

## **Appendix**

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## Appendix A. Search terms and strategies

PICO	Search Number	Search Terms
P	#1	NOAC OR “New oral anticoagulants” OR “Novel oral anticoagulants” OR DOAC OR “Direct oral anticoagulants” OR “Non vitamin K antagonist” OR “Factor Xa inhibitor” OR “Factor IIa inhibitor” OR “factor-specific oral anticoagulants” OR “thrombin inhibitor” OR Dabigatran OR Rivaroxaban OR Apixaban OR Edoxaban
I	#2	Idarucizumab OR Praxbind
	#3	“Andexanet alfa” OR Andexxa
	#4	PCC OR “Prothrombin complex concentrate” OR Cofact
	#5	“Activated prothrombin complex concentrate” OR FEIBA
	#6	rFVIIa OR “Recombinant factor VIIa” OR Novoseven
	#7	FFP OR “Fresh frozen plasma”
	#8	#2 OR #3 OR #4 OR #5 OR #6 OR #7
C		-
O		-
P AND I		#1 AND #8

## Appendix B. Description of NOACs and reversal agents

	<b>n</b>	
Indications of NOAC, n (%)	220	
AF		188 (85.45)
VTE		10 (4.55)
AF/VTE		22 (10.00)
Types of NOAC, n (%)	220	
Dabigatran		136 (61.82)
Rivaroxaban		68 (30.91)
Apixaban		16 (7.27)
Doses of NOACs per day, mg, mean (SD)		
Dabigatran	94	265.85 (41.36)
Rivaroxaban	31	18.55 (4.32)
Apixaban	9	7.78 (2.64)
Time since last dose, hours, median (range)	56	11.50 (1, 96)
Reversal agents, n (%)	220	
PCC		68 (30.91)
Idarucizumab		46 (20.91)
FFP		29 (13.18)
aPCC		28 (12.73)
rFVIIa		13 (5.91)
PCC + FFP		14 (6.36)
rFVIIa + FFP		10 (4.55)
aPCC + idarucizumab		2 (0.91)
aPCC + FFP		5 (2.27)
PCC + idarucizumab		2 (0.91)
PCC + rFVIIa		3 (1.36)
Doses of reversal agents		
PCC, Unit/kg, mean (SD)	40	27.77 (12.72)
Total PCC, Unit, mean (SD)	56	2418.82 (1127.31)
aPCC, Unit/kg, median (range)	30	28.75 (8.00, 100.00)
Total aPCC, Unit, mean (SD)	13	2952.15 (1237.19)
rFVIIa, mcg/kg, median (range)	5	48.90 (2.40, 90.00)
Total rFVIIa, mg, median (range)	9	4.00 (2.00, 21.60)
FFP, Unit, median (range)	37	4.00 (1, 20)
Idarucizumab, g, mean (SD)	50	5.00 (0.0)

**Appendix C. Criteria for justification of reversal outcome**

<b>Reversal criteria used for reversal judgment</b>	<b>n (%)</b>
Bleeding cessation/stopped	86 (39.09)
No expansion of hematoma on CT scan	68 (30.91)
Survived/transferred/discharged	29 (13.18)
Clinically stable	23 (10.45)
Normalization of coagulation parameters	14 (6.36)
Total	220 (100.0)

#### Appendix D. Comparison of characteristics between reversal outcomes

Characteristics	Reverse n = 174	Non-reverse n = 46	P-value
Sex, n (%)			
Male	95 (61.69)	25 (62.5)	0.925
Female	59 (38.31)	15 (37.5)	
Age, years, mean (SD)	77.82 (9.47)	75.44 (9.72)	0.144
Medical history, n (%)			
Hypertension	66 (52.8)	11 (40.74)	0.256
Diabetes	22 (17.6)	1 (3.7)	0.079
Coronary artery disease	24 (19.2)	7 (25.93)	0.432
Cerebrovascular disease	17 (13.6)	4 (14.81)	1.000
Renal impairment	23 (18.40)	4 (14.81))	0.787
Renal function on admission			
SCr, mg/dl, median (range)	1.8 (0.74, 11.27)	1.35 (0.80, 10.50)	0.610
CrCl, ml/min, median (range)	46.40 (14.00, 113.00)	55.5 (24.2, 110.0)	0.365
Concomitant antiplatelet, n (%)	32 (43.24)	4 (25.00)	0.177
Cause of bleeding, n (%)			
Spontaneous	116 (66.67)	30 (65.22)	0.769
Trauma	51 (29.31)	13 (28.26)	
Post-procedure	7 (4.02)	3 (6.52)	
Site of bleeding, n (%)			
Intracranial	88 (59.06)	26 (61.9)	0.712
Gastrointestinal	37 (24.83)	8 (19.05)	
Other	24 (16.11)	8 (19.05)	
Indications of NOAC, n (%)			
AF	131 (87.92)	29 (69.05)	0.004
VTE	7 (4.7)	2 (4.76)	
AF/VTE	11 (7.38)	11 (26.19)	
Type of NOAC, n (%)			
Dabigatran	110 (63.22)	26 (56.52)	0.607
Rivaroxaban	51 (29.31)	17 (36.96)	
Apixaban	13 (7.47)	3 (6.52)	

