American College of Radiology
ACR Appropriateness Criteria®

Radiologic Management of Pulmonary Nodules and Masses

Variant 1: Adult. Stable 1 to 3 cm solitary solid pulmonary nodule. Unchanged in diameter for 2 years. Person who smokes. Next step.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
Follow-up imaging only	May be appropriate	Limited	N/A	N/A	6	6	0	1	0	0	5	4	1	1	0

References	Study Quality
17 (37820837)	4
16 (36597231)	3
2 (36049538)	4

Percutaneous lung biopsy	May be appropriate (Disagreement)	Expert Opinion	N/A	N/A	5	5	2	4	2	1	0	1	2	0	0

References	Study Quality
24 (25163758)	4
23 (31084480)	4
20 (34986006)	2
19 (35227506)	3
21 (34121343)	4
22 (34229043)	3
13 (25430528)	3
12 (34654044)	4
4 (35080453)	4
10 (24954230)	2
11 (24581458)	3

Stereotactic body radiotherapy	Usually not appropriate	Limited	N/A	N/A	3	3	4	3	3	1	1	0	0	1	0

References	Study Quality
25 (30226453)	4

Surgical management	Usually not appropriate	Moderate	N/A	N/A	3	3	4	3	3	0	2	0	0	1	0

References	Study Quality
14 (30720402)	3
26 (30772108)	Good

Percutaneous ablation lung	Usually not appropriate	Limited	N/A	N/A	3	3	4	3	3	1	1	0	1	0	0

References	Study Quality
18 (24952227)	2

Endobronchial ultrasound and biopsy	Usually not appropriate	Strong	N/A	N/A	3	3	2	2	4	0	3	1	0	0	0

References	Study Quality
13 (25430528)	3
12 (34654044)	4
10 (24954230)	2
11 (24581458)	3
9 (32967044)	Good
8 (34481209)	2
6 (30103727)	4
4 (35080453)	4
5 (27886860)	2
7 (36640994)	Good

Fiducial marker and surgical management	Usually not appropriate	Limited	N/A	N/A	2	2	4	4	2	1	0	1	1	0	0

References	Study Quality
14 (30720402)	3
15 (30819493)	2

Variant 2: Adult. Serially, enlarging solitary solid pulmonary nodule, now 1 to 3 cm in diameter. Person who smokes. Next step.

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

References	Study Quality
37 (38538978)	3
24 (25163758)	4
20 (34986006)	2
23 (31084480)	4
21 (34121343)	4
22 (34229043)	3
13 (25430528)	3
12 (34654044)	4
19 (35227506)	3
10 (24954230)	2
11 (24581458)	3

Endobronchial ultrasound and biopsy	Usually appropriate	Limited	N/A	N/A	7	7	0	0	0	1	1	1	4	4	2

References	Study Quality
5 (27886860)	2
27 (28074327)	4
28 (31387600)	4

Follow-up imaging only	Usually not appropriate	Limited	N/A	N/A	3	3	3	3	4	1	1	0	1	0	0

References	Study Quality
4 (35080453)	4

Stereotactic body radiotherapy	Usually not appropriate	Strong	N/A	N/A	3	3	1	5	5	1	0	0	0	0	0

References	Study Quality
38 (33811997)	2
39 (29852037)	2

Surgical management	Usually not appropriate	Strong	N/A	N/A	3	3	1	3	6	0	1	0	0	1	0

References	Study Quality
45 (37324102)	2
44 (29547899)	4
43 (30056040)	4
42 (30947705)	4
40 (29959940)	4
41 (37473998)	1

Fiducial marker and surgical management	Usually not appropriate	Moderate	N/A	N/A	3	3	1	4	2	1	3	1	0	0	0

References	Study Quality
31 (26772183)	4
30 (34229986)	3
29 (30958102)	2

Percutaneous ablation lung	Usually not appropriate	Strong	N/A	N/A	2	2	1	6	5	0	0	0	0	0	0

References	Study Quality
36 (34612679)	4
35 (30143031)	2
18 (24952227)	2
33 (36276106)	3
32 (33245066)	2
34 (36039430)	2

Variant 3: Adult. 1 to 3 cm solitary solid pulmonary nodule near the hilum. Identified on initial screening CT chest. Person who smokes. Next step.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
Endobronchial ultrasound and biopsy	Usually appropriate	Strong	N/A	N/A	8	8	0	0	0	0	0	0	4	5	4
References	Study Quality														
47 (30059678)	3														
46 (25611227)	1														
27 (28074327)	4														
5 (27886860)	2														
Percutaneous lung biopsy	May be appropriate	Limited	N/A	N/A	6	6	0	0	1	0	3	8	0	0	0
References	Study Quality														
53 (20351523)	3														
54 (25877365)	4														
Follow-up imaging only	May be appropriate	Limited	N/A	N/A	5	5	0	0	0	0	8	4	0	0	0
References	Study Quality														
50 (30868898)	4														
49 (-3197179)	4														
Surgical management	Usually not appropriate	Limited	N/A	N/A	3	3	1	5	5	0	1	0	0	0	0
References	Study Quality														
58 (33485660)	4														
59 (31163131)	4														
Stereotactic body radiotherapy	Usually not appropriate	Limited	N/A	N/A	2	2	2	5	5	0	0	0	0	0	0
References	Study Quality														

		57 (37924974)	4												
		56 (36027934)	4												
		55 (27131846)	3												
Percutaneous ablation lung	Usually not appropriate	Limited	N/A	N/A	2	2	1	6	5	0	0	0	0	0	0
		References	Study Quality												
		52 (33957875)	3												
		51 (24808438)	3												
Fiducial marker and surgical management	Usually not appropriate	Limited	N/A	N/A	2	2	1	6	3	1	1	0	0	0	0
		References	Study Quality												
		48 (29939888)	4												

