American College of Radiology
ACR Appropriateness Criteria®

Staging and Follow-up of Pancreatic Neuroendocrine Tumors

Variant 1: Adult. Local staging of pancreatic neuroendocrine tumor.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
CT abdomen and pelvis with IV contrast	Usually appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	8	8	0	0	1	0	0	2	1	4	6

References	Study Quality
22 (33064623)	4
21 (25048189)	4
18 (23436873)	4
19 (29140113)	4
20 (34647178)	4
17 (28355596)	4
10 (33978449)	4
2 (29594467)	4
9 (30376977)	4
6 (22915400)	4

CT abdomen and pelvis without and with IV contrast	Usually appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢☢ 10-30 mSv [ped]	7	7	1	0	0	0	1	5	6	1	0
DOTATATE PET/CT skull base to mid-thigh	Usually appropriate	Limited	☢☢☢ 1-10 mSv		7	7	1	0	0	0	2	4	5	1	1

References	Study Quality
26 (20395323)	4

US abdomen endoscopic	May be appropriate	Limited	O 0 mSv	O 0 mSv [ped]	6	6	1	0	0	0	2	9	2	0	0
MRI abdomen without and with IV contrast	May be appropriate (Disagreement)	Expert Opinion	O 0 mSv	O 0 mSv [ped]	5	5	3	2	1	0	0	1	5	1	1
MRI abdomen without and with IV contrast with MRCP	May be appropriate (Disagreement)	Expert Opinion	O 0 mSv	O 0 mSv [ped]	5	5	1	1	1	0	0	0	2	5	4

References	Study Quality
25 (31856076)	4
1 (36737523)	4
17 (28355596)	4
23 (26742109)	4
24 (29025982)	4

References	Study Quality
7 (34175209)	4
9 (30376977)	4

References	Study Quality
9 (30376977)	4
27 (28092495)	4
31 (26850565)	4
18 (23436873)	4
5 (32346794)	4
28 (28619284)	4
33 (26280127)	4
19 (29140113)	4
10 (33978449)	4
20 (34647178)	4
29 (23728305)	2
32 (30182253)	3
21 (25048189)	4

References	Study Quality
33 (26280127)	4

32 (30182253)	3
31 (26850565)	4
30 (26022520)	4
29 (23728305)	2
28 (28619284)	4
18 (23436873)	4
27 (28092495)	4
19 (29140113)	4
10 (33978449)	4
20 (34647178)	4
13 (28480609)	2
9 (30376977)	4
21 (25048189)	4
5 (32346794)	4
6 (22915400)	4

FDG-PET/CT skull base to mid-thigh	May be appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢ 3-10 mSv [ped]	5	5	2	1	2	1	8	0	0	0	0
MRI abdomen without IV contrast with MRCP	May be appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	4	4	1	1	1	5	4	2	0	0	0
CT abdomen and pelvis without IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	3	3	1	4	5	2	0	2	0	0	0
MRI abdomen without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	3	3	4	1	3	4	1	1	0	0	0

Variant 2: Adult. Staging of pancreatic neuroendocrine tumor. Evaluation for metastatic disease.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
CT abdomen and pelvis with IV contrast	Usually appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv	8	8	1	0	0	0	0	0	3	8	2

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations 1	2	3	4	5	6	7	8	9
				[ped]											
References	Study Quality														
17 (28355596)	4														
34 (20010089)	4														
DOTATATE PET/CT skull base to mid-thigh	Usually appropriate	Limited	☢☢☢ 1-10 mSv		8	8	0	0	0	0	0	0	3	5	6
References	Study Quality														
26 (20395323)	4														
25 (31856076)	4														
1 (36737523)	4														
17 (28355596)	4														
23 (26742109)	4														
24 (29025982)	4														
CT chest abdomen pelvis with IV contrast	Usually appropriate	Limited	☢☢☢☢ 10-30 mSv	☢☢☢☢ 3-10 mSv [ped]	7	7	0	0	1	1	2	3	3	0	4
References	Study Quality														
35 (-3197520)	4														
25 (31856076)	4														
1 (36737523)	4														
8 (32675783)	4														
17 (28355596)	4														
23 (26742109)	4														
MRI abdomen and pelvis without and with IV contrast	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	7	7	0	0	1	1	1	0	6	5	0
References	Study Quality														
39 (35550803)	4														
38 (29470627)	4														