**Appendix D. Comparison of characteristics between reversal outcomes (continue)**

<b>Characteristics</b>	<b>Reverse n = 174</b>	<b>Non-reverse n = 46</b>	<b>P-value</b>
<b>Doses of NOACs, mg/day, mean (SD)</b>			
Dabigatran	261.43 (42.23)	285.88 (31.43)	0.027
Rivaroxaban	19.20 (4.25)	15.83 (3.76)	0.086
Apixaban	7.14 (2.67)	10.0 (0.0)	0.030
Time since last dose, hours, median (range)	12 (1, 96)	12 (11, 24)	0.712
<b>Group of reversal agents, n (%)</b>			
Standard	123 (82.55)	40 (95.24)	0.040
Specific	26 (17.45)	2 (4.76)	
<b>Reversal agents, n (%)</b>			
PCC	55 (31.61)	13 (28.26)	0.014
aPCC	22 (12.64)	6 (13.04)	
rFVIIa	7 (4.02)	6 (13.04)	
FFP	23 (13.22)	6 (13.04)	
Idarucizumab	43 (24.71)	3 (6.52)	
Combined reversal agents	24 (13.79)	12 (26.09)	
<b>Doses of reversal agents</b>			
PCC, Unit/kg, median (range)	25.00 (14.50, 63.00)	19.50 (8.5, 50)	0.915
Total PCC, Unit, mean (SD)	2476.39 (1150.96)	2154.00 (1023.63)	0.417
Total rFVIIa, mg, median (range)	4.00 (2.00, 21.60)	7.50 (7.00, 8.00)	0.566
FFP, Unit, median (range)	3 (1, 20)	6 (2, 20)	0.162
<b>Additional treatments for bleeding</b>			
Receiving PRBC transfusion, n (%)	49 (30.82)	18 (40.00)	0.247
PRBC unit, median (range)	3 (1, 25)	8 (2, 32)	0.003
Receiving hemodialysis, n (%)	20 (12.9)	7 (15.56)	0.647

**Appendix E. Proportions of bleeding sites in each group of interested interventions**

<b>Management</b>	<b>Site of Bleeding</b>			<b>Total</b>
	<b>ICH</b>	<b>GI</b>	<b>Other</b>	
DTI-Standard	35 (40.70)	36 (41.86)	15 (17.44)	86
DTI-Specific	30 (60.00)	11 (22.00)	9 (18.00)	50
FXa-Standard	64 (76.19)	8 (9.52)	12 (14.29)	84
Total	129 (58.64)	55 (25.00)	36 (16.36)	220 (100.0)

## Appendix F. Comparison of characteristics between death outcomes

<b>Characteristics</b>	<b>Death n = 48</b>	<b>Alive n = 172</b>	<b>P-value</b>
Sex, n (%)			
Male	29 (69.05)	91 (59.87)	0.278
Female	13 (30.95)	61 (40.13)	
Age, years, mean (SD)	78.02 (8.61)	77.16 (10.30)	0.592
Medical history, n (%)			
Hypertension	11 (33.33)	66 (55.46)	0.024
Diabetes	2 (6.06)	21 (17.65)	0.100
Coronary artery disease	8 (24.24)	23 (19.33)	0.535
Cerebrovascular disease	6 (18.18)	15 (12.61)	0.403
Renal impairment	11 (26.19)	19 (12.10)	0.023
Renal function at baseline			
CrCl, ml/min, median (range)	41.80 (33, 50.60)	40.75 (30.50, 100.00)	0.688
Renal function on admission			
SCr, mg/dl, median (range)	2.05 (1.14, 10.50)	1.63 (0.74, 11.27)	0.668
CrCl, ml/min, median (range)	35.60 (14.00, 70.00)	53.00 (14.00, 113.00)	0.271
Concomitant antiplatelet, n (%)	9 (52.94)	27 (36.99)	0.227
Cause of bleeding, n (%)			
Spontaneous	32 (66.67)	114 (66.28)	0.787
Trauma	13 (27.08)	51 (29.65)	
Post-procedure	3 (6.25)	7 (4.07)	
Site of bleeding, n (%)			
Intracranial	29 (65.91)	85 (57.82)	0.502
Gastrointestinal	10 (22.73)	35 (23.81)	
Other	5 (11.36)	27 (18.37)	
Indications of NOAC, n (%)			
AF	33 (75)	127 (86.39)	0.106
VTE	2 (4.55)	7 (4.76)	
AF/VTE	9 (20.45)	13 (8.84)	



