American College of Radiology
ACR Appropriateness Criteria®

Acute Spinal Trauma

Variant 1: Age greater than or equal to 16 years and less than 65 years. Acute cervical spine blunt trauma; imaging not indicated by CCR or NEXUS clinical criteria. Low-risk criteria. 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 and neck with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	21	1	0	0	0	0	0	0	0
CT myelography cervical spine	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢ 0.3-3 mSv [ped]	1	1	21	1	0	0	0	0	0	0	0
CT cervical spine with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	20	1	1	0	0	0	0	0	0
CT cervical spine without IV contrast	Usually not appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	14	2	2	3	1	0	0	0	0

References	Study Quality
5 (11597285)	3
4 (10891516)	3

CT cervical spine without and with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	19	2	1	0	0	0	0	0	0
Arteriography cervicocerebral	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	21	1	0	0	0	0	0	0	0
MRA neck without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	21	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	21	1	0	0	0	0	0	0	0
MRI cervical spine without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	20	2	0	0	0	0	0	0	0
MRI cervical spine without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	21	1	0	0	0	0	0	0	0
Radiography cervical spine	Usually not appropriate	Limited	☢☢ 0.1-1mSv	☢☢ 0.03-0.3 mSv [ped]	1	1	15	0	3	0	2	0	1	0	1

References	Study Quality
5 (11597285)	3
4 (10891516)	3

MRA neck with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	21	1	0	0	0	0	0	0	0
MRI cervical spine with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	21	1	0	0	0	0	0	0	0

Variant 2: Age 16 years or older. Acute cervical spine blunt trauma. Imaging indicated by CCR or NEXUS clinical criteria. Initial imaging.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
CT cervical spine without IV contrast	Usually appropriate	Strong	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	9	9	0	0	1	1	1	0	1	3	15

References	Study Quality
30 (25757133)	4
31 (27602907)	4
29 (19509621)	2
32 (15920400)	M
9 (27438681)	2

CTA head and neck with IV contrast	Usually not appropriate	Strong	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	14	1	5	1	1	0	0	0	0

References	Study Quality
35 (32195997)	2
33 (32520898)	2
34 (36101794)	4

CT myelography cervical spine	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢ 0.3-3 mSv [ped]	1	1	20	1	1	0	0	0	0	0	0
CT cervical spine with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	20	1	1	0	0	0	0	0	0
CT cervical spine without and with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	19	2	1	0	0	0	0	0	0
Arteriography cervicocerebral	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	20	1	1	0	0	0	0	0	0
MRA neck without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	20	1	1	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	20	1	1	0	0	0	0	0	0
MRI cervical spine without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	17	1	2	0	1	0	1	0	0
MRI cervical spine without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	20	1	1	0	0	0	0	0	0
Radiography cervical spine	Usually not appropriate	Strong	☢☢ 0.1-1mSv	☢☢ 0.03-0.3 mSv [ped]	1	1	16	1	3	0	0	1	1	0	0

References	Study Quality
41 (24139671)	3
40 (23404352)	3
39 (22663912)	4

37 (21085024)	2
38 (21265348)	3
36 (20583514)	3
29 (19509621)	2

MRA neck with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	20	1	1	0	0	0	0	0	0
MRI cervical spine with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	20	1	1	0	0	0	0	0	0

Variant 3: Age 16 years or older. Acute cervical spine blunt trauma. No unstable injury demonstrated initially, but kept in collar for neck pain. No new neurologic symptoms. Follow-up imaging.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
CT cervical spine without IV contrast	Usually appropriate	Strong	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	8	8	1	0	0	0	6	1	3	4	7

References	Study Quality
30 (25757133)	4
31 (27602907)	4
29 (19509621)	2
9 (27438681)	2

MRI cervical spine without IV contrast	May be appropriate	Strong	O 0 mSv	O 0 mSv [ped]	5	5	0	0	0	2	14	5	1	0	0

