American College of Radiology
ACR Appropriateness Criteria®

Cerebrovascular Diseases-Aneurysm, Vascular Malformation, and Subarachnoid Hemorrhage

Variant 1: Known acute subarachnoid hemorrhage (SAH) on CT. Next imaging study.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
CTA head with IV contrast	Usually appropriate	Strong	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	9	9	1	0	1	0	0	1	0	5	10

References	Study Quality
4 (20935079)	M
13 (20729022)	2
15 (18065510)	2
20 (19942709)	3
19 (28201559)	2
18 (27060510)	2
10 (23142024)	2
17 (21839961)	1
16 (21990653)	2
14 (25194636)	Good

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
Arteriography cervicocerebral	Usually appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	8	8	0	0	0	0	2	3	4	5	4

References	Study Quality
12 (27659193)	4
11 (26338924)	4
10 (23142024)	2

Procedure	Appropriateness	Strength	Adult RRL	Pediatric RRL										
MRA head without IV contrast	May be appropriate	Strong	O 0 mSv	O 0 mSv [ped]	5	5	0	0	0	3	13	2	1	0	0

References	Study Quality
21 (24326447)	Good
22 (24495263)	2
23 (21529794)	2

Procedure	Appropriateness	Strength	Adult RRL	Pediatric RRL										
MRI head without IV contrast	Usually not appropriate	Limited	O 0 mSv	O 0 mSv [ped]	3	3	7	0	4	2	3	2	0	0	0

References	Study Quality
25 (21174171)	4
24 (20051974)	2

Procedure	Appropriateness	Strength	Adult RRL	Pediatric RRL										
CTA neck with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	1	1	10	3	3	0	2	1	0	0	0
CT head with IV contrast	Usually not appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	1	1	15	1	2	0	0	0	0	0	0

References	Study Quality
1 (31685104)	4

Procedure	Appropriateness	Strength	Adult RRL	Pediatric RRL										
CT head without IV contrast	Usually not appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	1	1	18	1	0	0	0	0	0	0	0

References	Study Quality
1 (31685104)	4

Procedure	Appropriateness	Strength	Adult RRL	Pediatric RRL										
CT head without and with IV contrast	Usually not appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	14	3	1	0	0	0	0	0	0

References	Study Quality
1 (31685104)	4

Procedure	Appropriateness	Strength	Adult RRL	Pediatric RRL										
CT head perfusion with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv		1	1	12	3	2	1	0	0	0	0	0
MRA head without and with IV contrast	Usually not appropriate	Strong	O 0 mSv	O 0 mSv [ped]	1	1	16	1	1	1	0	0	0	0	0

References		**Study Quality**													
21 (24326447)		Good													
22 (24495263)		2													
23 (21529794)		2													

Procedure	Appropriateness	Strength	Adult RRL	Pediatric RRL										
MRA neck without IV contrast	Usually not appropriate	Expert Consensus	☢ 0 mSv	☢ 0 mSv [ped]	1	1	18	0	1	0	0	0	0	0	0
MRA neck without and with IV contrast	Usually not appropriate	Expert Consensus	☢ 0 mSv	☢ 0 mSv [ped]	1	1	15	1	0	0	0	2	0	0	0
MRI head without and with IV contrast	Usually not appropriate	Limited	☢ 0 mSv	☢ 0 mSv [ped]	1	1	13	1	2	2	0	0	0	0	0

References		**Study Quality**													
25 (21174171)		4													
24 (20051974)		2													

Procedure	Appropriateness	Strength	Adult RRL	Pediatric RRL										
MRI head perfusion with IV contrast	Usually not appropriate	Expert Consensus	☢ 0 mSv	☢ 0 mSv [ped]	1	1	15	0	1	2	0	0	0	0	0
US duplex Doppler carotid artery	Usually not appropriate	Expert Consensus	☢ 0 mSv	☢ 0 mSv [ped]	1	1	16	1	0	1	0	0	0	0	0
US duplex Doppler transcranial	Usually not appropriate	Expert Consensus	☢ 0 mSv	☢ 0 mSv [ped]	1	1	16	1	0	1	0	0	0	0	0
MRV head without IV contrast	Usually not appropriate	Expert Consensus	☢ 0 mSv	☢ 0 mSv [ped]	1	1	15	2	1	0	0	0	0	0	0
CTV head with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	12	2	2	2	0	0	0	0	0
MRV head without and with IV contrast	Usually not appropriate	Expert Consensus	☢ 0 mSv	☢ 0 mSv [ped]	1	1	15	2	1	0	0	0	0	0	0
MRA head with IV contrast	Usually not appropriate	Strong	☢ 0 mSv	☢ 0 mSv [ped]	1	1	12	5	1	1	0	0	0	0	0