**Appendix F. Comparison of characteristics between death outcomes (continue)**

<b>Characteristics</b>	<b>Death n = 48</b>	<b>Alive n = 172</b>	<b>P-value</b>
Type of NOAC, n (%)			
Dabigatran	30 (62.50)	106 (61.63)	0.954
Rivaroxaban	15 (31.25)	53 (30.81)	
Apixaban	3 (6.25)	13 (7.56)	
Doses of NOACs per day, mg, mean (SD)			
Dabigatran	280.00 (35.54)	262.03 (42.30)	0.085
Rivaroxaban	18.75 (2.50)	18.52 (4.56)	0.922
Apixaban	-	7.50 (2.67)	
Time since last dose, hours, median (range)	11.00 (1.10, 28.00)	12.00 (1.00, 96.00)	0.809
Group of reversal agents, n (%)			
Standard	42 (95.45)	121 (82.31)	0.031
Specific	2 (4.55)	26 (17.69)	
Reversal agents, n (%)			
PCC	15 (31.25)	53 (30.81)	<0.001
aPCC	3 (6.25)	25 (14.53)	
rFVIIa	7 (14.58)	6 (3.49)	
FFP	6 (12.5)	23 (13.37)	
Idarucizumab	3 (6.25)	43 (25.00)	
Combined reversal agents	14 (29.17)	22 (12.79)	
Doses of reversal agents			
PCC, Unit/kg, mean (SD)	32.94 (15.23)	26.67 (12.11)	0.241
Total PCC, Unit, mean (SD)	3017.75 (1164.38)	2179.25 (1031.85)	0.011
rFVIIa, mcg/kg, median (range)	69.5 (48.9, 90.0)	30.0 (2.4, 90.0)	0.374
Total rFVIIa, mg, median (range)	8.00 (7.00, 8.00)	3.50 (2.00, 21.60)	0.117
FFP, Unit, median (range)	6.00 (2.00, 20.00)	3.50 (1.00, 20.00)	0.370
Additional treatments for bleeding			
Receiving PRBC transfusion, n (%)	21 (50.00)	46 (28.40)	0.008
PRBC unit, median (range)	5.00 (2.00, 32.00)	3.00 (1.00, 25.00)	0.192
Receiving hemodialysis, n (%)	9 (21.95)	18 (11.32)	0.076

## Appendix G. Incidence rate for cohort studies

Author (year)	Intervention	No. subjects	No. reverse	IR/100	95% CI
<b>Reversal</b>					
Connolly (2016)	FXa-Specific	46	37	80.43	66.83, 89.35
Sin (2016)	FXa-Standard	9	7	77.78	45.26, 93.68
Majeed (2017)	FXa-Standard	84	58	69.05	58.51, 77.92
Harrison (2018)	FXa-Standard	14	13	92.86	68.53, 98.73
Schenk (2018)	FXa-Standard	13	10	76.92	49.74, 91.82
Schulman (2018)	FXa-Standard	66	43	65.15	53.11, 75.52
Pollack (2017)	DTI-Specific	301	203		
Sin (2016)	DTI-Standard	2	1	50.00	9.45, 90.55
Schulman (2017)	DTI-Standard	14	9	64.29	38.76, 83.66
<b>Death</b>					
Connolly (2016)	FXa-Specific	46	7	15.22	7.57, 28.22
Bouget (2015)	FXa-Standard	6	2	33.33	9.68, 70.00
Majeed (2017)	FXa-Standard	84	27	32.14	23.13, 42.72
Harrison (2018)	FXa-Standard	14	2	14.29	4.01, 39.94
Schenk (2018)	FXa-Standard	13	3	23.08	8.18, 50.26
Schulman (2018)	FXa-Standard	66	9	13.64	7.34, 23.93
Pollack (2017)	DTI-Specific	301	19	6.31	4.08, 9.65
Smythe (2015)	DTI-Standard	4	2	50.0	15.0, 85.0
Schulman (2017)	DTI-Standard	14	1	7.14	1.27, 31.47

