American College of Radiology
ACR Appropriateness Criteria®

Supplemental Breast Cancer Screening Based on Breast Density

Variant 1: Adult female. Supplemental breast cancer screening. Average risk. Nondense breasts.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
Digital breast tomosynthesis screening	Usually appropriate	Limited	☢☢ 0.1-1mSv		9	9	1	1	0	0	0	0	4	2	10

References	Study Quality
2 (-3100780)	4
12 (30107542)	Good
9 (30816931)	3
3 (31063080)	3
10 (35352019)	Good
13 (37249433)	3
4 (2858707)	3
11 (31084476)	4

US breast	Usually not appropriate	Limited	O 0 mSv	O 0 mSv [ped]	3	3	4	4	5	4	0	0	1	0	0

References	Study Quality
20 (32903054)	4
17 (36719288)	Good
7 (37150275)	4
18 (36999589)	4
19 (33032820)	Good

MRI breast without and with IV contrast	Usually not appropriate	Moderate	O 0 mSv	O 0 mSv [ped]	2	2	7	4	4	0	1	1	0	1	0

References	Study Quality
16 (28221097)	1

Mammography with IV contrast	Usually not appropriate	Limited	☢☢ 0.1-1mSv		2	2	8	2	6	0	0	1	0	1	0

References	Study Quality
14 (27097789)	3
15 (36108478)	4

MRI breast without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	2	0	0	0	0	0	0	1
FDG-PET breast dedicated	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv		1	1	17	0	0	0	0	0	0	0	1
Sestamibi MBI	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv		1	1	17	0	0	0	0	0	0	0	1
MRI breast without and with IV contrast abbreviated	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	10	3	2	0	2	0	1	0	0
MRI breast without IV contrast abbreviated	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	16	1	0	0	0	0	0	1	0

Variant 2: Adult female. Supplemental breast cancer screening. Average risk. Heterogeneously dense breasts.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
Digital breast tomosynthesis screening	Usually appropriate	Limited	☢☢ 0.1-1mSv		9	9	0	0	0	0	0	0	1	0	16

References	Study Quality
2 (-3100780)	4
12 (30107542)	Good
20 (32903054)	4

9 (30816931)	3
3 (31063080)	3
17 (36719288)	Good
10 (35352019)	Good
13 (37249433)	3
4 (2858707)	3
11 (31084476)	4

MRI breast without and with IV contrast	May be appropriate	Moderate	O 0 mSv	O 0 mSv [ped]	5	5	0	0	0	0	13	2	2	0	0

References	Study Quality
16 (28221097)	1
17 (36719288)	Good

US breast	May be appropriate	Strong	O 0 mSv	O 0 mSv [ped]	5	5	0	0	0	1	11	4	1	0	0

References	Study Quality
34 (26547101)	2
20 (32903054)	4
33 (34406400)	2
35 (30316869)	1
17 (36719288)	Good
7 (37150275)	4
18 (36999589)	4
19 (33032820)	Good

MRI breast without and with IV contrast abbreviated	May be appropriate	Strong	O 0 mSv	O 0 mSv [ped]	5	5	0	0	0	1	12	2	2	0	0

References	Study Quality
27 (28749202)	4
25 (26152500)	2
24 (24958821)	2
28 (32096852)	1
29 (32931396)	2

References	Study Quality
26 (30887736)	4
23 (37581498)	3
19 (33032820)	Good

Mammography with IV contrast	Usually not appropriate	Strong	☢☢ 0.1-1mSv		2	2	8	4	5	0	0	0	0	0	0

References	Study Quality
21 (30240292)	2
14 (27097789)	3
22 (31453765)	2
15 (36108478)	4

MRI breast without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	14	3	0	0	0	1	0	0	0
FDG-PET breast dedicated	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv		1	1	15	1	1	0	0	0	0	0	1
Sestamibi MBI	Usually not appropriate	Limited	☢☢☢ 1-10 mSv		1	1	12	2	1	1	1	0	0	1	0

References	Study Quality
31 (25615744)	1
32 (27186635)	3
7 (37150275)	4
30 (34887334)	4

MRI breast without IV contrast abbreviated	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	2	0	0	0	0	1	0	0

Variant 3: Adult female. Supplemental breast cancer screening. Average risk. Extremely dense breasts.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
Digital breast tomosynthesis screening	Usually appropriate	Limited	☢☢ 0.1-1mSv		9	9	0	0	1	0	0	0	0	1	15

References	Study Quality
2 (-3100780)	4
12 (30107542)	Good
20 (32903054)	4
9 (30816931)	3
3 (31063080)	3
17 (36719288)	Good
10 (35352019)	Good
13 (37249433)	3
4 (2858707)	3
11 (31084476)	4

MRI breast without and with IV contrast	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	0	0	2	8	5	2

References	Study Quality
36 (31774954)	Good
37 (33724062)	3
38 (18389253)	4

MRI breast without and with IV contrast abbreviated	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	0	0	1	10	4	2