References		**Study Quality**													
21 (24326447)		Good													
22 (24495263)		2													

								1	2	3	4	5	6	7	8	9
			23 (21529794)			2										
MRA neck with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1		14	1	0	0	2	1	0	0	0
MRV head with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1		15	2	1	0	0	0	0	0	0
MRI head with IV contrast	Usually not appropriate	Limited	O 0 mSv	O 0 mSv [ped]	1	1		13	1	3	1	0	0	0	0	0

References	Study Quality
25 (21174171)	4
24 (20051974)	2

Variant 2:   Suspected cerebral vasospasm. Initial imaging.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
CTA head with IV contrast	Usually appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	8	8	0	0	0	0	0	1	6	4	7

References	Study Quality
33 (20884748)	M
36 (18080806)	4

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	1	2	3	4	5	6	7	8	9
Arteriography cervicocerebral	Usually appropriate	Moderate	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	8	8	0	0	0	0	3	0	5	5	5

References	Study Quality
28 (25468878)	4
6 (22556195)	4
31 (21350201)	1

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	1	2	3	4	5	6	7	8	9
US duplex Doppler transcranial	May be appropriate	Strong	O 0 mSv	O 0 mSv [ped]	6	6	0	0	0	1	5	5	7	0	1

References	Study Quality

Procedure	Appropriateness	Evidence	Adult RRL	Pediatric RRL			1	2	3	4	5	6	7	8	9
		40 (26495942)		Good												
		41 (21633870)		2												
CT head without IV contrast	May be appropriate	Moderate	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	5	5	1	0	0	3	13	0	1	0	1
		References		Study Quality												
		35 (28365434)		Good												
CT head perfusion with IV contrast	May be appropriate	Strong	☢☢☢ 1-10 mSv		5	5	1	0	0	2	9	7	0	0	0
		References		Study Quality												
		33 (20884748)		M												
		32 (29058091)		2												
		28 (25468878)		4												
		29 (23982597)		2												
		26 (21748499)		4												
		34 (24200901)		4												
MRI head without IV contrast	May be appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	4	4	6	1	1	5	4	2	0	0	0
MRI head perfusion with IV contrast	May be appropriate	Limited	O 0 mSv	O 0 mSv [ped]	4	4	5	4	0	9	1	0	0	0	0
		References		Study Quality												
		38 (29439196)		4												
		39 (29611451)		2												
CTA neck with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	1	1	17	1	0	0	0	0	0	1	0
CT head with IV contrast	Usually not appropriate	Moderate	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	1	1	13	2	1	2	0	0	0	0	0
		References		Study Quality												
		35 (28365434)		Good												

Procedure	Appropriateness	Study Quality	Adult RRL	Pediatric RRL										
CT head without and with IV contrast	Usually not appropriate	Moderate	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	14	3	1	0	0	0	0	0	0

	References	Study Quality
	35 (28365434)	Good

Procedure	Appropriateness	Study Quality	Adult RRL	Pediatric RRL										
MRA head without IV contrast	Usually not appropriate	Limited	O 0 mSv	O 0 mSv [ped]	1	1	16	1	0	0	2	0	0	0	0

	References	Study Quality
	37 (20532584)	2

Procedure	Appropriateness	Study Quality	Adult RRL	Pediatric RRL										
MRA head without and with IV contrast	Usually not appropriate	Limited	O 0 mSv	O 0 mSv [ped]	1	1	18	1	0	0	0	0	0	0	0

	References	Study Quality
	37 (20532584)	2

Procedure	Appropriateness	Study Quality	Adult RRL	Pediatric RRL										
MRA neck without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	0	0	1	0	1	0	1	0
MRA neck without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	0	0	1	0	1	0	1	0
MRI head without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	14	2	1	1	0	0	0	0	0
US duplex Doppler carotid artery	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	14	1	1	0	1	1	0	0	0
MRV head without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	1	1	0	1	0	0	0	0
CTV head with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	15	1	0	1	0	1	0	0	0
MRV head without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	16	1	0	0	1	0	0	0	0
MRA head with IV contrast	Usually not appropriate	Limited	O 0 mSv	O 0 mSv [ped]	1	1	13	2	0	1	0	0	0	2	0