References	Study Quality
36 (23533288)	2
25 (31856076)	4
34 (20010089)	4
37 (28902795)	4
9 (30376977)	4
1 (36737523)	4

CT abdomen and pelvis without and with IV contrast	May be appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢☢ 10-30 mSv [ped]	6	6	1	0	0	0	4	6	3	0	0
CT chest abdomen pelvis without and with IV contrast	May be appropriate	Limited	☢☢☢☢ 10-30 mSv	☢☢☢☢☢ 10-30 mSv [ped]	5	5	1	0	0	1	8	2	1	1	0

References	Study Quality
35 (-3197520)	4
25 (31856076)	4
1 (36737523)	4
8 (32675783)	4
17 (28355596)	4
23 (26742109)	4

MRI abdomen and pelvis without IV contrast	May be appropriate	Strong	O 0 mSv	O 0 mSv [ped]	5	5	1	1	1	2	7	1	1	0	0

References	Study Quality
36 (23533288)	2
40 (27345612)	2
41 (21474918)	4

FDG-PET/CT skull base to mid-thigh	May be appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢ 3-10 mSv [ped]	5	5	0	1	0	0	13	0	0	0	0
CT abdomen and pelvis without IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	3	3	4	1	6	1	1	1	0	0	0

CT chest abdomen pelvis without IV contrast	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢ 3-10 mSv [ped]	3	3	2	3	9	0	0	0	0	0	0
US abdomen endoscopic	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	2	2	6	4	2	1	1	0	0	0	0

Variant 3: Adult. Pancreatic neuroendocrine tumor. Imaging after surgical resection, no suspected or known recurrence. Surveillance.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
CT abdomen and pelvis with IV contrast	Usually appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	8	8	0	0	1	0	0	0	4	4	5
	References			Study Quality											
	9 (30376977)			4											
	35 (-3197520)			4											
CT chest abdomen pelvis with IV contrast	Usually appropriate	Limited	☢☢☢☢ 10-30 mSv	☢☢☢☢ 3-10 mSv [ped]	7	7	1	0	0	0	0	3	9	1	0
	References			Study Quality											
	35 (-3197520)			4											
CT abdomen and pelvis without and with IV contrast	May be appropriate (Disagreement)	Expert Opinion	☢☢☢☢ 10-30 mSv	☢☢☢☢☢ 10-30 mSv [ped]	5	5	1	1	0	0	2	8	1	1	0
CT chest abdomen pelvis without and with IV contrast	May be appropriate	Limited	☢☢☢☢ 10-30 mSv	☢☢☢☢☢ 10-30 mSv [ped]	5	5	1	0	3	1	6	3	0	0	0
	References			Study Quality											
	35 (-3197520)			4											
MRI abdomen and pelvis without and with IV contrast	May be appropriate (Disagreement)	Expert Opinion	O 0 mSv	O 0 mSv [ped]	5	5	2	0	0	0	0	0	8	4	0
	References			Study Quality											

		1 (36737523)		4											
		9 (30376977)		4											
		43 (23192781)		4											
DOTATATE PET/CT skull base to mid-thigh	May be appropriate	Limited	☢☢☢ 1-10 mSv		5	5	2	0	0	2	8	1	1	0	0
		References		Study Quality											
		17 (28355596)		4											
		23 (26742109)		4											
		24 (29025982)		4											
		25 (31856076)		4											
		35 (-3197520)		4											
		42 (34985313)		4											
		1 (36737523)		4											
MRI abdomen and pelvis without IV contrast	May be appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	4	4	2	0	0	7	5	0	0	0	0
CT abdomen and pelvis without IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	3	3	3	3	3	3	1	1	0	0	0
CT chest abdomen pelvis without IV contrast	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢ 3-10 mSv [ped]	3	3	2	5	2	3	0	2	0	0	0
FDG-PET/CT skull base to mid-thigh	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢ 3-10 mSv [ped]	3	3	5	2	4	3	0	0	0	0	0
US abdomen endoscopic	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	2	2	6	5	2	0	1	0	0	0	0

