American College of Radiology
ACR Appropriateness Criteria®

Management of Vertebral Compression Fractures

Variant 1: New symptomatic vertebral compression fracture (VCF) identified on radiographs. No known malignancy. 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	0	0	1	9	10

References	Study Quality
46 (23619191)	2
47 (18831901)	2
45 (19504131)	4
43 (19282740)	4
48 (21779855)	4
49 (21217433)	2
44 (21162942)	2
50 (25946722)	2
51 (16687528)	2

CT spine area of interest without IV contrast	Usually appropriate	Strong	Varies	Varies	8	8	0	0	0	1	1	1	3	7	7

References	Study Quality
40 (28065376)	2
12 (14519867)	4
39 (22091375)	4
41 (26537691)	2
42 (26928067)	2

Bone scan whole body	May be appropriate	Strong	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	5	5	1	0	2	6	8	3	0	0	0

References	Study Quality
53 (20706042)	3
54 (18349795)	2
56 (21165311)	3
52 (22927151)	3
55 (26364958)	3

SPECT or SPECT/CT spine area of interest	May be appropriate	Strong	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	5	5	0	0	0	3	16	2	0	0	0

References	Study Quality
59 (22208854)	2
57 (23559712)	4
58 (24694774)	3
60 (29893749)	2

CT spine area of interest without and with IV contrast	Usually not appropriate	Strong	Varies	Varies	3	3	6	3	4	1	4	1	1	0	0

References	Study Quality
40 (28065376)	2
12 (14519867)	4
39 (22091375)	4
41 (26537691)	2
42 (26928067)	2

CT spine area of interest with IV contrast	Usually not appropriate	Strong	Varies	Varies	3	3	5	2	8	0	3	2	0	0	0

References	Study Quality
40 (28065376)	2
12 (14519867)	4
39 (22091375)	4
41 (26537691)	2

		42 (26928067)		2												
MRI spine area of interest without and with IV contrast	Usually not appropriate	Strong	O 0 mSv	O 0 mSv [ped]	3	3	5	1	5	6	4	0	0	0	0
		References		Study Quality												
		46 (23619191)		2												
		47 (18831901)		2												
		45 (19504131)		4												
		43 (19282740)		4												
		48 (21779855)		4												
		49 (21217433)		2												
		44 (21162942)		2												
		50 (25946722)		2												
		51 (16687528)		2												
MRI spine area of interest with IV contrast	Usually not appropriate	Strong	O 0 mSv	O 0 mSv [ped]	3	3	8	1	12	0	0	0	0	0	0
		References		Study Quality												
		46 (23619191)		2												
		47 (18831901)		2												
		45 (19504131)		4												
		43 (19282740)		4												
		48 (21779855)		4												
		49 (21217433)		2												
		44 (21162942)		2												
		50 (25946722)		2												
		51 (16687528)		2												
FDG-PET/CT skull base to mid-thigh	Usually not appropriate	Limited	☢☢☢☢ 10-30 mSv	☢☢☢☢ 3-10 mSv [ped]	2	2	6	5	3	3	3	0	0	0	0
		References		Study Quality												
		61 (12195540)		4												
		63 (12811277)		1												
		62 (11914890)		4												

64 (3277565)	4
65 (29348133)	4

CT myelography spine area of interest	Usually not appropriate	Expert Consensus	Varies	Varies	2	2	8	3	3	4	2	0	0	0	0

Variant 2: New symptomatic VCF identified on radiographs. History of malignancy. 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 and with IV contrast	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	9	9	0	0	0	0	0	0	2	8	10

References	Study Quality
46 (23619191)	2
47 (18831901)	2
66 (28670417)	3
70 (21857034)	3
69 (21214309)	2
65 (29348133)	4
71 (21555353)	2
68 (2740506)	4

CT spine area of interest without IV contrast	Usually appropriate	Strong	Varies	Varies	7	7	0	0	0	0	0	1	13	6	1

References	Study Quality
40 (28065376)	2
12 (14519867)	4
39 (22091375)	4
66 (28670417)	3
67 (26376170)	4
41 (26537691)	2
42 (26928067)	2

MRI spine area of interest without IV contrast	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	7	7	1	0	0	0	3	3	5	5	3