	References	Study Quality

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median									
										37 (20532584)				2	
MRA neck with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	0	0	0	1	1	1	0	0
MRV head with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	1	1	0	1	0	0	0	0
MRI head with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	14	1	3	0	0	0	0	0	0

Variant 3:   Known cerebral aneurysm; untreated. Surveillance monitoring.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
CTA head with IV contrast	Usually appropriate	Strong	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	9	9	0	0	0	0	0	2	2	4	10

References	Study Quality
4 (20935079)	M
13 (20729022)	2
15 (18065510)	2
19 (28201559)	2
18 (27060510)	2
10 (23142024)	2
17 (21839961)	1
16 (21990653)	2
14 (25194636)	Good

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median									
MRA head without IV contrast	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	9	9	0	0	0	0	0	1	1	6	10

References	Study Quality
21 (24326447)	Good
45 (25463352)	1
22 (24495263)	2

Procedure	Appropriateness	Evidence	Adult RRL	Pediatric RRL											
				23 (21529794)			2								
Arteriography cervicocerebral	May be appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	5	5	1	0	0	1	8	5	3	1	0
MRA head with IV contrast	May be appropriate (Disagreement)	Expert Opinion	O 0 mSv	O 0 mSv [ped]	5	5	5	2	1	2	3	2	2	2	0

References	Study Quality
21 (24326447)	Good
45 (25463352)	1
22 (24495263)	2
23 (21529794)	2

Procedure	Appropriateness	Evidence	Adult RRL	Pediatric RRL											
MRA head without and with IV contrast	May be appropriate	Strong	O 0 mSv	O 0 mSv [ped]	4	4	4	1	2	5	6	1	0	0	0

References	Study Quality
21 (24326447)	Good
45 (25463352)	1
22 (24495263)	2
23 (21529794)	2

Procedure	Appropriateness	Evidence	Adult RRL	Pediatric RRL											
CTA neck with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	1	1	14	1	1	0	1	1	0	0	0
CT head with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	1	1	15	3	0	0	0	0	0	0	0
CT head without IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	1	1	15	2	0	1	0	0	0	0	0
CT head without and with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	15	3	0	0	0	0	0	0	0
CT head perfusion with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv		1	1	15	2	1	0	0	0	0	0	0

Procedure	Appropriateness	Rating Basis	Adult RRL	Pediatric RRL										
MRA neck without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	14	1	2	0	1	0	0	0	0
MRA neck without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	0	2	1	0	0	0	0	0
MRI head without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	16	0	1	0	0	1	0	0	0
MRI head without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	2	1	0	0	0	0	0	0
MRI head perfusion with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	14	1	3	0	0	0	0	0	0
US duplex Doppler carotid artery	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	17	0	1	0	0	0	0	0	0
US duplex Doppler transcranial	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	16	1	1	0	0	0	0	0	0
MRV head without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	17	0	1	0	0	0	0	0	0
CTV head with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	15	1	2	0	0	0	0	0	0
MRV head without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	17	0	1	0	0	0	0	0	0
MRA neck with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	0	2	0	1	0	0	0	0
MRV head with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	17	0	1	0	0	0	0	0	0
MRI head with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	14	2	2	0	0	0	0	0	0

Variant 4:   Known cerebral aneurysm; previously treated. Surveillance monitoring.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
Arteriography cervicocerebral	Usually appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	8	8	0	0	0	0	2	2	3	5	6
MRA head without IV contrast	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	8	8	1	0	0	0	0	3	4	5	5

References	Study Quality
58 (24008171)	M
60 (25352582)	3
62 (29440326)	3
63 (27102311)	1
61 (25999378)	2
59 (23012464)	2

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	1	2	3	4	5	6	7	8	9
CTA head with IV contrast	Usually appropriate	Strong	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	7	7	0	0	0	0	4	1	5	4	4

References	Study Quality
55 (30143820)	1
57 (30219936)	2
53 (28580532)	2
54 (26329465)	2
56 (21125478)	2

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	1	2	3	4	5	6	7	8	9
MRA head without and with IV contrast	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	0	4	0	6	5	4

References	Study Quality
58 (24008171)	M
60 (25352582)	3
62 (29440326)	3
63 (27102311)	1
61 (25999378)	2
59 (23012464)	2