## Appendix H. Characteristics and endpoints for case report/series

Author	Year	Sex	Age	Site of bleeding	NOAC	Indication	Reversal agents	Reversal	Death
Alhashem HM.	2017	M	65	GI	Dabigatran	AF	aPCC+Idarucizumab	yes	no
Ali AN.	2013	M	89	GI	Dabigatran	AF	PCC+FFP	yes	no
Arai N.	2018	M	79	ICH	Dabigatran	AF	Idarucizumab	yes	no
Aron J.	2014	M	76	ICH	Dabigatran	AF	rFVIIa	yes	yes
Bene J.	2012	F	79	GI	Dabigatran	AF	FFP	yes	no
Beyer-Westendorf J.	2014	M	80	ICH	Rivaroxaban	AF	PCC+FFP	yes	yes
Beyer-Westendorf J.	2014	M	75	Other	Rivaroxaban	VTE	PCC	yes	no
Beyer-Westendorf J.	2014	M	82	ICH	Rivaroxaban	AF	PCC	yes	yes
Beyer-Westendorf J.	2014	F	77	GI	Rivaroxaban	VTE	PCC	yes	no
Beyer-Westendorf J.	2014	M	64	GI	Rivaroxaban	AF	PCC	yes	no
Beyer-Westendorf J.	2014	F	82	Other	Rivaroxaban	AF	PCC+FFP	yes	no
Beynon C.	2015	M	76	ICH	Apixaban	AF	PCC	yes	no
Beynon C.	2015	F	78	ICH	Apixaban	AF	PCC	yes	no
Beynon C.	2015	F	77	ICH	Rivaroxaban	AF/VTE	PCC	no	no
Beynon C.	2015	M	89	ICH	Rivaroxaban	AF/VTE	PCC+FFP	no	yes
Beynon C.	2015	M	73	ICH	Rivaroxaban	AF/VTE	PCC	no	no
Beynon C.	2015	M	80	ICH	Rivaroxaban	AF/VTE	PCC	no	yes
Brewer DC.	2016	M	79	Other	Rivaroxaban	AF	PCC	yes	no
Cano EL.	2012	F	78	GI	Dabigatran	AF	PCC+FFP	no	yes
Cebeci E.	2016	M	54	Other	Dabigatran	AF	FFP	yes	no

**Appendix H. Characteristics and endpoints for case report/series (continue)**

Author	Year	Sex	Age	Site of bleeding	NOAC	Indication	Reversal agents	Reversal	Death
Chang DN.	2013	M	94	ICH	Dabigatran	AF	aPCC	yes	no
Chen BC.	2012	M	79	GI	Dabigatran	AF	PCC+FFP	no	yes
Chen BC.	2012	M	86	GI	Dabigatran	AF	FFP	yes	no
Chen BC.	2013	M	80	Other	Dabigatran	AF	FFP	yes	no
Chic Acevedo C.	2015	F	51	GI	Rivaroxaban	AF	PCC	yes	no
Chung MC.	2016	M	70	Other	Dabigatran	AF	FFP	yes	no
Cohen M.	2017	M	69	GI	Rivaroxaban	AF	FFP	yes	no
Crapelli GB.	2016	F	84	Other	Dabigatran	AF	PCC+rFVIIa	no	yes
Cronin J.	2014	F	84	GI	Dabigatran	AF	PCC	yes	no
Dager WE.	2013	F	67	Other	Dabigatran	AF	aPCC+FFP	yes	no
Denetclaw TH.	2016	F	88	Other	Apixaban	AF	PCC	yes	no
Diaz MQ.	2013	M	76	GI	Dabigatran	AF	PCC	yes	no
Diaz MQ.	2013	F	82	GI	Dabigatran	AF	PCC	yes	no
Diaz MQ.	2013	M	83	GI	Dabigatran	AF	PCC	yes	no
Diaz MQ.	2013	M	82	GI	Dabigatran	AF	PCC	yes	no
Diaz MQ.	2013	M	88	GI	Dabigatran	AF	PCC	yes	yes
Dibu JR.	2016	F	81	ICH	Rivaroxaban	AF	aPCC	yes	no
Dibu JR.	2016	M	69	ICH	Dabigatran	AF	aPCC	yes	no
Dibu JR.	2016	M	49	ICH	Rivaroxaban	AF	aPCC	yes	no
Dibu JR.	2016	F	81	ICH	Apixaban	AF	aPCC	yes	no