References	Study Quality
46 (23619191)	2
47 (18831901)	2
66 (28670417)	3
70 (21857034)	3
69 (21214309)	2
65 (29348133)	4
71 (21555353)	2
68 (2740506)	4

FDG-PET/CT skull base to mid-thigh	May be appropriate	Moderate	☢☢☢☢ 10-30 mSv	☢☢☢☢ 3-10 mSv [ped]	6	6	0	1	0	1	6	4	4	4	0

References	Study Quality
61 (12195540)	4
64 (3277565)	4
74 (27694173)	4
73 (32105873)	Good

Bone scan whole body	May be appropriate	Strong	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	5	5	0	0	1	2	9	5	3	0	0

References	Study Quality
53 (20706042)	3
54 (18349795)	2
56 (21165311)	3
52 (22927151)	3
55 (26364958)	3
58 (24694774)	3
72 (22487972)	4

MRI spine area of interest with IV contrast	May be appropriate (Disagreement)	Expert Opinion	O 0 mSv	O 0 mSv [ped]	5	5	6	0	7	0	1	7	0	0	0

References	Study Quality
46 (23619191)	2
47 (18831901)	2
66 (28670417)	3
70 (21857034)	3
69 (21214309)	2
65 (29348133)	4
71 (21555353)	2
68 (2740506)	4

Image-guided biopsy spine area of interest	May be appropriate	Limited	Varies	Varies	5	5	0	0	0	1	10	9	1	0	0

References	Study Quality
75 (19829253)	3

SPECT or SPECT/CT spine area of interest	May be appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	5	5	0	0	0	1	18	1	1	0	0

References	Study Quality
59 (22208854)	2
57 (23559712)	4
58 (24694774)	3

CT myelography spine area of interest	May be appropriate	Expert Consensus	Varies	Varies	4	4	3	2	2	4	7	2	0	0	0
CT spine area of interest without and with IV contrast	Usually not appropriate	Strong	Varies	Varies	3	3	9	0	5	1	6	0	0	0	0

References	Study Quality
40 (28065376)	2
12 (14519867)	4
39 (22091375)	4
66 (28670417)	3
67 (26376170)	4
41 (26537691)	2

		42 (26928067)		2												
CT spine area of interest with IV contrast	Usually not appropriate	Strong	Varies	Varies	3	3	9	0	4	6	2	0	0	0	0
		References		Study Quality												
		40 (28065376)		2												
		12 (14519867)		4												
		39 (22091375)		4												
		66 (28670417)		3												
		67 (26376170)		4												
		41 (26537691)		2												
		42 (26928067)		2												

Variant 3: New back pain. Previously treated VCF or multiple VCFs. 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	8	8	0	0	0	0	2	3	4	4	7
		References		Study Quality											
		12 (14519867)		4											
		39 (22091375)		4											
		78 (20528649)		2											
		76 (22637642)		2											
		77 (15690210)		4											
MRI spine area of interest without IV contrast	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	8	8	0	0	0	0	1	1	2	7	9
		References		Study Quality											
		80 (17361377)		2											
		79 (24792612)		4											

MRI spine area of interest without and with IV contrast	May be appropriate	Limited	O 0 mSv	O 0 mSv [ped]	6	6	0	0	0	0	9	4	7	1	0

References	Study Quality
80 (17361377)	2
79 (24792612)	4

Bone scan whole body	May be appropriate	Strong	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	5	5	1	0	1	6	6	5	1	0	0

References	Study Quality
53 (20706042)	3
54 (18349795)	2
56 (21165311)	3
52 (22927151)	3
55 (26364958)	3

FDG-PET/CT skull base to mid-thigh	May be appropriate	Limited	☢☢☢☢ 10-30 mSv	☢☢☢☢ 3-10 mSv [ped]	5	5	3	2	4	1	8	1	0	1	0

References	Study Quality
61 (12195540)	4
63 (12811277)	1
62 (11914890)	4
64 (3277565)	4

SPECT or SPECT/CT spine area of interest	May be appropriate	Strong	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	5	5	0	0	0	2	17	1	0	1	0

References	Study Quality
59 (22208854)	2
57 (23559712)	4
58 (24694774)	3
60 (29893749)	2

CT spine area of interest without and with IV contrast	Usually not appropriate	Strong	Varies	Varies	3	3	9	1	4	5	2	0	0	0	0