Procedure	Appropriateness	Rating Type	Adult Radiation	Pediatric Radiation											
MRA head with IV contrast	May be appropriate (Disagreement)	Expert Opinion	O 0 mSv	O 0 mSv [ped]	5	5	2	2	2	1	4	1	2	5	0

References	Study Quality
58 (24008171)	M
60 (25352582)	3
62 (29440326)	3
63 (27102311)	1
61 (25999378)	2
59 (23012464)	2

Procedure	Appropriateness	Rating Type	Adult Radiation	Pediatric Radiation											
CTA neck with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	1	1	15	1	0	1	0	1	0	0	0
CT head with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	1	1	17	0	1	0	0	0	0	0	0
CT head without IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	1	1	16	0	1	0	1	0	0	0	0
CT head without and with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	17	0	1	0	0	0	0	0	0
CT head perfusion with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv		1	1	15	1	1	0	1	0	0	0	0
MRA neck without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	1	0	2	0	0	0	0	0
MRA neck without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	1	0	2	0	0	0	0	0
MRI head without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	1	0	1	1	0	0	0	0
MRI head without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	0	0	2	0	0	0	1	0

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	1	2	3	4	5	6	7	8	9
MRI head perfusion with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	1	1	0	1	0	0	0	0
US duplex Doppler carotid artery	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	18	0	0	0	0	0	0	0	0
US duplex Doppler transcranial	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	17	0	0	1	0	0	0	0	0
MRV head without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	18	0	0	0	0	0	0	0	0
CTV head with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	16	1	0	1	0	0	0	0	0
MRV head without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	18	0	0	0	0	0	0	0	0
MRA neck with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	1	0	2	0	0	0	0	0
MRV head with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	18	0	0	0	0	0	0	0	0
MRI head with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	1	0	1	0	0	0	1	0

Variant 5:   High-risk cerebral aneurysm screening.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
MRA head without IV contrast	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	9	9	1	0	0	0	0	0	1	5	11

References	Study Quality
21 (24326447)	Good
22 (24495263)	2
23 (21529794)	2

Procedure	Appropriateness	Rec. Strength	Adult RRL	Pediatric RRL			1	2	3	4	5	6	7	8	9
CTA head with IV contrast	Usually appropriate	Strong	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	8	8	0	0	0	0	1	2	6	4	5

References	Study Quality
4 (20935079)	M
13 (20729022)	2
15 (18065510)	2
19 (28201559)	2
18 (27060510)	2
10 (23142024)	2
17 (21839961)	1
16 (21990653)	2
14 (25194636)	Good

Procedure	Appropriateness	Rec. Strength	Adult RRL	Pediatric RRL			1	2	3	4	5	6	7	8	9
CTA neck with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	1	1	14	1	0	0	1	1	0	1	0
CT head with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	1	1	16	0	1	0	0	1	0	0	0
CT head without IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	1	1	16	0	1	0	1	0	0	0	0
CT head without and with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	18	0	0	0	0	0	0	0	0
CT head perfusion with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv		1	1	17	0	1	0	0	0	0	0	0
Arteriography cervicocerebral	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	14	0	5	0	0	0	0	0	0
MRA head without and with IV contrast	Usually not appropriate	Strong	O 0 mSv	O 0 mSv [ped]	1	1	10	2	2	1	2	0	0	0	1

References	Study Quality
21 (24326447)	Good

22 (24495263)		2												
23 (21529794)		2												

Procedure	Appropriateness	Evidence	RRL Adult	RRL Ped												
MRA neck without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	0	0	1	1	0	1	0	0
MRA neck without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	0	0	1	1	0	1	0	0
MRI head without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	1	1	0	1	0	0	0	0
MRI head without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	16	0	2	0	0	0	0	0	0
MRI head perfusion with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	18	0	0	0	0	0	0	0	0
US duplex Doppler carotid artery	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	17	0	1	0	0	0	0	0	0
US duplex Doppler transcranial	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	17	0	0	1	0	0	0	0	0
MRV head without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	17	0	1	0	0	0	0	0	0
CTV head with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	18	0	0	0	0	0	0	0	0
MRV head without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	17	0	1	0	0	0	0	0	0
MRA head with IV contrast	Usually not appropriate	Strong	O 0 mSv	O 0 mSv [ped]	1	1	15	4	0	0	0	0	0	0	0

