treatment / all	0 / 0	0 / 0	0 / 0
Muscle haemorrhage			
subjects affected / exposed	1 / 34 (2.94%)	0 / 18 (0.00%)	0 / 49 (0.00%)
occurrences causally related to treatment / all	0 / 1	0 / 0	0 / 0
deaths causally related to treatment / all	0 / 0	0 / 0	0 / 0
Infections and infestations			
Cavernous sinus thrombosis			
subjects affected / exposed	0 / 34 (0.00%)	0 / 18 (0.00%)	1 / 49 (2.04%)
occurrences causally related to treatment / all	0 / 0	0 / 0	1 / 1
deaths causally related to treatment / all	0 / 0	0 / 0	0 / 0
Device related infection			
subjects affected / exposed	0 / 34 (0.00%)	1 / 18 (5.56%)	0 / 49 (0.00%)
occurrences causally related to treatment / all	0 / 0	0 / 1	0 / 0
deaths causally related to treatment / all	0 / 0	0 / 0	0 / 0
Device related sepsis			

subjects affected / exposed	0 / 34 (0.00%)	1 / 18 (5.56%)	0 / 49 (0.00%)
occurrences causally related to treatment / all	0 / 0	0 / 1	0 / 0
deaths causally related to treatment / all	0 / 0	0 / 0	0 / 0
Sepsis			
subjects affected / exposed	0 / 34 (0.00%)	0 / 18 (0.00%)	1 / 49 (2.04%)
occurrences causally related to treatment / all	0 / 0	0 / 0	0 / 1
deaths causally related to treatment / all	0 / 0	0 / 0	0 / 0
Urinary tract infection			
subjects affected / exposed	0 / 34 (0.00%)	1 / 18 (5.56%)	0 / 49 (0.00%)
occurrences causally related to treatment / all	0 / 0	0 / 1	0 / 0
deaths causally related to treatment / all	0 / 0	0 / 0	0 / 0

Serious adverse events	Arm D (Episodic or Prophylactic Treatment): Emicizumab	Arm Bemi: Emicizumab after Week 24	
Total subjects affected by serious adverse events			
subjects affected / exposed	0 / 7 (0.00%)	1 / 13 (7.69%)	
number of deaths (all causes)	0	0	
number of deaths resulting from adverse events			
Injury, poisoning and procedural complications			
Subdural haemorrhage			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences causally related to treatment / all	0 / 0	0 / 0	
deaths causally related to treatment / all	0 / 0	0 / 0	
Vascular disorders			
Thrombophlebitis superficial			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences causally related to treatment / all	0 / 0	0 / 0	
deaths causally related to treatment / all	0 / 0	0 / 0	
Nervous system disorders			
Headache			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences causally related to treatment / all	0 / 0	0 / 0	
deaths causally related to treatment / all	0 / 0	0 / 0	
Blood and lymphatic system disorders			

Iron deficiency anaemia			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences causally related to treatment / all	0 / 0	0 / 0	
deaths causally related to treatment / all	0 / 0	0 / 0	
Thrombotic microangiopathy			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences causally related to treatment / all	0 / 0	0 / 0	
deaths causally related to treatment / all	0 / 0	0 / 0	
Gastrointestinal disorders			
Gastric ulcer haemorrhage			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences causally related to treatment / all	0 / 0	0 / 0	
deaths causally related to treatment / all	0 / 0	0 / 0	
Gastrointestinal haemorrhage			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences causally related to treatment / all	0 / 0	0 / 0	
deaths causally related to treatment / all	0 / 0	0 / 0	
Skin and subcutaneous tissue disorders			
Skin necrosis			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences causally related to treatment / all	0 / 0	0 / 0	
deaths causally related to treatment / all	0 / 0	0 / 0	
Renal and urinary disorders			
Haematuria			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences causally related to treatment / all	0 / 0	0 / 0	
deaths causally related to treatment / all	0 / 0	0 / 0	
Musculoskeletal and connective tissue disorders			
Haemarthrosis			
subjects affected / exposed	0 / 7 (0.00%)	1 / 13 (7.69%)	
occurrences causally related to treatment / all	0 / 0	0 / 1	
deaths causally related to treatment / all	0 / 0	0 / 0	
Muscle haemorrhage			

subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences causally related to treatment / all	0 / 0	0 / 0	
deaths causally related to treatment / all	0 / 0	0 / 0	
Infections and infestations			
Cavernous sinus thrombosis			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences causally related to treatment / all	0 / 0	0 / 0	
deaths causally related to treatment / all	0 / 0	0 / 0	
Device related infection			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences causally related to treatment / all	0 / 0	0 / 0	
deaths causally related to treatment / all	0 / 0	0 / 0	
Device related sepsis			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences causally related to treatment / all	0 / 0	0 / 0	
deaths causally related to treatment / all	0 / 0	0 / 0	
Sepsis			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences causally related to treatment / all	0 / 0	0 / 0	
deaths causally related to treatment / all	0 / 0	0 / 0	
Urinary tract infection			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences causally related to treatment / all	0 / 0	0 / 0	
deaths causally related to treatment / all	0 / 0	0 / 0	

Frequency threshold for reporting non-serious adverse events: 5 %

Non-serious adverse events	Arm A (Episodic Treatment): Emicizumab	Arm B (Episodic Treatment): No Emicizumab	Arm C (Prophylactic Treatment): Emicizumab
Total subjects affected by non-serious adverse events			
subjects affected / exposed	22 / 34 (64.71%)	8 / 18 (44.44%)	15 / 49 (30.61%)
Investigations			
Blood glucose increased			

subjects affected / exposed	0 / 34 (0.00%)	1 / 18 (5.56%)	0 / 49 (0.00%)
occurrences (all)	0	1	0
Injury, poisoning and procedural complications			
Post procedural constipation			
subjects affected / exposed	0 / 34 (0.00%)	1 / 18 (5.56%)	0 / 49 (0.00%)
occurrences (all)	0	1	0
Procedural hypotension			
subjects affected / exposed	0 / 34 (0.00%)	1 / 18 (5.56%)	0 / 49 (0.00%)
occurrences (all)	0	1	0
Procedural nausea			
subjects affected / exposed	0 / 34 (0.00%)	1 / 18 (5.56%)	0 / 49 (0.00%)
occurrences (all)	0	1	0
Procedural pain			
subjects affected / exposed	0 / 34 (0.00%)	1 / 18 (5.56%)	0 / 49 (0.00%)
occurrences (all)	0	1	0
Vascular disorders			
Deep vein thrombosis			
subjects affected / exposed	0 / 34 (0.00%)	1 / 18 (5.56%)	0 / 49 (0.00%)
occurrences (all)	0	1	0
Nervous system disorders			
Headache			
subjects affected / exposed	3 / 34 (8.82%)	0 / 18 (0.00%)	5 / 49 (10.20%)
occurrences (all)	3	0	6
General disorders and administration site conditions			
Chest pain			
subjects affected / exposed	1 / 34 (2.94%)	1 / 18 (5.56%)	0 / 49 (0.00%)
occurrences (all)	1	1	0
Fatigue			
subjects affected / exposed	3 / 34 (8.82%)	0 / 18 (0.00%)	2 / 49 (4.08%)
occurrences (all)	3	0	2
Injection site reaction			
subjects affected / exposed	8 / 34 (23.53%)	0 / 18 (0.00%)	5 / 49 (10.20%)
occurrences (all)	15	0	11
Pyrexia			
subjects affected / exposed	0 / 34 (0.00%)	1 / 18 (5.56%)	0 / 49 (0.00%)
occurrences (all)	0	1	0