References	Study Quality
27 (28749202)	4
25 (26152500)	2
24 (24958821)	2
28 (32096852)	1
29 (32931396)	2
26 (30887736)	4
23 (37581498)	3
19 (33032820)	Good

US breast	May be appropriate	Strong	O 0 mSv	O 0 mSv [ped]	5	5	0	0	0	1	8	4	4	0	0

References	Study Quality

References	Study Quality
34 (26547101)	2
20 (32903054)	4
33 (34406400)	2
35 (30316869)	1
17 (36719288)	Good
7 (37150275)	4
18 (36999589)	4
19 (33032820)	Good

Mammography with IV contrast	Usually not appropriate	Strong	☢☢ 0.1-1mSv		2	2	6	3	6	1	1	0	0	0	0

References	Study Quality
21 (30240292)	2
14 (27097789)	3
22 (31453765)	2
15 (36108478)	4

MRI breast without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	16	1	0	0	0	0	1	0	0
FDG-PET breast dedicated	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv		1	1	16	1	0	0	0	0	0	1	0
Sestamibi MBI	Usually not appropriate	Limited	☢☢☢ 1-10 mSv		1	1	12	3	1	1	0	0	0	1	0

References	Study Quality
31 (25615744)	1
32 (27186635)	3
7 (37150275)	4
30 (34887334)	4

MRI breast without IV contrast abbreviated	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	2	0	0	0	0	1	0	0

Variant 4: Adult female. Supplemental breast cancer screening. Intermediate risk. Nondense breasts.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
Digital breast tomosynthesis screening	Usually appropriate	Limited	☢☢ 0.1-1mSv		9	9	1	1	0	0	0	0	4	3	9

References	Study Quality
2 (-3100780)	4
12 (30107542)	Good
9 (30816931)	3
3 (31063080)	3
10 (35352019)	Good
13 (37249433)	3
4 (2858707)	3
11 (31084476)	4

MRI breast without and with IV contrast	May be appropriate (Disagreement)	Expert Opinion	O 0 mSv	O 0 mSv [ped]	5	5	0	0	0	5	0	1	9	0	2

References	Study Quality
3 (31063080)	3
39 (35783682)	4

MRI breast without and with IV contrast abbreviated	May be appropriate	Strong	O 0 mSv	O 0 mSv [ped]	5	5	0	0	0	6	8	1	2	0	0

References	Study Quality
27 (28749202)	4
25 (26152500)	2
24 (24958821)	2
28 (32096852)	1
26 (30887736)	4
23 (37581498)	3

US breast	Usually not appropriate	Limited	O 0 mSv	O 0 mSv [ped]	3	3	5	3	5	1	2	0	1	0	1

References	Study Quality
20 (32903054)	4
17 (36719288)	Good
7 (37150275)	4
18 (36999589)	4
19 (33032820)	Good

Mammography with IV contrast	Usually not appropriate	Strong	☢☢ 0.1-1mSv		3	3	5	2	5	1	2	2	0	0	0

References	Study Quality
21 (30240292)	2
14 (27097789)	3
22 (31453765)	2
41 (33787291)	3
15 (36108478)	4

MRI breast without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	16	1	0	0	0	1	0	0	0
FDG-PET breast dedicated	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv		1	1	16	1	0	0	0	0	1	0	0
Sestamibi MBI	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv		1	1	17	0	0	0	0	0	0	1	0
MRI breast without IV contrast abbreviated	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	16	1	0	0	0	0	1	0	0

Variant 5: Adult female. Supplemental breast cancer screening. Intermediate risk. Heterogeneously dense breasts.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
Digital breast tomosynthesis screening	Usually appropriate	Limited	☢☢ 0.1-1mSv		9	9	0	0	0	0	0	0	0	1	16

References	Study Quality

2 (-3100780)	4
12 (30107542)	Good
20 (32903054)	4
9 (30816931)	3
3 (31063080)	3
17 (36719288)	Good
10 (35352019)	Good
13 (37249433)	3
4 (2858707)	3
11 (31084476)	4

MRI breast without and with IV contrast	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	0	1	0	10	4	2

References	Study Quality
3 (31063080)	3
17 (36719288)	Good
7 (37150275)	4

MRI breast without and with IV contrast abbreviated	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	0	1	0	10	4	2

References	Study Quality
27 (28749202)	4
25 (26152500)	2
24 (24958821)	2
28 (32096852)	1
29 (32931396)	2
26 (30887736)	4
23 (37581498)	3
19 (33032820)	Good

US breast	May be appropriate	Strong	O 0 mSv	O 0 mSv [ped]	5	5	0	0	0	0	13	2	2	0	0

References	Study Quality
34 (26547101)	2

20 (32903054)	4
33 (34406400)	2
35 (30316869)	1
17 (36719288)	Good
7 (37150275)	4
18 (36999589)	4
19 (33032820)	Good

Mammography with IV contrast	May be appropriate	Strong	☢☢ 0.1-1mSv		5	5	0	0	0	0	12	4	1	0	0

References	Study Quality
21 (30240292)	2
14 (27097789)	3
22 (31453765)	2
15 (36108478)	4

