### American College of Radiology ACR Appropriateness Criteria<sup>®</sup>

### **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.

	Appropriateness								F	'inal '	Tabu	latio	ns		
Procedure	Category	SOE	Adults RRL	Peds RRL	Rating	Median	1	2	3	4	5	6	7	8	9
CTA head and neck with IV contrast	Usually not appropriate	Expert Consensus	ତତତ 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	ବ୍ୟବ୍ୟକ 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	ଝଝଝ 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	ଝଝଝ 1-10 mSv	ଡଡଡଡ 3- 10 mSv [ped]	1	1	14	2	2	3	1	0	0	0	0
		References		Study	Quality										
		4 (10891516)			3										
		5 (11597285)			3		-								
CT cervical spine without and with IV contrast	Usually not appropriate	Expert Consensus	ଝେଝ 1-10 mSv	ଡଡଡଡଡ 3- 10 mSv [ped]	1	1	19	2	1	0	0	0	0	0	0
Arteriography cervicocerebral	Usually not appropriate	Expert Consensus	ତତତ 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	Usuall approp	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	Usuall approp	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	Usuall approp	Expert Consensus	O 0 mSv	,	O 0 mSv [ped]	1	1	21	1	0	0	0	0	0	0	0
Radiography cervical spine	Usuall approp	Limited	ତତ 0.1-1m	ıSv	�� 0.03- 0.3 mSv [ped]	1	1	15	0	3	0	2	0	1	0	1
		References			Study	Quality										
		4 (10891516)				3										
		5 (11597285)				3										
MRA neck with IV contrast	Usuall approp	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	Usuall approp	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.

	Appropri	ateness	COL			<b>D</b> (1				ŀ	inal	Tabu	latio	ns		
Procedure	Categ		SOE	Adults RRL	Peds RRL	Rating	Median	1	2	3	4	5	6	7	8	9
CT cervical spine without IV contrast	Usual appropr		Strong	ତତତ 1-10 mSv	≎≎≎≎ 3- 10 mSv [ped]	9	9	0	0	1	1	1	0	1	3	15
	-		References		Study	Quality										
	-		29 (19509621)			2										
			32 (15920400)			М										
			31 (27602907)			4										
			30 (25757133)			4										
			9 (27438681)			2										

CTA head and neck with IV contrast	Usuall approp	Strong	ଷଷଷ 1-10 mSv	& ⊕ ⊕ ⊕ ⊕ 3- 10 mSv [ped]	1	1	14	1	5	1	1	0	0	0	0
		References		Study	y Quality		-			-				•	
		35 (32195997)			2										
		34 (36101794)			4										
		33 (32520898)			2								_		
CT myelography cervical spine	Usuall approp	Expert Consensus	ତତତତ 10-30 mSv	)	1	1	20	1	1	0	0	0	0	0	0
CT cervical spine with IV contrast	Usuall approp	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	Usuall approp	Expert Consensus	ତତତ 1-10 mSv	≎≎≎≎ 3- 10 mSv [ped]	1	1	19	2	1	0	0	0	0	0	0
Arteriography cervicocerebral	Usuall approp	Expert Consensus	ତତତ 1-10 mSv	≎≎≎≎≎ 3- 10 mSv [ped]	1	1	20	1	1	0	0	0	0	0	0
MRA neck without IV contrast	Usuall approp	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	Usuall approp	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	Usuall approp	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	Usuall approp	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	20	1	1	0	0	0	0	0	0
Radiography cervical spine	Usuall approp	Strong	֎֎ 0.1-1mS	v 0.03- 0.3 mSv [ped]	1	1	16	1	3	0	0	1	1	0	0
		References		Study	y Quality										
		41 (24139671)			3										
		40 (23404352)			3										
		39 (22663912)			4										

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

	Appropri	ateness	COL			D. (				F	'inal '	Tabu	latio	ns		
Procedure	Categ		SOE	Adults RR	L Peds RRL	Rating	Median	1	2	3	4	5	6	7	8	9
CT cervical spine without IV contrast	Usua approp		Strong	ଡଡଡ 1-1 mSv	0	8	8	1	0	0	0	6	1	3	4	7
			References		Study	Quality										
			9 (27438681)			2										
			31 (27602907)			4										
			30 (25757133)			4										
			29 (19509621)			2										
MRI cervical spine without IV contrast	May approp	be priate	Strong	O 0 mSv	, O 0 mSv [ped]	5	5	0	0	0	2	14	5	1	0	0
			References		Study	Quality										
			60 (23075855)			2										
			48 (22187629)			1										
			68 (22310029)			3										
			59 (18188119)			М										
			69 (19912072)			4										
			47 (19672633)			3										