**Appendix H. Characteristics and endpoints for case report/series (continue)**

Author	Year	Sex	Age	Site of bleeding	NOAC	Indication	Reversal agents	Reversal	Death
Dibu JR.	2016	M	81	ICH	Rivaroxaban	AF	aPCC	yes	no
Dumkow LE.	2012	M	85	GI	Dabigatran	AF	PCC+FFP	yes	yes
Durie R.	2016	M	60	ICH	Apixaban	AF	PCC+FFP	no	yes
Edwards G.	2018	M	63	ICH	Dabigatran	AF	PCC+Idarucizumab	yes	no
Egger F.	2016	F	78	Other	Rivaroxaban	AF	PCC	yes	no
Evans NR.	2016	M	78	ICH	Dabigatran	AF	aPCC	yes	no
Faust AC.	2014	M	85	ICH	Dabigatran	AF	aPCC	yes	no
Faust AC.	2016	F	91	ICH	Rivaroxaban	VTE	PCC+FFP	yes	yes
Faust AC.	2016	F	83	ICH	Rivaroxaban	AF	PCC+FFP	yes	no
Faust AC.	2016	M	72	ICH	Rivaroxaban	AF	PCC+FFP	yes	no
Faust AC.	2018	M	77	ICH	Apixaban	AF	PCC	yes	no
Faust AC.	2018	M	85	ICH	Apixaban	AF	PCC+FFP	yes	no
Fellows SE.	2013	M	85	GI	Dabigatran	AF	FFP	yes	no
Garber ST.	2012	M	83	ICH	Dabigatran	AF	rFVIIa	no	yes
Gendron N.	2017	F	96	GI	Dabigatran	AF	Idarucizumab	yes	no
Gendron N.	2017	F	77	GI	Dabigatran	AF	Idarucizumab	yes	no
Gendron N.	2017	M	80	ICH	Dabigatran	AF	aPCC+Idarucizumab	yes	no
Giustozzi M.	2017	M	80	GI	Dabigatran	AF	Idarucizumab	yes	no
Giustozzi M.	2017	F	85	Other	Dabigatran	AF	Idarucizumab	yes	no

**Appendix H. Characteristics and endpoints for case report/series (continue)**

Author	Year	Sex	Age	Site of bleeding	NOAC	Indication	Reversal agents	Reversal	Death
Goriacko P.	2017	M	53	Other	Dabigatran	AF	Idarucizamab	yes	no
Goriacko P.	2017	M	79	ICH	Dabigatran	AF	Idarucizamab	yes	no
Goriacko P.	2017	F	82	GI	Dabigatran	AF	Idarucizamab	yes	no
Goriacko P.	2017	F	82	GI	Dabigatran	AF	Idarucizamab	yes	no
Goriacko P.	2017	F	82	GI	Dabigatran	AF	Idarucizamab	yes	no
Grandhi R.	2015	M	74	ICH	Rivaroxaban	AF	PCC	yes	no
Grandhi R.	2015	M	87	ICH	Apixaban	AF	PCC	yes	yes
Grandhi R.	2015	F	80	ICH	Rivaroxaban	AF	PCC	yes	yes
Grandhi R.	2015	M	85	ICH	Rivaroxaban	AF	PCC	yes	no
Grandhi R.	2015	F	83	ICH	Rivaroxaban	AF	PCC	yes	no
Grandhi R.	2015	M	56	ICH	Rivaroxaban	AF	PCC	yes	yes
Grandhi R.	2015	F	81	ICH	Rivaroxaban	AF	PCC	yes	no
Grandhi R.	2015	M	81	ICH	Rivaroxaban	AF	PCC	yes	no
Grandhi R.	2015	M	83	ICH	Rivaroxaban	AF	PCC	yes	yes
Grandhi R.	2015	M	83	ICH	Apixaban	AF	PCC	yes	yes
Grandhi R.	2015	F	88	ICH	Rivaroxaban	AF	PCC	yes	no
Grandhi R.	2015	M	85	ICH	Rivaroxaban	AF	PCC	yes	no
Grandhi R.	2015	M	96	ICH	Rivaroxaban	AF	PCC	yes	yes
Grandhi R.	2015	F	76	ICH	Rivaroxaban	AF	PCC	yes	no

**Appendix H. Characteristics and endpoints for case report/series (continue)**

Author	Year	Sex	Age	Site of bleeding	NOAC	Indication	Reversal agents	Reversal	Death
Grandhi R.	2015	F	88	ICH	Rivaroxaban	AF	PCC	no	no
Grandhi R.	2015	M	74	ICH	Rivaroxaban	AF	PCC	yes	no
Harinstein LM.	2013	M	84	GI	Dabigatran	AF	rFVIIa+FFP	yes	no
Held V.	2016	F	74	ICH	Dabigatran	AF	Idarucizumab	yes	no
Held V.	2016	M	76	ICH	Dabigatran	AF	Idarucizumab	yes	no
Hofer S.	2016	F	82	Other	Dabigatran	AF	Idarucizumab	yes	no
Htun K.	2014	M	72	ICH	Dabigatran	AF	rFVIIa	yes	no
Jones JM.	2016	M	71	GI	Dabigatran	AF	PCC+FFP	yes	no
Kasliwal MK.	2015	M	83	ICH	Rivaroxaban	AF	aPCC	yes	no
Kaur U.	2018	F	65	ICH	Dabigatran	VTE	FFP	no	yes
Kermer P.	2017	M	76	ICH	Dabigatran	AF	Idarucizumab	yes	no
Kermer P.	2017	M	65	ICH	Dabigatran	AF	Idarucizumab	yes	no
Kermer P.	2017	F	83	ICH	Dabigatran	AF	Idarucizumab	yes	no
Kermer P.	2017	F	74	ICH	Dabigatran	AF	Idarucizumab	yes	no
Kermer P.	2017	F	82	ICH	Dabigatran	AF	Idarucizumab	yes	no
Kermer P.	2017	F	78	ICH	Dabigatran	AF	Idarucizumab	no	yes
Kermer P.	2017	M	71	ICH	Dabigatran	AF	Idarucizumab	yes	no
Kermer P.	2017	F	73	ICH	Dabigatran	AF	Idarucizumab	no	no
Kermer P.	2017	M	83	ICH	Dabigatran	AF	Idarucizumab	yes	no
Kermer P.	2017	M	78	ICH	Dabigatran	AF	Idarucizumab	yes	no