Variant 4: Adult. Pancreatic neuroendocrine tumor. Follow-up imaging after treatment. Liver dominant disease.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
CT abdomen and pelvis without	Usually	Limited	☢☢☢☢ 10-30	☢☢☢☢☢	8	8	1	0	0	1	0	2	2	6	2

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
and with IV contrast	appropriate		mSv	10-30 mSv [ped]											

References	Study Quality
17 (28355596)	4
34 (20010089)	4
36 (23533288)	2

MRI abdomen and pelvis without and with IV contrast	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	8	8	0	0	0	0	0	2	3	4	5

References	Study Quality
40 (27345612)	2
39 (35550803)	4
36 (23533288)	2
25 (31856076)	4
37 (28902795)	4
38 (29470627)	4
9 (30376977)	4
1 (36737523)	4

CT chest abdomen pelvis with IV contrast	Usually appropriate	Limited	☢☢☢☢ 10-30 mSv	☢☢☢☢ 3-10 mSv [ped]	7	7	1	0	0	0	1	2	9	1	0

References	Study Quality
35 (-3197520)	4
17 (28355596)	4

CT chest abdomen pelvis without and with IV contrast	Usually appropriate	Limited	☢☢☢☢ 10-30 mSv	☢☢☢☢☢ 10-30 mSv [ped]	7	7	1	0	0	0	2	2	7	2	0

References	Study Quality
35 (-3197520)	4
17 (28355596)	4

CT abdomen and pelvis with IV contrast	May be appropriate (Disagreement)	Expert Opinion	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	5	5	2	0	0	0	1	1	2	6	2

References	Study Quality
17 (28355596)	4
34 (20010089)	4
36 (23533288)	2

MRI abdomen and pelvis without IV contrast	May be appropriate (Disagreement)	Expert Opinion	O 0 mSv	O 0 mSv [ped]	5	5	1	1	1	0	4	6	1	0	0

References	Study Quality
36 (23533288)	2
40 (27345612)	2
41 (21474918)	4

MRI abdomen without IV contrast with MRCP	May be appropriate (Disagreement)	Expert Opinion	O 0 mSv	O 0 mSv [ped]	5	5	2	0	1	1	4	5	1	0	0

References	Study Quality
36 (23533288)	2
40 (27345612)	2
41 (21474918)	4

MRI abdomen without and with IV contrast with MRCP	May be appropriate (Disagreement)	Expert Opinion	O 0 mSv	O 0 mSv [ped]	5	5	1	1	1	1	0	0	6	3	1

References	Study Quality
40 (27345612)	2
39 (35550803)	4
36 (23533288)	2
25 (31856076)	4
37 (28902795)	4
38 (29470627)	4
9 (30376977)	4
1 (36737523)	4

DOTATATE PET/CT skull base to mid-thigh	May be appropriate (Disagreement)	Expert Opinion	☢☢☢ 1-10 mSv		5	5	2	0	0	1	2	7	2	0	0

References	Study Quality
42 (34985313)	4
35 (-3197520)	4
17 (28355596)	4
23 (26742109)	4
24 (29025982)	4
25 (31856076)	4
1 (36737523)	4

CT abdomen and pelvis without IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	3	3	2	2	10	0	0	0	0	0	0
FDG-PET/CT skull base to mid-thigh	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢ 3-10 mSv [ped]	3	3	2	1	5	5	1	0	0	0	0
CT chest abdomen pelvis without IV contrast	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢ 3-10 mSv [ped]	2	2	2	10	1	1	0	0	0	0	0
US abdomen endoscopic	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	10	3	0	0	1	0	0	0	0

Variant 5: Adult. Pancreatic neuroendocrine tumor. Follow-up imaging after treatment. Non-liver dominant disease.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
CT abdomen and pelvis with IV contrast	Usually appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	8	8	1	0	0	0	0	0	3	8	2
CT chest abdomen pelvis with IV contrast	Usually appropriate	Limited	☢☢☢☢ 10-30 mSv	☢☢☢☢ 3-10 mSv [ped]	8	8	1	0	0	1	2	1	2	4	3