References	Study Quality

		12 (14519867)	4												
		39 (22091375)	4												
		78 (20528649)	2												
		76 (22637642)	2												
		77 (15690210)	4												
CT spine area of interest with IV contrast	Usually not appropriate	Strong	Varies	Varies	3	3	9	1	10	1	0	0	0	0	0
		References	Study Quality												
		12 (14519867)	4												
		39 (22091375)	4												
		78 (20528649)	2												
		76 (22637642)	2												
		77 (15690210)	4												
MRI spine area of interest with IV contrast	Usually not appropriate	Limited	O 0 mSv	O 0 mSv [ped]	3	3	7	1	6	0	7	0	0	0	0
		References	Study Quality												
		80 (17361377)	2												
		79 (24792612)	4												
CT myelography spine area of interest	Usually not appropriate	Expert Consensus	Varies	Varies	3	3	7	2	4	5	2	0	0	0	0

Variant 4: Asymptomatic VCF identified on radiographs. History of malignancy. 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 and with IV contrast	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	9	9	0	0	0	0	1	0	3	6	10
		References	Study Quality												
		96 (23960179)	4												
		89 (22194515)	2												

		88 (24484060)	2												
		66 (28670417)	3												
		67 (26376170)	4												
		91 (20580503)	3												
		93 (19530588)	3												
		94 (26204297)	4												
		70 (21857034)	3												
		95 (27441748)	4												
		16 (20809724)	4												
		90 (8059251)	4												
		92 (-3194747)	4												
CT spine area of interest without IV contrast	Usually appropriate	Strong	Varies	Varies	8	8	0	0	1	1	1	3	4	7	3
		References	Study Quality												
		40 (28065376)	2												
		12 (14519867)	4												
		39 (22091375)	4												
		66 (28670417)	3												
		41 (26537691)	2												
		42 (26928067)	2												
MRI spine area of interest without IV contrast	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	7	7	1	0	0	0	3	1	7	8	0
		References	Study Quality												
		96 (23960179)	4												
		89 (22194515)	2												
		88 (24484060)	2												
		66 (28670417)	3												
		67 (26376170)	4												
		91 (20580503)	3												
		93 (19530588)	3												
		94 (26204297)	4												

		70 (21857034)		3											
		95 (27441748)		4											
		16 (20809724)		4											
		90 (8059251)		4											
		92 (-3194747)		4											
Bone scan whole body	May be appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	5	5	1	0	0	3	10	3	2	0	1
		References		Study Quality											
		98 (12369658)		2											
		97 (11110531)		4											
FDG-PET/CT skull base to mid-thigh	May be appropriate	Strong	☢☢☢☢ 10-30 mSv	☢☢☢☢ 3-10 mSv [ped]	5	5	0	0	1	0	17	2	1	0	0
		References		Study Quality											
		101 (23251117)		4											
		61 (12195540)		4											
		63 (12811277)		1											
		62 (11914890)		4											
		74 (27694173)		4											
		73 (32105873)		Good											
Image-guided biopsy spine area of interest	May be appropriate	Limited	Varies	Varies	5	5	0	0	0	2	15	3	1	0	0
		References		Study Quality											
		102 (30767427)		2											
SPECT or SPECT/CT spine area of interest	May be appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	5	5	0	0	0	4	16	0	1	0	0
		References		Study Quality											
		57 (23559712)		4											
		99 (8254410)		3											
		100 (18993040)		3											

CT spine area of interest without and with IV contrast	Usually not appropriate	Strong	Varies	Varies	3	3	8	1	10	2	0	0	0	0	0

References	Study Quality
40 (28065376)	2
12 (14519867)	4
39 (22091375)	4
66 (28670417)	3
41 (26537691)	2
42 (26928067)	2

CT spine area of interest with IV contrast	Usually not appropriate	Strong	Varies	Varies	3	3	9	1	10	1	0	0	0	0	0

References	Study Quality
40 (28065376)	2
12 (14519867)	4
39 (22091375)	4
66 (28670417)	3
41 (26537691)	2
42 (26928067)	2

MRI spine area of interest with IV contrast	Usually not appropriate	Strong	O 0 mSv	O 0 mSv [ped]	3	3	8	0	5	0	7	1	0	0	0