References	Study Quality
56 (25997715)	4
60 (23075855)	2
61 (24033302)	3
48 (22187629)	1
68 (22310029)	3
62 (27893647)	2

63 (21619408)	M
55 (20336892)	4
57 (20065765)	M
59 (18188119)	M
51 (18073599)	4
69 (19912072)	4
47 (19672633)	3
67 (15853463)	2
58 (18469647)	3
54 (18404054)	4
52 (16374279)	2
9 (27438681)	2
64 (35690715)	4
66 (24269913)	2
53 (34480416)	2
65 (34850316)	1

Radiography cervical spine	May be appropriate (Disagreement)	Expert Opinion	☢☢ 0.1-1mSv	☢☢ 0.03-0.3 mSv [ped]	5	5	12	2	2	0	0	4	1	0	1

References	Study Quality
41 (24139671)	3
68 (22310029)	3
38 (21265348)	3
70 (27984030)	Good

CTA head and neck with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	19	1	2	0	0	0	0	0	0
CT myelography cervical spine	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢ 0.3-3 mSv [ped]	1	1	19	1	2	0	0	0	0	0	0
CT cervical spine with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	20	1	1	0	0	0	0	0	0

CT cervical spine without and with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	20	2	0	0	0	0	0	0	0
Arteriography cervicocerebral	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	20	2	0	0	0	0	0	0	0
MRA neck without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	20	1	0	1	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	20	1	1	0	0	0	0	0	0
MRI cervical spine without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	20	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	20	1	1	0	0	0	0	0	0
MRI cervical spine with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	20	1	0	0	1	0	0	0	0

Variant 4: Age 16 years or older. Acute cervical spine blunt trauma. Suspected arterial injury with or without positive cervical spine 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 and neck with IV contrast	Usually appropriate	Strong	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	9	9	0	0	0	0	0	0	2	4	16

References	Study Quality
92 (24355656)	3
93 (22695428)	3
83 (19537053)	4
98 (27015579)	2
91 (12435934)	1
95 (16688051)	3
88 (17893500)	2

		87 (24458034)	3												
		96 (25794340)	2												
		33 (32520898)	2												
		34 (36101794)	4												
		94 (34854931)	4												
		97 (28799874)	2												
		99 (37191023)	2												
Arteriography cervicocerebral	Usually not appropriate	Strong	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	17	2	2	0	0	0	1	0	0
		References	Study Quality												
		78 (23574813)	2												
		74 (22990630)	3												
		76 (21494192)	3												
		88 (17893500)	2												
		87 (24458034)	3												
		89 (24157089)	4												
		90 (11981216)	2												
MRA neck without IV contrast	Usually not appropriate	Strong	O 0 mSv	O 0 mSv [ped]	1	1	12	5	2	2	1	0	0	0	0
		References	Study Quality												
		93 (22695428)	3												
		101 (7839986)	2												
		103 (18635617)	2												
		102 (22929690)	4												
MRA neck without and with IV contrast	Usually not appropriate	Limited	O 0 mSv	O 0 mSv [ped]	1	1	14	4	3	1	0	0	0	0	0
		References	Study Quality												
		100 (28759887)	4												
MRA neck with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	14	4	3	0	0	0	1	0	0

Variant 5: Age 16 years or older. Acute cervical, thoracic or lumbar spine blunt trauma. Suspected or confirmed ligamentous, spinal cord or nerve root injury, with or without trauma identified 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
MRI spine area of interest without IV contrast	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	9	9	0	0	0	0	1	0	5	1	15

References	Study Quality
112 (27235527)	4
56 (25997715)	4
123 (25769487)	3
111 (24731570)	3
61 (24033302)	3
109 (22614795)	2
12 (23114489)	4
108 (22407141)	4
110 (23025962)	3
117 (27334017)	4
36 (20583514)	3
55 (20336892)	4
107 (19523626)	4
59 (18188119)	M
105 (16103286)	4
122 (17108836)	4
128 (20388006)	4
9 (27438681)	2
125 (27417396)	4
119 (30007757)	4
116 (29229178)	4
114 (28803621)	4

