American College of Radiology
ACR Appropriateness Criteria®

Workup of Noncerebral Systemic Arterial Embolic Source

Variant 1: Known upper extremity arterial occlusion. Suspected embolic etiology. Next imaging study to determine source.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
CT heart function and morphology with IV contrast	Usually appropriate	Strong	☢☢☢☢ 10-30 mSv	☢☢☢☢ 3-10 mSv [ped]	8	8	0	0	0	0	0	0	4	13	0

References	Study Quality
38 (19179202)	2
36 (29555833)	2
33 (29330651)	3
23 (29218612)	2
32 (25751618)	2
22 (20809409)	2
19 (21757676)	1
20 (22495682)	1
31 (23821020)	2
26 (26341605)	4
24 (28740038)	2
21 (27601228)	2
34 (29374188)	2
25 (30801566)	1
37 (31738598)	4
28 (23406625)	Good
30 (26178177)	Good

18 (19366905)	1															
29 (29961869)	Good															
39 (10992020)	4															
40 (25018846)	4															
35 (22342878)	4															
27 (19356536)	1															
US echocardiography transthoracic resting	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	8	8	0	0	0	0	1	0	2	11	3	
References	Study Quality															
49 (26476503)	1															
2 (25747606)	3															
52 (27256218)	4															
46 (16824834)	3															
53 (16946152)	3															
54 (1987242)	1															
CTA chest with IV contrast	Usually appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	7	7	0	0	0	0	1	1	10	5	0	
References	Study Quality															
12 (29150083)	2															
41 (10966185)	4															
13 (21529769)	4															
MRA chest without and with IV contrast	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	7	7	0	0	1	0	1	3	9	3	0	
References	Study Quality															
43 (20013276)	3															
44 (17285264)	2															
MRI heart function and morphology without IV contrast	Usually appropriate	Moderate	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	0	1	4	10	2	0	
References	Study Quality															
49 (26476503)	1															

		45 (29374292)		Good												
MRI heart function and morphology without and with IV contrast	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	0	1	0	11	5	0	
		References		Study Quality												
		45 (29374292)		Good												
		37 (31738598)		4												
		29 (29961869)		Good												
		39 (10992020)		4												
		47 (17313647)		4												
		46 (16824834)		3												
		48 (23793590)		4												
US echocardiography transesophageal	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	0	0	3	12	2	0	
		References		Study Quality												
		2 (25747606)		3												
		31 (23821020)		2												
		4 (24523417)		3												
		50 (31236074)		3												
		51 (23186295)		4												
		13 (21529769)		4												
		10 (19995630)		4												
		46 (16824834)		3												
MRA chest without IV contrast	May be appropriate	Limited	O 0 mSv	O 0 mSv [ped]	6	6	0	0	1	0	4	7	4	1	0	
		References		Study Quality												
		43 (20013276)		3												
		44 (17285264)		2												
Aortography chest	Usually not appropriate	Limited	☢☢☢ 1-10 mSv		3	3	2	5	10	0	0	0	0	0	0	
		References		Study Quality												

16 (19251175)	4
17 (22723539)	4
11 (21145267)	4

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
US duplex Doppler abdomen	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	11	4	0	1	1	0	0	0	0

Variant 2: Known arterial occlusion in the mesenteric or renal arterial system or renal infarcts. Suspected embolic etiology. Next imaging study to determine source.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
US echocardiography transthoracic resting	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	8	8	0	0	0	1	0	0	4	10	2

References	Study Quality
49 (26476503)	1
2 (25747606)	3
52 (27256218)	4
46 (16824834)	3
53 (16946152)	3
54 (1987242)	1

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
CTA chest with IV contrast	Usually appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	7	7	0	0	0	0	0	3	13	0	0

References	Study Quality
12 (29150083)	2
41 (10966185)	4
13 (21529769)	4

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
CTA chest and abdomen with IV contrast	Usually appropriate	Limited	☢☢☢☢ 10-30 mSv		7	7	2	0	0	0	0	0	8	7	0

References	Study Quality
56 (21482138)	4
57 (19770313)	4

References	Study Quality
12 (29150083)	2
41 (10966185)	4
13 (21529769)	4

CT heart function and morphology with IV contrast	Usually appropriate	Strong	☢☢☢☢ 10-30 mSv	☢☢☢☢ 3-10 mSv [ped]	7	7	0	0	0	0	0	0	10	7	0

References	Study Quality
38 (19179202)	2
36 (29555833)	2
33 (29330651)	3
23 (29218612)	2
32 (25751618)	2
22 (20809409)	2
19 (21757676)	1
20 (22495682)	1
31 (23821020)	2
26 (26341605)	4
24 (28740038)	2
21 (27601228)	2
34 (29374188)	2
25 (30801566)	1
37 (31738598)	4
28 (23406625)	Good
30 (26178177)	Good
18 (19366905)	1
29 (29961869)	Good
39 (10992020)	4
40 (25018846)	4
35 (22342878)	4
27 (19356536)	1

MRA chest and abdomen without and with IV contrast	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	0	0	1	12	4	0