**Appendix H. Characteristics and endpoints for case report/series (continue)**

Author	Year	Sex	Age	Site of bleeding	NOAC	Indication	Reversal agents	Reversal	Death
Kerner P.	2017	M	56	ICH	Dabigatran	AF	Idarucizamab	yes	no
Kerner P.	2017	F	86	ICH	Dabigatran	AF	Idarucizamab	yes	no
Kernan L.	2012	M	92	GI	Dabigatran	VTE	FFP	no	yes
Kham NM.	2016	M	63	Other	Rivaroxaban	AF	FFP	yes	no
Kham NM.	2016	M	63	Other	Rivaroxaban	AF	FFP	yes	no
Kiraly A.	2013	M	86	Other	Rivaroxaban	AF	aPCC+FFP	yes	no
Kiraly A.	2013	M	69	ICH	Dabigatran	AF	aPCC	yes	no
Kizilirmak F.	2016	F	66	Other	Dabigatran	AF	FFP	yes	no
Klusak A.	2014	M	68	ICH	Rivaroxaban	AF	PCC	yes	no
Lal Y.	2013	F	64	ICH	Dabigatran	AF	FFP	yes	yes
Lal Y.	2013	F	80	ICH	Dabigatran	AF	FFP	no	yes
Lo JC.	2014	M	92	ICH	Rivaroxaban	AF	FFP	no	no
Majeed A.	2016	F	83	GI	Dabigatran	AF/VTE	rFVIIa	no	yes
Majeed A.	2016	M	79	Other	Dabigatran	AF/VTE	rFVIIa	yes	no
Majeed A.	2016	M	69	Other	Dabigatran	AF/VTE	rFVIIa	no	yes
Majeed A.	2016	M	79	GI	Dabigatran	AF/VTE	rFVIIa	yes	no
Majeed A.	2016	M	74	Other	Dabigatran	AF/VTE	PCC	no	yes
Majeed A.	2016	F	76	GI	Dabigatran	AF/VTE	rFVIIa	yes	no



**Appendix H. Characteristics and endpoints for case report/series (continue)**

Author	Year	Sex	Age	Site of bleeding	NOAC	Indication	Reversal agents	Reversal	Death
Majeed A.	2016	M	77	ICH	Dabigatran	AF/VTE	PCC	no	yes
Majeed A.	2016	M	68	Other	Dabigatran	AF/VTE	rFVIIa	no	yes
Majeed A.	2016	F	68	GI	Dabigatran	AF/VTE	rFVIIa	yes	no
Majeed A.	2016	M	79	ICH	Dabigatran	AF/VTE	rFVIIa	no	yes
Majeed A.	2016	M	72	GI	Dabigatran	AF/VTE	rFVIIa	no	yes
Mao G.	2017	M	71	ICH	Rivaroxaban	AF	aPCC	yes	no
Mao G.	2017	M	85	ICH	Rivaroxaban	AF	aPCC	yes	no
Mao G.	2017	F	74	ICH	Apixaban	AF	aPCC	yes	no
Mao G.	2017	M	78	ICH	Rivaroxaban	AF	aPCC	no	yes
Mao G.	2017	M	84	ICH	Rivaroxaban	AF	aPCC	no	yes
Mao G.	2017	M	62	ICH	Rivaroxaban	AF	aPCC	no	no
Mao G.	2017	F	77	ICH	Apixaban	AF	aPCC	yes	no
Mao G.	2017	F	81	ICH	Rivaroxaban	AF	aPCC	no	yes
Mao G.	2017	M	73	ICH	Apixaban	AF	aPCC	no	no
Mao G.	2017	M	85	ICH	Rivaroxaban	AF	aPCC	yes	no
Mao G.	2017	M	67	ICH	Rivaroxaban	AF	aPCC	yes	no
Marino K.	2016	F	58	Other	Dabigatran	AF	Idarucizamab	yes	no
Masotti L.	2015	F	93	GI	Dabigatran	AF	PCC	yes	no
Mathais Q.	2018	M	78	ICH	Dabigatran	AF	Idarucizamab	yes	no