References	Study Quality
96 (23960179)	4
89 (22194515)	2
88 (24484060)	2
66 (28670417)	3
67 (26376170)	4
91 (20580503)	3
93 (19530588)	3
94 (26204297)	4
70 (21857034)	3
95 (27441748)	4

16 (20809724)	4
90 (8059251)	4
92 (-3194747)	4

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations 1	2	3	4	5	6	7	8	9
CT myelography spine area of interest	Usually not appropriate	Expert Consensus	Varies	Varies	3	3	6	2	4	3	4	1	0	0	0

Variant 5: Asymptomatic, osteoporotic VCF. Initial treatment.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations 1	2	3	4	5	6	7	8	9
Medical management only	Usually appropriate	Strong	N/A	N/A	9	9	0	0	0	0	0	0	1	4	15

References	Study Quality
36 (24325929)	4
108 (19478654)	1
103 (1836154)	4
104 (1627411)	4
107 (24077202)	3
109 (28739478)	4
111 (12052450)	1
110 (12879220)	2

Percutaneous vertebral augmentation	Usually not appropriate	Expert Consensus	N/A	N/A	3	3	7	3	11	0	0	0	0	0	0
Surgical consultation	Usually not appropriate	Expert Consensus	N/A	N/A	3	3	7	2	4	4	2	0	1	0	0
Percutaneous ablation spine	Usually not appropriate	Limited	N/A	N/A	1	1	14	2	4	0	0	0	0	0	0

References	Study Quality
112 (18566009)	4

Radiation oncology consultation	Usually not appropriate	Expert Consensus	N/A	N/A	1	1	14	2	4	0	0	0	0	0	0

Variant 6: Symptomatic osteoporotic VCF with bone marrow edema or intravertebral cleft. Initial treatment.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
Medical management only	Usually appropriate	Strong	N/A	N/A	8	8	0	0	1	0	2	0	4	7	6

References	Study Quality
101 (23251117)	4
108 (19478654)	1
113 (19657122)	1
103 (1836154)	4
104 (1627411)	4
107 (24077202)	3

Percutaneous vertebral augmentation	Usually appropriate	Strong	N/A	N/A	8	8	0	0	0	0	1	1	7	7	4

References	Study Quality
125 (26630417)	1
120 (27400110)	2
22 (27544377)	1
118 (25787683)	2
122 (25404372)	2
21 (24315046)	1
121 (23391839)	3
33 (23021641)	1
23 (21375382)	1
129 (21076886)	3
124 (20625321)	2

128 (20372942)	3
20 (25822543)	1
34 (22116114)	2
36 (24325929)	4
108 (19478654)	1
116 (20190623)	1
113 (19657122)	1
117 (19246088)	1
115 (20701962)	1
114 (19657121)	1
89 (22194515)	2
119 (16429288)	4
123 (18989668)	2
127 (30552168)	4
126 (31325625)	1

Surgical consultation	May be appropriate	Limited	N/A	N/A	5	5	0	0	0	1	17	1	1	1	0

References	Study Quality
130 (25808687)	4

Percutaneous ablation spine	Usually not appropriate	Limited	N/A	N/A	1	1	14	2	3	0	1	0	0	0	0

References	Study Quality
112 (18566009)	4

Radiation oncology consultation	Usually not appropriate	Expert Consensus	N/A	N/A	1	1	15	2	3	0	0	0	0	0	0
Systemic radionuclide therapy	Usually not appropriate	Expert Consensus	N/A	N/A	1	1	17	1	2	0	0	0	0	0	0

Variant 7: New symptomatic VCF. History of prior vertebroplasty or surgery. Initial treatment.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
Percutaneous vertebral augmentation	Usually appropriate	Strong	N/A	N/A	8	8	0	0	0	0	3	0	7	8	2
References	Study Quality														
136 (19581311)	2														
135 (20672965)	2														
133 (29743284)	2														
134 (28072794)	Good														
Medical management only	Usually appropriate	Limited	N/A	N/A	7	7	0	0	2	0	3	1	5	6	3
References	Study Quality														
36 (24325929)	4														
108 (19478654)	1														
107 (24077202)	3														
Surgical consultation	May be appropriate	Limited	N/A	N/A	5	5	0	0	0	1	12	7	1	0	0
References	Study Quality														
137 (21629164)	4														
Percutaneous ablation spine	Usually not appropriate	Limited	N/A	N/A	1	1	11	3	4	0	2	0	0	0	0
References	Study Quality														
112 (18566009)	4														
Radiation oncology consultation	Usually not appropriate	Expert Consensus	N/A	N/A	1	1	12	3	2	2	1	0	0	0	0
Systemic radionuclide therapy	Usually not appropriate	Expert Consensus	N/A	N/A	1	1	15	1	3	1	0	0	0	0	0