References	Study Quality
56 (21482138)	4
58 (24935911)	2
43 (20013276)	3
57 (19770313)	4
44 (17285264)	2

MRI heart function and morphology without IV contrast	Usually appropriate	Moderate	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	0	1	6	8	2	0

References	Study Quality
49 (26476503)	1
45 (29374292)	Good

MRI heart function and morphology without and with IV contrast	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	0	0	1	11	5	0

References	Study Quality
45 (29374292)	Good
37 (31738598)	4
29 (29961869)	Good
39 (10992020)	4
47 (17313647)	4
46 (16824834)	3
48 (23793590)	4

US echocardiography transesophageal	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	0	0	3	12	2	0

References	Study Quality
2 (25747606)	3
31 (23821020)	2
4 (24523417)	3
50 (31236074)	3
51 (23186295)	4
13 (21529769)	4
10 (19995630)	4

		46 (16824834)			3											
MRA chest without IV contrast	May be appropriate	Limited	O 0 mSv	O 0 mSv [ped]	6	6	0	0	0	1	5	5	5	0	0
		References			Study Quality											
		43 (20013276)			3											
		44 (17285264)			2											
MRA chest without and with IV contrast	May be appropriate	Limited	O 0 mSv	O 0 mSv [ped]	6	6	0	0	0	0	2	7	7	0	0
		References			Study Quality											
		43 (20013276)			3											
		44 (17285264)			2											
MRA chest and abdomen without IV contrast	May be appropriate	Strong	O 0 mSv	O 0 mSv [ped]	6	6	0	0	0	1	1	11	3	1	0
		References			Study Quality											
		56 (21482138)			4											
		58 (24935911)			2											
		43 (20013276)			3											
		57 (19770313)			4											
		44 (17285264)			2											
US duplex Doppler abdomen	May be appropriate	Limited	O 0 mSv	O 0 mSv [ped]	4	4	2	1	2	7	4	0	1	0	0
		References			Study Quality											
		56 (21482138)			4											
Aortography chest and abdomen	Usually not appropriate	Limited	☢☢☢☢ 10-30 mSv		3	3	1	4	9	2	1	0	0	0	0
		References			Study Quality											
		16 (19251175)			4											
		17 (22723539)			4											
		11 (21145267)			4											

Variant 3: Known lower extremity arterial occlusion. Suspected embolic etiology. Next imaging study to determine source.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
CTA chest abdomen pelvis with IV contrast	Usually appropriate	Limited	☢☢☢☢☢ 30-100 mSv	☢☢☢☢☢ 10-30 mSv [ped]	8	8	0	0	0	0	0	0	6	9	2

References	Study Quality
56 (21482138)	4
57 (19770313)	4
12 (29150083)	2
41 (10966185)	4
13 (21529769)	4

MRI heart function and morphology without and with IV contrast	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	8	8	0	0	0	0	0	0	4	12	1

References	Study Quality
45 (29374292)	Good
37 (31738598)	4
29 (29961869)	Good
39 (10992020)	4
47 (17313647)	4
46 (16824834)	3
48 (23793590)	4

US echocardiography transthoracic resting	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	8	8	0	0	0	0	1	0	3	11	2

References	Study Quality
49 (26476503)	1
2 (25747606)	3
52 (27256218)	4

References	Study Quality
46 (16824834)	3
53 (16946152)	3
54 (1987242)	1

CTA chest with IV contrast	Usually appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	7	7	0	0	0	0	0	2	14	0	0

References	Study Quality
12 (29150083)	2
41 (10966185)	4
13 (21529769)	4

CT heart function and morphology with IV contrast	Usually appropriate	Strong	☢☢☢☢ 10-30 mSv	☢☢☢☢ 3-10 mSv [ped]	7	7	0	0	0	0	0	0	10	5	2

References	Study Quality
38 (19179202)	2
36 (29555833)	2
33 (29330651)	3
23 (29218612)	2
32 (25751618)	2
22 (20809409)	2
19 (21757676)	1
20 (22495682)	1
31 (23821020)	2
26 (26341605)	4
24 (28740038)	2
21 (27601228)	2
34 (29374188)	2
25 (30801566)	1
37 (31738598)	4
28 (23406625)	Good
30 (26178177)	Good
18 (19366905)	1

References	Study Quality
29 (29961869)	Good
39 (10992020)	4
40 (25018846)	4
35 (22342878)	4
27 (19356536)	1

MRA chest without and with IV contrast	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	0	0	5	11	0	0

References	Study Quality
43 (20013276)	3
44 (17285264)	2

MRA chest abdomen pelvis without and with IV contrast	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	0	0	2	12	3	0

References	Study Quality
56 (21482138)	4
58 (24935911)	2
43 (20013276)	3
57 (19770313)	4
44 (17285264)	2

MRI heart function and morphology without IV contrast	Usually appropriate	Moderate	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	0	0	3	11	3	0

References	Study Quality
49 (26476503)	1
45 (29374292)	Good

US echocardiography transesophageal	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	7	7	0	0	1	0	0	3	11	2	0