115 (28826754)	3
106 (19486558)	4
66 (24269913)	2
21 (31440893)	4
113 (29450715)	4
118 (29530277)	2
129 (31405713)	4
120 (32298957)	4
126 (33309644)	2
124 (27404215)	4
127 (36705382)	2
121 (16307197)	4

CT myelography spine area of interest	Usually not appropriate	Limited	Varies	Varies	3	3	10	0	4	3	4	1	0	0	0

References	Study Quality
61 (24033302)	3
104 (15734929)	4
52 (16374279)	2

MRI spine area of interest without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	16	1	2	0	1	1	1	0	0
MRI spine area of interest with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	19	1	0	0	0	1	1	0	0
CTA spine area of interest with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	18	2	2	0	0	0	0	0	0
Arteriography spine area of interest	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	19	1	2	0	0	0	0	0	0
MRA spine area of interest without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	18	1	1	1	1	0	0	0	0
MRA spine area of interest with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	19	1	0	1	1	0	0	0	0

MRA spine area of interest without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	18	1	1	2	0	0	0	0	0

Variant 6: Age 16 years or older. Acute thoracic or lumbar spine blunt trauma in a high-risk or unexaminable patient. Initial imaging.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
CT spine area of interest without IV contrast	Usually appropriate	Strong	Varies	Varies	9	9	0	0	0	0	0	0	3	6	13
References				Study Quality											
133 (23422283)				2											
134 (27663571)				2											
132 (20699755)				3											
135 (14566120)				2											
21 (31440893)				4											
Radiography spine area of interest	Usually not appropriate	Strong	Varies	Varies	1	1	17	2	2	0	1	0	0	0	0
References				Study Quality											
133 (23422283)				2											
135 (14566120)				2											
136 (-3131250)				3											
CT spine area of interest without and with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	18	1	1	1	1	0	0	0	0
CT spine area of interest with IV contrast	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	19	1	0	0	2	0	0	0	0
MRI spine area of interest without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	19	1	0	1	1	0	0	0	0
MRI spine area of interest without IV contrast	Usually not appropriate	Limited	O 0 mSv	O 0 mSv [ped]	1	1	14	3	4	0	0	1	0	0	0
References				Study Quality											

56 (25997715)	4
108 (22407141)	4
18 (12554032)	3

MRI spine area of interest with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	19	1	0	0	2	0	0	0	0
CT myelography spine area of interest	Usually not appropriate	Expert Consensus	Varies	Varies	1	1	19	2	1	0	0	0	0	0	0

Variant 7: Age 16 years or older. Acute cervical spine blunt trauma. Obtunded. No trauma identified on cervical spine CT without IV contrast. Next imaging study.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
MRI cervical spine without IV contrast	May be appropriate (Disagreement)	Expert Opinion	O 0 mSv	O 0 mSv [ped]	5	5	2	1	0	1	12	4	2	0	0

References	Study Quality
141 (25775316)	4
123 (25769487)	3
140 (25076462)	3
111 (24731570)	3
143 (23856632)	M
108 (22407141)	4
138 (22491556)	3
142 (27305663)	2
55 (20336892)	4
144 (18073612)	2
51 (18073599)	4
139 (28993912)	4
113 (29450715)	4

CTA head and neck with IV contrast	Usually not appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	2	2	11	1	0	3	5	1	1	0	0

			References		Study Quality											
			73 (22327974)		3											
CT myelography cervical spine	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢ 0.3-3 mSv [ped]	1	1	19	3	0	0	0	0	0	0	0	0
Arteriography cervicocerebral	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	18	3	0	0	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	18	1	0	1	0	2	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	1	1	1	1	1	0	0	0	0
MRI cervical spine without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	18	1	0	0	3	0	0	0	0	0
MRA neck with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	19	1	0	2	0	0	0	0	0	0
MRI cervical spine with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	19	1	0	0	2	0	0	0	0	0

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.**