Variant 4: Adult. Serially, enlarging solitary solid pulmonary nodule in the periphery of the lung, now 1 to 3 cm in diameter. High risk of poor surgical outcome. Next step.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
Percutaneous lung biopsy	Usually appropriate	Strong	N/A	N/A	8	8	0	0	0	0	0	0	3	6	4
		References	Study Quality												
		24 (25163758)	4												
		19 (35227506)	3												
		13 (25430528)	3												
		12 (34654044)	4												
		10 (24954230)	2												
		11 (24581458)	3												
Stereotactic body radiotherapy	May be appropriate	Limited	N/A	N/A	6	6	0	0	0	2	4	2	3	1	0
		References	Study Quality												
		57 (37924974)	4												

		67 (19251380)		2												
Follow-up imaging only	May be appropriate	Limited	N/A	N/A	5	5	1	3	2	2	3	1	1	0	0
		References		Study Quality												
		50 (30868898)		4												
Percutaneous ablation lung	May be appropriate	Strong	N/A	N/A	5	5	0	0	0	2	5	4	0	1	0
		References		Study Quality												
		66 (24239684)		4												
		65 (36892641)		4												
		62 (24042540)		4												
		64 (35704108)		4												
		36 (34612679)		4												
		63 (36647962)		4												
		18 (24952227)		2												
		33 (36276106)		3												
		32 (33245066)		2												
		34 (36039430)		2												
Endobronchial ultrasound and biopsy	May be appropriate	Moderate	N/A	N/A	5	5	0	0	0	0	8	2	1	1	0
		References		Study Quality												
		28 (31387600)		4												
		60 (40300665)		2												
Fiducial marker and surgical management	Usually not appropriate	Limited	N/A	N/A	3	3	2	6	2	1	0	2	0	0	0
		References		Study Quality												
		61 (23608462)		4												
Surgical management	Usually not appropriate	Limited	N/A	N/A	2	2	2	7	3	0	0	0	0	0	0
		References		Study Quality												
		42 (30947705)		4												

68 (32163551)	4

Variant 5: Adult. 1 to 3 cm solitary solid pulmonary nodule in the periphery of the lung. Previously treated nonpulmonary primary malignancy. Next step.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
Percutaneous lung biopsy	Usually appropriate	Strong	N/A	N/A	8	8	0	0	0	0	0	0	1	8	4
References	Study Quality														
19 (35227506)	3														
13 (25430528)	3														
10 (24954230)	2														
11 (24581458)	3														
Endobronchial ultrasound and biopsy	May be appropriate	Limited	N/A	N/A	6	6	0	0	0	1	4	5	2	0	0
References	Study Quality														
28 (31387600)	4														
Follow-up imaging only	May be appropriate	Limited	N/A	N/A	5	5	0	0	1	1	8	2	0	0	0
References	Study Quality														
16 (36597231)	3														
Surgical management	May be appropriate (Disagreement)	Expert Opinion	N/A	N/A	5	5	1	3	4	0	1	1	2	0	0
References	Study Quality														
75 (29891107)	4														
76 (33858453)	2														
Fiducial marker and surgical management	May be appropriate (Disagreement)	Expert Opinion	N/A	N/A	5	5	1	3	3	1	2	1	1	0	0
References	Study Quality														

		69 (24529549)		4												
Stereotactic body radiotherapy	Usually not appropriate	Moderate	N/A	N/A	3	3	1	5	3	0	2	1	0	0	0
		References		Study Quality												
		74 (35490932)		4												
		73 (25968471)		3												
		72 (32819261)		Good												
Percutaneous ablation lung	Usually not appropriate	Limited	N/A	N/A	3	3	1	5	3	1	1	1	0	0	0
		References		Study Quality												
		71 (36209996)		2												
		70 (36169242)		4												

Variant 6: Adult. 1 to 3 cm solitary ground glass pulmonary nodule which has persisted on short interval follow-up. Findings suspicious for primary lung adenocarcinoma. Next step.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
Percutaneous lung biopsy	Usually appropriate	Limited	N/A	N/A	7	7	0	0	0	1	3	2	2	4	0
		References		Study Quality											
		78 (35305375)		4											
		77 (25406492)		3											
Follow-up imaging only	May be appropriate	Limited	N/A	N/A	6	6	0	0	0	2	4	3	2	1	0
		References		Study Quality											
		49 (-3197179)		4											
Fiducial marker and surgical management	May be appropriate	Moderate	N/A	N/A	6	6	0	0	0	0	6	5	1	0	0
		References		Study Quality											

		29 (30958102)		2												
		30 (34229986)		3												
Endobronchial ultrasound and biopsy	May be appropriate	Limited	N/A	N/A	6	6	0	0	0	2	3	2	5	0	0
		References		Study Quality												
		5 (27886860)		2												
		28 (31387600)		4												
		27 (28074327)		4												
Stereotactic body radiotherapy	Usually not appropriate	Limited	N/A	N/A	3	3	1	4	7	0	0	0	0	0	0
		References		Study Quality												
		73 (25968471)		3												
		74 (35490932)		4												
Surgical management	Usually not appropriate	Limited	N/A	N/A	3	3	1	2	5	0	4	0	0	0	0
		References		Study Quality												
		33 (36276106)		3												
		79 (36219310)		3												
		80 (35965138)		4												
Percutaneous ablation lung	Usually not appropriate	Limited	N/A	N/A	3	3	1	5	6	0	0	0	0	0	0
		References		Study Quality												
		33 (36276106)		3												

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.**