		67 (	(15853463)				2										
		66 (	(24269913)				2										
		65 (	(34850316)				1										
		64 (	(35690715)				4										
		63 (	(21619408)				М										
		62 (	(27893647)				2										
		61 (	(24033302)				3										
		58 (	(18469647)				3										
		57 (	(20065765)				М										
		56 (	(25997715)				4										
		55 (	(20336892)				4										
		54 (	(18404054)				4										
		53 (	(34480416)				2										
		52 (	(16374279)				2										
		51 (	(18073599)				4										
			27438681)				2			1							_
Radiography cervical spine	May be appropriat (Disagreeme	te Expert	t Opinion	֎֎ 0.1-1m	ıSv	�� 0.03- 0.3 mSv [ped]	5	5	12	2	2	0	0	4	1	0	
		R	eferences			Study	Quality										
		41 (	(24139671)				3										
		38 (	(21265348)				3										
		70 (	(27984030)			G	Good										
		68 (	(22310029)				3										
CTA head and neck with IV contrast	Usually no appropriat		xpert isensus	ତତତ 1-1 mSv	0	֎֎֎֎ 3- 10 mSv [ped]	1	1	19	1	2	0	0	0	0	0	
CT myelography cervical spine	Usually no appropriat	te E	xpert isensus	<del>ଡଡଡଡ</del> 10- mSv	30	≎≎≎ 0.3- 3 mSv [ped]	1	1	19	1	2	0	0	0	0	0	
CT cervical spine with IV contrast	Usually no appropriat		xpert isensus	ଝେଝ 1-1। mSv	0	€€€€ 3- 10 mSv [ped]	1	1	20	1	1	0	0	0	0	0	

CT cervical spine without and with IV contrast	Usually not appropriate	Expert Consensus	ଡେଡଡ 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	ଝେଝେ 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.

	Appropri	iateness	COL							ŀ	Final	Tabu	latio	ns		
Procedure	Categ	gory	SOE	Adults RRL	Peds RRL	Rating	Median	1	2	3	4	5	6	7	8	9
CTA head and neck with IV contrast	Usua approp		Strong	ଡଡଡ 1-10 mSv	≎≎≎≎ 3- 10 mSv [ped]	9	9	0	0	0	0	0	0	2	4	16
			References		Study	y Quality										
			92 (24355656)			3										
			93 (22695428)			3										
			87 (24458034)			3										
			99 (37191023)			2										
			98 (27015579)			2										
			97 (28799874)			2										
			96 (25794340)			2										

		95 (16688051)			3										
		94 (34854931)			4										
		91 (12435934)			1										
		88 (17893500)			2										
		83 (19537053)			4										
		34 (36101794)			4										
		33 (32520898)			2										
Arteriography cervicocerebral	Usually not appropriate	Strong	ତେତେ 1-10 mSv	ତତତତ 3- 10 mSv [ped]	1	1	17	2	2	0	0	0	1	0	0
		References		Study	Quality										
		87 (24458034)			3										
		90 (11981216)			2										
		89 (24157089)			4										
		88 (17893500)			2										
		78 (23574813)			2										
		76 (21494192)			3										
		74 (22990630)			3										
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										
		103 (18635617)	)		2										
		102 (22929690)	)		4										
		101 (7839986)			2										
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				1				<u> </u>	<u> </u>	
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

	Appropriateness	COF				N7 11			]	Final	Tabu	ılatio	ons		
Procedure	Category	SOE	Adults RRL	Peds RRL	Rating	Median	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	v Quality										
		129 (31405713)	)		4										
		128 (20388006)	)		4										
		127 (36705382)	)		2										
		126 (33309644)	)		2										
		125 (27417396)	)		4										
		124 (27404215)	)		4										
		123 (25769487)	)		3										
		122 (17108836)	)		4										
		121 (16307197)	)		4										
		120 (32298957)	)		4										
		119 (30007757)	)		4										
		118 (29530277)	)		2										
		117 (27334017)	)		4										
		116 (29229178)	)		4										
		115 (28826754)	)		3										
		114 (28803621)	)		4										
		113 (29450715)	)		4										
		112 (27235527)	)		4										
		111 (24731570)	)		3										
		110 (23025962)	)		3										
		109 (22614795)	)		2										
		108 (22407141)	)		4										

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.