Variant 8: Benign VCF with worsening pain, deformity, or pulmonary dysfunction. Initial treatment.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
Percutaneous vertebral augmentation	Usually appropriate	Strong	N/A	N/A	8	8	0	0	0	0	0	1	6	8	5

References	Study Quality
27 (26109687)	2
30 (25844701)	Good
22 (27544377)	1
29 (26071690)	1
28 (25884343)	2
26 (26280719)	2
25 (25300981)	2
24 (24901876)	1
21 (24315046)	1
17 (24253785)	1
141 (24077200)	2
33 (23021641)	1
32 (22628598)	3
23 (21375382)	1
124 (20625321)	2
34 (22116114)	2
36 (24325929)	4
89 (22194515)	2
1 (8324412)	4
107 (24077202)	3
123 (18989668)	2
31 (14736654)	2
138 (10892628)	4
139 (8324411)	4

Surgical consultation	Usually appropriate	Expert Consensus	N/A	N/A	7	7	0	0	1	0	1	2	9	6	2

Medical management only	May be appropriate	Limited	N/A	N/A	5	5	0	1	2	0	12	6	0	0	0

References	Study Quality
36 (24325929)	4
108 (19478654)	1
103 (1836154)	4
104 (1627411)	4
107 (24077202)	3

Percutaneous ablation spine	Usually not appropriate	Limited	N/A	N/A	1	1	13	2	5	0	0	0	0	0	0

References	Study Quality
112 (18566009)	4

Radiation oncology consultation	Usually not appropriate	Expert Consensus	N/A	N/A	1	1	16	1	3	0	0	0	0	0	0
Systemic radionuclide therapy	Usually not appropriate	Expert Consensus	N/A	N/A	1	1	16	1	3	0	0	0	0	0	0

Variant 9: Pathological VCF with ongoing or increasing mechanical pain. Initial treatment.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
Surgical consultation	Usually appropriate	Strong	N/A	N/A	8	8	0	0	0	0	2	1	3	9	5

References	Study Quality
154 (16112300)	1
150 (20562730)	4
137 (21629164)	4
14 (21709187)	3
153 (15450879)	4
151 (-3121235)	4

		152 (26337716)		Good												
		155 (28937455)		4												
Radiation oncology consultation	Usually appropriate	Strong	N/A	N/A	8	8	0	0	0	0	3	0	6	8	3
		References		Study Quality												
		96 (23960179)		4												
		157 (6178497)		1												
		159 (15450875)		4												
		158 (7607970)		2												
		156 (21277118)		4												
		95 (27441748)		4												
		165 (27479724)		4												
		15 (29048517)		Good												
		163 (32540335)		2												
		161 (31119099)		4												
Percutaneous vertebral augmentation	Usually appropriate	Strong	N/A	N/A	7	7	0	0	0	0	2	1	10	4	3
		References		Study Quality												
		17 (24253785)		1												
		148 (21333599)		1												
		149 (8685351)		2												
Percutaneous ablation spine	Usually appropriate	Strong	N/A	N/A	7	7	0	0	1	1	4	2	9	2	1
		References		Study Quality												
		144 (24927327)		3												
		146 (26635286)		2												
		145 (33308579)		4												
		143 (29794238)		2												
		147 (31677728)		4												
Medical management only	May be appropriate	Limited	N/A	N/A	5	5	0	1	0	1	16	2	0	1	0

		References			Study Quality											
		142 (15047923)			4											
Systemic radionuclide therapy	May be appropriate	Limited	N/A	N/A	4	4	5	1	4	1	10	0	0	0	0
		References			Study Quality											
		166 (15653650)			4											
		167 (15925817)			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.**