MRI breast without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	2	0	1	0	0	0	0	0
FDG-PET breast dedicated	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv		1	1	16	1	0	0	0	1	0	0	0
Sestamibi MBI	Usually not appropriate	Limited	☢☢☢ 1-10 mSv		1	1	13	1	1	2	0	0	1	0	0

References	Study Quality
31 (25615744)	1
32 (27186635)	3
7 (37150275)	4
30 (34887334)	4

MRI breast without IV contrast abbreviated	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	2	0	1	0	0	0	0	0

Variant 6: Adult female. Supplemental breast cancer screening. Intermediate risk. Extremely dense breasts.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
Digital breast tomosynthesis screening	Usually appropriate	Limited	☢☢ 0.1-1mSv		9	9	0	0	0	0	0	0	0	2	15

References	Study Quality
2 (-3100780)	4
12 (30107542)	Good
20 (32903054)	4
9 (30816931)	3
3 (31063080)	3
17 (36719288)	Good
10 (35352019)	Good
13 (37249433)	3
4 (2858707)	3
11 (31084476)	4

MRI breast without and with IV contrast	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	7	7	0	0	2	0	3	0	6	4	3

References	Study Quality
36 (31774954)	Good
37 (33724062)	3
38 (18389253)	4

MRI breast without and with IV contrast abbreviated	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	0	1	0	11	2	3

References	Study Quality
25 (26152500)	2
24 (24958821)	2
28 (32096852)	1
29 (32931396)	2
26 (30887736)	4
23 (37581498)	3
19 (33032820)	Good

Mammography with IV contrast	May be appropriate	Strong	☢☢ 0.1-1mSv		6	6	0	0	0	0	7	9	1	0	0

References	Study Quality
21 (30240292)	2
14 (27097789)	3
22 (31453765)	2
41 (33787291)	3
15 (36108478)	4

US breast	May be appropriate	Strong	O 0 mSv	O 0 mSv [ped]	5	5	0	0	0	0	14	2	1	0	0

References	Study Quality
34 (26547101)	2
20 (32903054)	4
33 (34406400)	2
35 (30316869)	1
17 (36719288)	Good
7 (37150275)	4
18 (36999589)	4
19 (33032820)	Good

MRI breast without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	16	1	0	1	0	0	0	0	0
FDG-PET breast dedicated	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv		1	1	17	0	0	0	1	0	0	0	0
Sestamibi MBI	Usually not appropriate	Limited	☢☢☢ 1-10 mSv		1	1	13	0	2	2	0	0	1	0	0

References	Study Quality
31 (25615744)	1
32 (27186635)	3
7 (37150275)	4
30 (34887334)	4

MRI breast without IV contrast abbreviated	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	16	1	0	1	0	0	0	0	0

Variant 7: Adult female. Supplemental breast cancer screening. High risk. Nondense or dense breasts.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
MRI breast without and with IV contrast	Usually appropriate	Moderate	O 0 mSv	O 0 mSv [ped]	9	9	1	1	0	0	0	0	3	3	10

References	Study Quality
5 (30255244)	4
42 (21139507)	1
3 (31063080)	3

Digital breast tomosynthesis screening	Usually appropriate	Limited	☢☢ 0.1-1mSv		9	9	0	0	0	0	0	0	0	1	16

References	Study Quality
2 (-3100780)	4
12 (30107542)	Good
20 (32903054)	4
9 (30816931)	3
3 (31063080)	3
17 (36719288)	Good
10 (35352019)	Good
13 (37249433)	3
4 (2858707)	3
11 (31084476)	4

MRI breast without and with IV contrast abbreviated	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	0	6	1	2	6	2

References	Study Quality
43 (26521970)	4

References	Study Quality
25 (26152500)	2
24 (24958821)	2
26 (30887736)	4
23 (37581498)	3
19 (33032820)	Good

US breast	May be appropriate	Strong	O 0 mSv	O 0 mSv [ped]	5	5	0	0	0	0	10	0	5	2	0

References	Study Quality
34 (26547101)	2
20 (32903054)	4
33 (34406400)	2
35 (30316869)	1
17 (36719288)	Good
7 (37150275)	4
18 (36999589)	4
19 (33032820)	Good

Mammography with IV contrast	May be appropriate	Strong	☢☢ 0.1-1mSv		5	5	0	0	0	0	13	3	1	0	0

References	Study Quality
21 (30240292)	2
14 (27097789)	3
22 (31453765)	2
15 (36108478)	4
23 (37581498)	3

MRI breast without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	15	1	1	1	0	0	0	0	0
FDG-PET breast dedicated	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv		1	1	16	1	0	1	0	0	0	0	0
Sestamibi MBI	Usually not appropriate	Limited	☢☢☢ 1-10 mSv		1	1	12	0	3	1	1	0	1	0	0

References	Study Quality

31 (25615744)	1
32 (27186635)	3
7 (37150275)	4
30 (34887334)	4

MRI breast without IV contrast abbreviated	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	16	0	1	1	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.**