Ear and labyrinth disorders			
Ear discomfort			
subjects affected / exposed	0 / 34 (0.00%)	1 / 18 (5.56%)	0 / 49 (0.00%)
occurrences (all)	0	1	0
Gastrointestinal disorders			
Abdominal pain upper			
subjects affected / exposed	0 / 34 (0.00%)	1 / 18 (5.56%)	0 / 49 (0.00%)
occurrences (all)	0	1	0
Enteritis			
subjects affected / exposed	2 / 34 (5.88%)	0 / 18 (0.00%)	0 / 49 (0.00%)
occurrences (all)	2	0	0
Large intestine polyp			
subjects affected / exposed	0 / 34 (0.00%)	1 / 18 (5.56%)	0 / 49 (0.00%)
occurrences (all)	0	1	0
Toothache			
subjects affected / exposed	2 / 34 (5.88%)	0 / 18 (0.00%)	0 / 49 (0.00%)
occurrences (all)	2	0	0
Respiratory, thoracic and mediastinal disorders			
Cough			
subjects affected / exposed	2 / 34 (5.88%)	0 / 18 (0.00%)	0 / 49 (0.00%)
occurrences (all)	3	0	0
Oropharyngeal pain			
subjects affected / exposed	0 / 34 (0.00%)	1 / 18 (5.56%)	0 / 49 (0.00%)
occurrences (all)	0	1	0
Skin and subcutaneous tissue disorders			
Hair growth abnormal			
subjects affected / exposed	3 / 34 (8.82%)	0 / 18 (0.00%)	0 / 49 (0.00%)
occurrences (all)	3	0	0
Rash			
subjects affected / exposed	0 / 34 (0.00%)	1 / 18 (5.56%)	0 / 49 (0.00%)
occurrences (all)	0	1	0
Musculoskeletal and connective tissue disorders			
Arthralgia			
subjects affected / exposed	2 / 34 (5.88%)	0 / 18 (0.00%)	3 / 49 (6.12%)
occurrences (all)	3	0	6
Myalgia			

subjects affected / exposed	2 / 34 (5.88%)	0 / 18 (0.00%)	0 / 49 (0.00%)
occurrences (all)	2	0	0
Infections and infestations			
Folliculitis			
subjects affected / exposed	2 / 34 (5.88%)	0 / 18 (0.00%)	0 / 49 (0.00%)
occurrences (all)	2	0	0
Nasopharyngitis			
subjects affected / exposed	1 / 34 (2.94%)	2 / 18 (11.11%)	0 / 49 (0.00%)
occurrences (all)	1	2	0
Upper respiratory tract infection			
subjects affected / exposed	7 / 34 (20.59%)	3 / 18 (16.67%)	2 / 49 (4.08%)
occurrences (all)	9	3	2
Metabolism and nutrition disorders			
Dehydration			
subjects affected / exposed	1 / 34 (2.94%)	1 / 18 (5.56%)	0 / 49 (0.00%)
occurrences (all)	1	1	0
Electrolyte imbalance			
subjects affected / exposed	0 / 34 (0.00%)	1 / 18 (5.56%)	0 / 49 (0.00%)
occurrences (all)	0	1	0

Non-serious adverse events	Arm D (Episodic or Prophylactic Treatment): Emicizumab	Arm Bemi: Emicizumab after Week 24	
Total subjects affected by non-serious adverse events			
subjects affected / exposed	2 / 7 (28.57%)	4 / 13 (30.77%)	
Investigations			
Blood glucose increased			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences (all)	0	0	
Injury, poisoning and procedural complications			
Post procedural constipation			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences (all)	0	0	
Procedural hypotension			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences (all)	0	0	
Procedural nausea			

subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences (all)	0	0	
Procedural pain			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences (all)	0	0	
Vascular disorders			
Deep vein thrombosis			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences (all)	0	0	
Nervous system disorders			
Headache			
subjects affected / exposed	2 / 7 (28.57%)	1 / 13 (7.69%)	
occurrences (all)	2	1	
General disorders and administration site conditions			
Chest pain			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences (all)	0	0	
Fatigue			
subjects affected / exposed	0 / 7 (0.00%)	1 / 13 (7.69%)	
occurrences (all)	0	1	
Injection site reaction			
subjects affected / exposed	1 / 7 (14.29%)	1 / 13 (7.69%)	
occurrences (all)	1	1	
Pyrexia			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences (all)	0	0	
Ear and labyrinth disorders			
Ear discomfort			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences (all)	0	0	
Gastrointestinal disorders			
Abdominal pain upper			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences (all)	0	0	
Enteritis			

subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences (all)	0	0	
Large intestine polyp			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences (all)	0	0	
Toothache			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences (all)	0	0	
Respiratory, thoracic and mediastinal disorders			
Cough			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences (all)	0	0	
Oropharyngeal pain			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences (all)	0	0	
Skin and subcutaneous tissue disorders			
Hair growth abnormal			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences (all)	0	0	
Rash			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences (all)	0	0	
Musculoskeletal and connective tissue disorders			
Arthralgia			
subjects affected / exposed	0 / 7 (0.00%)	1 / 13 (7.69%)	
occurrences (all)	0	1	
Myalgia			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences (all)	0	0	
Infections and infestations			
Folliculitis			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences (all)	0	0	
Nasopharyngitis			
subjects affected / exposed	0 / 7 (0.00%)	0 / 13 (0.00%)	
occurrences (all)	0	0	

Upper respiratory tract infection subjects affected / exposed occurrences (all)	0 / 7 (0.00%) 0	0 / 13 (0.00%) 0	
Metabolism and nutrition disorders Dehydration subjects affected / exposed occurrences (all)	0 / 7 (0.00%) 0	0 / 13 (0.00%) 0	
Electrolyte imbalance subjects affected / exposed occurrences (all)	0 / 7 (0.00%) 0	0 / 13 (0.00%) 0	

More information

Substantial protocol amendments (globally)

Were there any global substantial amendments to the protocol? Yes

Date	Amendment
21 April 2016	The main changes were as follows: - The planned number of participants to be enrolled in Arm C was increased from approximately 10-20 to 30-50, to enable the collection of additional safety and efficacy data from participants previously treated with prophylactic bypassing agents; - An additional emicizumab treatment arm (Arm D) was added, to enroll participants on episodic bypassing agents who had participated in NIS BH29768 but were unable to enroll in time to either Arm A or Arm B. This arm enabled the collection of additional efficacy, safety, pharmacokinetic, and pharmacodynamic data and plasma samples for the development and validation of in vitro diagnostic assay(s) suitable for participants receiving emicizumab treatment; - A secondary endpoint was added to compare all bleeds (i.e., treated with coagulation factors or not treated) as an additional assessment of efficacy given that some participants might have reported bleeds they did not treat; A planned interim analysis by the independent Data Monitoring Committee (iDMC), scheduled to occur during the execution of the primary efficacy period, was removed. This was due to the anticipated rapid completion of enrollment (i.e., approximately 7 months) and the very short time interval between the interim and primary analyses; - An option was provided for participants who were approved to up-titrate their dose to potentially combine emicizumab volumes from more than 1 vial into 1 syringe to reduce the number of subcutaneous injections they required.
30 November 2016	The main changes were as follows: - The permitted treatment for breakthrough bleeds was specified with guidance regarding the use of concomitant bypassing agents in participants being treated with emicizumab, as well as additional local and central laboratory assessments, in order to minimize the risk and monitor for thromboembolic and thrombotic microangiopathy events; - The use of short-term prophylaxis with aPCC concomitantly with emicizumab was prohibited, in order to minimize the risk of thromboembolic and thrombotic microangiopathy events; Microangiopathic hemolytic anemia/ thrombotic microangiopathy was newly classified as an adverse event of special interest (AESI), and an exclusion criterion to exclude participants at high risk to experience thrombotic microangiopathy was added; - A new efficacy objective to evaluate the clinical effect of emicizumab prophylaxis on the number of spontaneous bleeds over time (spontaneous bleed rate) was added, because this is a bleed category that is impacted by an effective treatment.

Notes:

Interruptions (globally)

Were there any global interruptions to the trial? Yes

Date	Interruption	Restart date
07 October 2016	4 participants experienced serious adverse events (2 participants experienced thromboembolic events and 2 participants experienced thrombotic microangiopathy) that resulted in temporary enrollment halt until further evaluation of these safety events, implementation of adequate mitigation measures and discussion with iDMC.	28 November 2016

Notes:

Limitations and caveats

None reported