References	Study Quality
21 (24326447)	Good
22 (24495263)	2
23 (21529794)	2

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	1	2	3	4	5	6	7	8	9
MRA neck with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	0	0	1	1	0	0	1	0
MRV head with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	17	0	1	0	0	0	0	0	0
MRI head with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	1	2	0	0	0	0	0	0

Variant 6:   Known high-flow vascular malformation (AVM/AVF). Surveillance monitoring.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
CTA head with IV contrast	Usually appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	8	8	1	0	1	0	0	2	1	6	7

References	Study Quality
87 (21402614)	2
86 (22705129)	4

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	1	2	3	4	5	6	7	8	9
Arteriography cervicocerebral	Usually appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	8	8	1	0	0	0	1	2	1	5	8

References	Study Quality
84 (28746939)	4
85 (23615081)	2

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	1	2	3	4	5	6	7	8	9
MRA head without IV contrast	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	8	8	0	0	0	0	1	0	3	10	5

References	Study Quality
95 (24029646)	1
97 (19833802)	2
88 (24904052)	3
96 (24475797)	2
94 (29188304)	4

References	Study Quality
93 (25994036)	2
91 (24475838)	1
89 (22300925)	2
92 (22095967)	1
90 (19467814)	3

MRA head without and with IV contrast	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	0	2	0	9	6	2

References	Study Quality
95 (24029646)	1
97 (19833802)	2
88 (24904052)	3
96 (24475797)	2
94 (29188304)	4
93 (25994036)	2
91 (24475838)	1
89 (22300925)	2
92 (22095967)	1
90 (19467814)	3

MRA head with IV contrast	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	7	7	1	0	0	0	4	3	7	3	1

References	Study Quality
95 (24029646)	1
97 (19833802)	2
88 (24904052)	3
96 (24475797)	2
94 (29188304)	4
93 (25994036)	2
91 (24475838)	1
89 (22300925)	2
92 (22095967)	1
90 (19467814)	3

Procedure	Appropriateness	Evidence	Adult RRL	Ped RRL											
MRI head without IV contrast	May be appropriate	Limited	O 0 mSv	O 0 mSv [ped]	5	5	0	0	1	2	11	3	0	0	2

References	Study Quality
83 (22107856)	4
86 (22705129)	4

Procedure	Appropriateness	Evidence	Adult RRL	Ped RRL											
MRI head without and with IV contrast	May be appropriate	Limited	O 0 mSv	O 0 mSv [ped]	5	5	0	0	0	2	12	3	2	0	0

References	Study Quality
83 (22107856)	4
86 (22705129)	4

Procedure	Appropriateness	Evidence	Adult RRL	Ped RRL											
MRI head perfusion with IV contrast	Usually not appropriate	Limited	O 0 mSv	O 0 mSv [ped]	3	3	7	2	3	3	2	2	0	0	0

References	Study Quality
83 (22107856)	4
98 (22791027)	3

Procedure	Appropriateness	Evidence	Adult RRL	Ped RRL											
CTA neck with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	1	1	18	1	0	0	0	0	0	0	0
CT head with IV contrast	Usually not appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	1	1	13	1	2	1	0	0	1	0	0

References	Study Quality
83 (22107856)	4
85 (23615081)	2

Procedure	Appropriateness	Evidence	Adult RRL	Ped RRL											
CT head without IV contrast	Usually not appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	1	1	11	0	1	2	2	2	0	0	0

References	Study Quality
83 (22107856)	4
85 (23615081)	2

Procedure	Appropriateness	Evidence	Adult RRL	Ped RRL											
CT head without and with IV contrast	Usually not appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	14	0	1	1	1	0	1	0	0

Procedure	Appropriateness	Evidence	Adult RRL	Pediatric RRL										
CT head perfusion with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv		1	1	16	0	0	0	0	1	1	0	0
MRA neck without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	18	1	0	0	0	0	0	0	0
MRA neck without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	18	1	0	0	0	0	0	0	0
US duplex Doppler carotid artery	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	16	0	2	0	0	0	0	0	0
US duplex Doppler transcranial	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	1	1	0	0	1	0	0	0
MRV head without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	16	0	0	0	0	1	1	0	0
CTV head with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	19	0	0	0	0	0	0	0	0
MRV head without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	17	1	1	0	0	0	0	0	0
MRA neck with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	17	2	0	0	0	0	0	0	0
MRV head with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	18	1	0	0	0	0	0	0	0
MRI head with IV contrast	Usually not appropriate	Limited	O 0 mSv	O 0 mSv [ped]	1	1	14	4	0	0	0	0	1	0	0