References	Study Quality
2 (25747606)	3
31 (23821020)	2
4 (24523417)	3
50 (31236074)	3
51 (23186295)	4

		13 (21529769)		4												
		10 (19995630)		4												
		46 (16824834)		3												
MRA chest without IV contrast	May be appropriate	Limited	O 0 mSv	O 0 mSv [ped]	6	6	0	0	0	1	6	4	5	0	0
		References		Study Quality												
		43 (20013276)		3												
		44 (17285264)		2												
MRA chest abdomen pelvis without IV contrast	May be appropriate	Strong	O 0 mSv	O 0 mSv [ped]	6	6	0	0	0	0	2	10	4	1	0
		References		Study Quality												
		56 (21482138)		4												
		58 (24935911)		2												
		43 (20013276)		3												
		57 (19770313)		4												
		44 (17285264)		2												
Aortography chest abdomen pelvis	Usually not appropriate	Limited	☢☢☢☢ 10-30 mSv		3	3	3	4	6	3	1	0	0	0	0
		References		Study Quality												
		16 (19251175)		4												
		17 (22723539)		4												
		11 (21145267)		4												
US duplex Doppler abdomen	Usually not appropriate	Limited	O 0 mSv	O 0 mSv [ped]	3	3	3	2	4	2	4	2	0	0	0
		References		Study Quality												
		56 (21482138)		4												

Variant 4: Known multiorgan system arterial occlusions. Suspected embolic etiology. Next imaging study to determine source.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
CT heart function and morphology with IV contrast	Usually appropriate	Strong	☢☢☢☢ 10-30 mSv	☢☢☢☢ 3-10 mSv [ped]	8	8	0	0	0	0	0	0	3	11	3

References	Study Quality
38 (19179202)	2
36 (29555833)	2
33 (29330651)	3
23 (29218612)	2
32 (25751618)	2
22 (20809409)	2
19 (21757676)	1
20 (22495682)	1
31 (23821020)	2
26 (26341605)	4
24 (28740038)	2
21 (27601228)	2
34 (29374188)	2
25 (30801566)	1
37 (31738598)	4
28 (23406625)	Good
30 (26178177)	Good
18 (19366905)	1
29 (29961869)	Good
39 (10992020)	4
40 (25018846)	4
35 (22342878)	4
27 (19356536)	1

MRI heart function and morphology without and with IV contrast	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	8	8	0	0	0	0	0	0	4	12	1

References	Study Quality
45 (29374292)	Good
37 (31738598)	4
29 (29961869)	Good
39 (10992020)	4
47 (17313647)	4
46 (16824834)	3
48 (23793590)	4

US echocardiography transthoracic resting	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	8	8	0	0	0	0	1	0	3	10	3

References	Study Quality
49 (26476503)	1
2 (25747606)	3
52 (27256218)	4
46 (16824834)	3
53 (16946152)	3
54 (1987242)	1

CTA chest with IV contrast	Usually appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	7	7	0	0	0	0	1	3	9	4	0

References	Study Quality
12 (29150083)	2
41 (10966185)	4
13 (21529769)	4

CTA chest abdomen pelvis with IV contrast	Usually appropriate	Limited	☢☢☢☢☢ 30-100 mSv	☢☢☢☢☢ 10-30 mSv [ped]	7	7	2	0	0	0	0	0	8	6	1

References	Study Quality
56 (21482138)	4
57 (19770313)	4
12 (29150083)	2
41 (10966185)	4

		13 (21529769)			4											
MRA chest without and with IV contrast	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	0	0	4	11	2	0
		References			Study Quality											
		43 (20013276)			3											
		44 (17285264)			2											
MRA chest abdomen pelvis without IV contrast	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	0	1	3	12	0	0
		References			Study Quality											
		56 (21482138)			4											
		58 (24935911)			2											
		43 (20013276)			3											
		57 (19770313)			4											
		44 (17285264)			2											
MRA chest abdomen pelvis without and with IV contrast	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	0	0	0	16	0	0
		References			Study Quality											
		56 (21482138)			4											
		58 (24935911)			2											
		43 (20013276)			3											
		57 (19770313)			4											
		44 (17285264)			2											
MRI heart function and morphology without IV contrast	Usually appropriate	Moderate	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	0	0	5	9	3	0
		References			Study Quality											
		49 (26476503)			1											
		45 (29374292)			Good											
US echocardiography transesophageal	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	1	0	3	12	1	0
		References			Study Quality											
		2 (25747606)			3											

31 (23821020)	2
4 (24523417)	3
50 (31236074)	3
51 (23186295)	4
13 (21529769)	4
10 (19995630)	4
46 (16824834)	3

MRA chest without IV contrast	May be appropriate	Limited	O 0 mSv	O 0 mSv [ped]	6	6	0	0	0	0	3	9	4	1	0	

References	Study Quality
43 (20013276)	3
44 (17285264)	2

US duplex Doppler abdomen	May be appropriate	Limited	O 0 mSv	O 0 mSv [ped]	4	4	4	2	2	3	6	0	0	0	0	

References	Study Quality
56 (21482138)	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.**