	Г														
	-	107 (19523626)			4										
		106 (19486558)	)		4										
		105 (16103286)	)		4										
		66 (24269913)			2										
		61 (24033302)			3										
		56 (25997715)			4										
		55 (20336892)			4										
		36 (20583514)			3										
	-	21 (31440893)			4										
		12 (23114489)			4										
	-	9 (27438681)			2										
		 59 (18188119)			М										
CT myelography spine area of interest	Usually approp	Limited	Varies	Varies	3	3	10	0	4	3	4	1	0	0	0
		References		Study	/ Quality										
		104 (15734929)	)		4										
		61 (24033302)			3										
		52 (16374279)			2										
MRI spine area of interest without and with IV contrast	Usually approp	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 approp	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 approp	Expert Consensus	Varies	Varies	1	1	18	2	2	0	0	0	0	0	0
Arteriography spine area of interest	Usually approp	Expert Consensus	Varies	Varies	1	1	19	1	2	0	0	0	0	0	0
MRA spine area of interest without IV contrast	Usually approp	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 appropr	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	
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### Variant 6: Age 16 years or older. Acute thoracic or lumbar spine blunt trauma in a high-risk or unexaminable patient. Initial imaging.

	Appropriaten	ess		D 1 DD1					F	'inal '	Tabu	latio	ns		
Procedure	Category	SOE SOE	Adults RRL	Peds RRL	Rating	Median	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									•	
		21 (31440893)		4											
		135 (14566120)	)		2										
		134 (27663571)	)												
		133 (23422283)													
		132 (20699755)	)		3					1					ı
Radiography spine area of interest	Usually not appropriate		Varies	Varies	1	1	17	2	2	0	1	0	0	0	0
		References		Study	Quality										
		133 (23422283)	)												
		135 (14566120)	)												
		136 (-3131250)													
CT spine area of interest without and with IV contrast	Usually not appropriate		Varies	Varies	1	1	18	1	1	1	1	0	0	0	0
CT spine area of interest with IV contrast	Usually not appropriate		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		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		O 0 mSv	O 0 mSv [ped]	1	1	14	3	4	0	0	1	0	0	0
		References		Study	Quality										

		 18 (12554032) 56 (25997715) 108 (22407141)													
MRI spine area of interest with IV contrast	Usually approp	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 approp	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.

	Appropri	iateness	005					Final Tabulations												
Procedure	Categ		SOE	Adults RRL	Peds RRL	Rating	Median	1	2	3	4	5	6	7	8	9				
MRI cervical spine without IV contrast	May approp (Disagre	oriate	Expert Opinion	O 0 mSv	O 0 mSv [ped]	5	5	2	1	0	1	12	4	2	0	0				
			References		Study	/ Quality														
			140 (25076462)	1		3														
			111 (24731570)	1		3														
			138 (22491556)	1																
			55 (20336892)			4														
			144 (18073612)			2														
			51 (18073599)			4														
			139 (28993912)			4														
			143 (23856632)			М														
			142 (27305663)			2														
			141 (25775316)			4														
			123 (25769487)			3														
			113 (29450715)																	
			108 (22407141)		4															
CTA head and neck with IV contrast	Usuall approp		Limited	ଝଝଝ 1-10 mSv	ଡେଡେଡେ 3- 10 mSv [ped]	2	2	11	1	0	3	5	1	1	0	0				

		References		Study											
		73 (22327974)		3											
CT myelography cervical spine	Usuall approp	Expert Consensus	ଝଝଝଝ 10-3 mSv	30	1	1	19	3	0	0	0	0	0	0	0
Arteriography cervicocerebral	Usuall approp	Expert Consensus	ଝେଝ 1-10 mSv	&&&& 3- 10 mSv [ped]	1	1	18	3	0	0	0	1	0	0	0
MRA neck without IV contrast	Usuall approp	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	18	1	0	1	0	2	0	0	0
MRA neck without and with IV contrast	Usuall approp	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	17	1	1	1	1	1	0	0	0
MRI cervical spine without and with IV contrast	Usuall approp	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	18	1	0	0	3	0	0	0	0
MRA neck with IV contrast	Usuall approp	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	19	1	0	2	0	0	0	0	0
MRI cervical spine with IV contrast	Usuall approp	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	19	1	0	0	2	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.