Variant 7:   Suspected central nervous system (CNS) vasculitis. Initial imaging.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
MRA head without IV contrast	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	8	8	0	0	0	0	7	1	0	9	2

References	Study Quality
99 (24491822)	4

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
MRI head without IV contrast	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	8	8	1	0	0	1	1	1	3	6	5

References	Study Quality
99 (24491822)	4
101 (17924545)	4
109 (19221296)	4
107 (29030476)	4
108 (24722305)	4
105 (25907920)	4

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
MRI head without and with IV contrast	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	8	8	0	0	0	0	2	0	1	10	6

References	Study Quality
99 (24491822)	4
101 (17924545)	4
109 (19221296)	4
107 (29030476)	4
108 (24722305)	4
105 (25907920)	4

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
CTA head with IV contrast	May be appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	6	6	0	0	0	0	6	4	7	0	2

References	Study Quality

		99 (24491822)			4									
Arteriography cervicocerebral	May be appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	6	6	0	0	0	1	7	3	7	0	1

References	Study Quality
99 (24491822)	4
107 (29030476)	4

CTA neck with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	1	1	16	2	1	0	0	0	0	0	0
CT head with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	1	1	17	0	0	0	0	0	1	0	0
CT head without IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	1	1	14	0	1	0	1	1	0	0	1
CT head without and with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	16	0	0	1	0	0	1	0	0
CT head perfusion with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv		1	1	17	0	0	0	0	1	0	0	0
MRA head without and with IV contrast	Usually not appropriate	Limited	O 0 mSv	O 0 mSv [ped]	1	1	12	1	5	1	0	0	0	0	0

References	Study Quality
99 (24491822)	4

MRA neck without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	16	3	0	0	0	0	0	0	0
MRA neck without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	17	2	0	0	0	0	0	0	0
MRI head perfusion with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	16	0	0	0	1	1	0	0	0
US duplex Doppler carotid artery	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	16	0	0	0	0	1	1	0	0

Procedure	Appropriateness	Evidence	Adult RRL	Pediatric RRL											
US duplex Doppler transcranial	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	16	0	0	1	1	0	0	0	0
MRV head without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	17	0	1	0	0	0	0	0	0
CTV head with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	15	1	1	1	0	0	0	0	0
MRV head without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	16	0	1	0	1	0	0	0	0
MRA head with IV contrast	Usually not appropriate	Limited	O 0 mSv	O 0 mSv [ped]	1	1	12	1	1	2	3	0	0	0	0

References	Study Quality
99 (24491822)	4

Procedure	Appropriateness	Evidence	Adult RRL	Pediatric RRL											
MRA neck with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	18	1	0	0	0	0	0	0	0
MRV head with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	17	0	1	0	0	0	0	0	0
MRI head with IV contrast	Usually not appropriate	Limited	O 0 mSv	O 0 mSv [ped]	1	1	11	6	1	0	0	0	1	0	0

References	Study Quality
99 (24491822)	4
101 (17924545)	4
109 (19221296)	4
107 (29030476)	4
108 (24722305)	4
105 (25907920)	4

Appendix Key

A more complete discussion of the items presented below can be found by accessing the supporting documents at the designated hyperlinks.

Appropriateness Category: The panel's recommendation for a procedure based on the assessment of the risks and benefits of performing the procedure for the specified clinical scenario.

SOE: Strength of Evidence. The assessment of the amount and quality of evidence found in the peer reviewed medical literature for an appropriateness recommendation.

- **References:** The citation number and PMID for the reference(s) associated with the recommendation.
- **Study Quality**: The assessment of the quality of an individual reference based on the number of study quality elements described in the reference.

RRL: Relative Radiation Level. A population based assessment of the amount of radiation a typical patient may be exposed to during the specified procedure.

Rating: The final rating (1-9 scale) for the procedure as determined by the panel during rating rounds.

Median: The median rating (1-9 scale) for the procedure as determined by the panel during rating rounds.

Final tabulations: A histogram showing the number of panel members who rated the procedure as noted in the column heading (ie, 1, 2, 3, etc.).

Additional supporting documents about the AC methodology and processes can be found at **www.acr.org/ac.**