**Appendix H. Characteristics and endpoints for case report/series (continue)**

Author	Year	Sex	Age	Site of bleeding	NOAC	Indication	Reversal agents	Reversal	Death
Maurice-Szamburski A.	2014	F	77	ICH	Rivaroxaban	AF	aPCC	yes	no
McGovern TR.	2015	M	83	GI	Dabigatran	AF	PCC	yes	no
Means L.	2016	M	64	GI	Rivaroxaban	VTE	PCC	yes	no
Means L.	2016	M	64	GI	Rivaroxaban	VTE	PCC	yes	no
Molina M.	2014	F	84	ICH	Rivaroxaban	AF	FFP	yes	no
Moore CH.	2012	F	78	GI	Dabigatran	AF	FFP	yes	no
Mourafetis J.	2018	M	77	GI	Dabigatran	AF	PCC+rFVIIa	yes	no
NannapaneniN.	2014	F	39	Other	Rivaroxaban	VTE	aPCC	no	no
Novak JE.	2018	M	71	Other	Dabigatran	AF	Idarucizamab	no	yes
Pahs L.	2015	M	62	GI	Rivaroxaban	AF	PCC	yes	no
Pahs L.	2015	M	49	ICH	Rivaroxaban	AF	PCC+FFP	yes	no
Pahs L.	2015	M	87	ICH	Dabigatran	AF	rFVIIa+FFP	yes	no
Pahs L.	2015	M	77	GI	Dabigatran	AF	rFVIIa+FFP	no	yes
Pakraftar S.	2014		64	ICH	Dabigatran	AF/VTE	FFP	yes	no
Pakraftar S.	2014		82	ICH	Dabigatran	AF/VTE	rFVIIa+FFP	yes	no
Pakraftar S.	2014		86	ICH	Dabigatran	AF/VTE	rFVIIa+FFP	yes	no
Pakraftar S.	2014		86	ICH	Dabigatran	AF/VTE	FFP	yes	no
Pakraftar S.	2014		89	ICH	Dabigatran	AF/VTE	FFP	yes	no
Pakraftar S.	2014		94	ICH	Dabigatran	AF/VTE	FFP	yes	no

**Appendix H. Characteristics and endpoints for case report/series (continue)**

Author	Year	Sex	Age	Site of bleeding	NOAC	Indication	Reversal agents	Reversal	Death
Paul S.	2015	F	67	GI	Dabigatran	AF	FFP	yes	no
Plener I.	2014	M	80	GI	Dabigatran	AF	aPCC+FFP	yes	no
Purrucker JC.	2014	F	76	ICH	Rivaroxaban	AF	PCC	no	yes
Quintard H.	2017	M	70	Other	Dabigatran	AF	PCC+Idarucizumab	yes	no
Quintavalla R.	2018	F	82	ICH	Dabigatran	AF	Idarucizumab	yes	no
Riario Sforza GG.	2018	F	87	GI	Dabigatran	AF	Idarucizumab	yes	no
Rinehart DR.	2015	M	76	ICH	Apixaban	AF	aPCC	yes	no
Ross B.	2014			GI	Dabigatran	AF	FFP	yes	no
Ross B.	2014			GI	Dabigatran	AF	FFP	yes	no
Ross B.	2014			ICH	Dabigatran	AF	rFVIIa+FFP	no	yes
Ross B.	2014			GI	Dabigatran	AF	FFP	yes	no
Ross B.	2014			ICH	Dabigatran	AF	FFP	no	yes
Ross B.	2014			ICH	Dabigatran	AF	rFVIIa+FFP	no	yes
Schaeffer S.	2013	F	78	GI	Dabigatran	AF	FFP	no	yes
Schulman S.	2014	M	84	ICH	Dabigatran	AF	aPCC	yes	no
Schulman S.	2014	F	81	ICH	Dabigatran	AF	aPCC	yes	no
Schulman S.	2014	F	83	GI	Dabigatran	AF	aPCC	yes	no
Senger S.	2016		84	ICH	Rivaroxaban	AF	PCC	yes	yes
Senger S.	2016		82	ICH	Dabigatran	AF	PCC	yes	no

**Appendix H. Characteristics and endpoints for case report/series (continue)**

Author	Year	Sex	Age	Site of bleeding	NOAC	Indication	Reversal agents	Reversal	Death
Senger S.	2016		76	ICH	Dabigatran	AF	PCC	no	yes
Senger S.	2016		88	ICH	Rivaroxaban	AF	PCC	yes	no
Senger S.	2016		75	ICH	Rivaroxaban	AF	PCC	yes	yes
Senger S.	2016		73	ICH	Rivaroxaban	AF	PCC	yes	no
Senger S.	2016		79	ICH	Rivaroxaban	AF	PCC+rFVIIa	no	no
Senger S.	2016		80	ICH	Dabigatran	VTE	PCC	yes	no
Senger S.	2016		87	ICH	Dabigatran	AF	PCC	yes	no
Senger S.	2016		85	ICH	Dabigatran	AF/VTE	PCC	yes	no
Senger S.	2016		78	ICH	Dabigatran	AF	PCC	yes	no
Senger S.	2016		85	ICH	Dabigatran	AF	PCC	yes	no
Senger S.	2016		84	ICH	Rivaroxaban	AF	PCC	no	no
Shank CD.	2015			ICH	Apixaban	AF	aPCC	yes	no
Simon A.	2017	M	77	GI	Dabigatran	AF	Idarucizamab	yes	yes
Singh T.	2013	M	86	ICH	Dabigatran	AF	rFVIIa+FFP	yes	no
Singh T.	2013	F	81	ICH	Dabigatran	AF	rFVIIa+FFP	yes	no
Singh T.	2013	M	65	Other	Dabigatran	AF	rFVIIa+FFP	no	yes
Singh T.	2013	F	77	GI	Dabigatran	AF	FFP	yes	no
Song S.	2017	M	84	Other	Dabigatran	AF	Idarucizamab	yes	no
Steele AP.	2018	M	86	GI	Dabigatran	AF	aPCC+FFP	no	yes

**Appendix H. Characteristics and endpoints for case report/series (continue)**

Author	Year	Sex	Age	Site of bleeding	NOAC	Indication	Reversal agents	Reversal	Death
Steele AP.	2018	F	62	GI	Dabigatran	AF	aPCC+FFP	no	yes
Stollberger C.	2012	M	85	Other	Dabigatran	AF	FFP	yes	no
Stollberger C.	2014	F	89	Other	Dabigatran	AF	PCC	yes	no
Thorborg C.	2016	F	79	GI	Dabigatran	AF	Idarucizamab	yes	no
Tsai LK.	2018	M	77	ICH	Dabigatran	AF	Idarucizamab	yes	no
Tsai LK.	2018	M	83	GI	Dabigatran	AF	Idarucizamab	yes	no
Tsai LK.	2018	M	81	ICH	Dabigatran	AF	Idarucizamab	yes	no
Tsai LK.	2018	M	78	ICH	Dabigatran	AF	Idarucizamab	yes	no
Tsai LK.	2018	M	74	ICH	Dabigatran	AF	Idarucizamab	yes	no
Tsai LK.	2018	F	78	ICH	Dabigatran	AF	Idarucizamab	yes	no
Tsai LK.	2018	F	87	ICH	Dabigatran	AF	Idarucizamab	yes	no
Tsai LK.	2018	M	79	ICH	Dabigatran	AF	Idarucizamab	yes	no
Vosko MR.	2017	M	88	ICH	Dabigatran	AF	Idarucizamab	yes	no
Vosko MR.	2017	M	87	ICH	Dabigatran	AF	Idarucizamab	yes	no
Vosko MR.	2017	F	93	Other	Dabigatran	AF	Idarucizamab	yes	no
Vosko MR.	2017	F	44	ICH	Dabigatran	VTE	Idarucizamab	yes	no
Vosko MR.	2017	M	83	Other	Dabigatran	AF	Idarucizamab	yes	no
Warkentin TE.	2012	M	79	Other	Dabigatran	AF	rFVIIa	yes	no
Wyckowski MK.	2012	F	66	Other	Dabigatran	AF	PCC	yes	no

**Appendix H. Characteristics and endpoints for case report/series (continue)**

Author	Year	Sex	Age	Site of bleeding	NOAC	Indication	Reversal agents	Reversal	Death
Yoshimura S.	2017	M	66	ICH	Rivaroxaban	AF	PCC	yes	no
Yoshimura S.	2017	F	82	Other	Apixaban	AF	PCC	yes	no
Yoshimura S.	2017	M	72	GI	Rivaroxaban	AF	PCC	no	no
Yoshimura S.	2017	F	87	ICH	Rivaroxaban	AF	PCC	yes	no
Yoshimura S.	2017	M	76	ICH	Rivaroxaban	AF	PCC	yes	no
Yoshimura S.	2017	F	80	ICH	Dabigatran	AF	PCC	yes	no
Yoshimura S.	2017	M	76	ICH	Rivaroxaban	AF	PCC	no	no
Yoshimura S.	2017	M	65	Other	Rivaroxaban	AF	PCC	no	no
Yoshimura S.	2017	F	67	Other	Apixaban	AF	PCC	no	no