References	Study Quality

		35 (-3197520)		4												
MRI abdomen and pelvis without and with IV contrast	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	7	7	0	1	0	0	1	2	7	3	0
		References		Study Quality												
		43 (23192781)		4												
DOTATATE PET/CT skull base to mid-thigh	Usually appropriate	Limited	☢☢☢ 1-10 mSv		7	7	0	1	0	1	1	3	3	3	2
		References		Study Quality												
		24 (29025982)		4												
		8 (32675783)		4												
		1 (36737523)		4												
CT abdomen and pelvis without and with IV contrast	May be appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢☢ 10-30 mSv [ped]	6	6	1	0	0	0	3	9	1	0	0
CT chest abdomen pelvis without and with IV contrast	May be appropriate	Limited	☢☢☢☢ 10-30 mSv	☢☢☢☢☢ 10-30 mSv [ped]	6	6	0	1	0	1	3	7	2	0	0
		References		Study Quality												
		35 (-3197520)		4												
MRI abdomen and pelvis without IV contrast	May be appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	5	5	0	1	0	2	10	1	0	0	0
MRI abdomen without IV contrast with MRCP	May be appropriate	Strong	O 0 mSv	O 0 mSv [ped]	5	5	0	1	2	3	7	1	0	0	0
		References		Study Quality												
		36 (23533288)		2												
		40 (27345612)		2												
MRI abdomen without and with IV contrast with MRCP	May be appropriate (Disagreement)	Expert Opinion	O 0 mSv	O 0 mSv [ped]	5	5	0	1	2	0	7	1	3	0	0
		References		Study Quality												
		43 (23192781)		4												

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

References	Study Quality
42 (34985313)	4

CT abdomen and pelvis without IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	3	3	1	4	9	0	0	0	0	0	0
CT chest abdomen pelvis without IV contrast	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢ 3-10 mSv [ped]	3	3	2	4	8	0	0	0	0	0	0
US abdomen endoscopic	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	10	1	1	0	1	1	0	0	0

Variant 6: Adult. Pancreatic neuroendocrine tumor. Follow-up imaging of untreated disease.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
CT abdomen and pelvis with IV contrast	Usually appropriate	Strong	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	8	8	0	0	0	1	0	1	1	5	6

References	Study Quality
32 (30182253)	3
31 (26850565)	4
30 (26022520)	4
20 (34647178)	4
29 (23728305)	2
21 (25048189)	4
18 (23436873)	4
5 (32346794)	4
10 (33978449)	4
2 (29594467)	4
13 (28480609)	2

		9 (30376977)		4												
MRI abdomen without and with IV contrast with MRCP	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	8	8	1	0	0	1	0	2	3	3	4	
		References		Study Quality												
		38 (29470627)		4												
		32 (30182253)		3												
		31 (26850565)		4												
		27 (28092495)		4												
		29 (23728305)		2												
		21 (25048189)		4												
		5 (32346794)		4												
		19 (29140113)		4												
		10 (33978449)		4												
		20 (34647178)		4												
		13 (28480609)		2												
		9 (30376977)		4												
CT abdomen and pelvis without and with IV contrast	Usually appropriate	Limited	☢☢☢☢ 10-30 mSv	☢☢☢☢☢ 10-30 mSv [ped]	7	7	0	0	1	1	3	1	3	4	1	
		References		Study Quality												
		2 (29594467)		4												
		9 (30376977)		4												
		18 (23436873)		4												
MRI abdomen and pelvis without and with IV contrast	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	1	1	1	7	2	2	
		References		Study Quality												
		38 (29470627)		4												
		33 (26280127)		4												
		31 (26850565)		4												
		27 (28092495)		4												
		29 (23728305)		2												

32 (30182253)	3
5 (32346794)	4
19 (29140113)	4
10 (33978449)	4
20 (34647178)	4
13 (28480609)	2
9 (30376977)	4
21 (25048189)	4

MRI abdomen without IV contrast with MRCP	May be appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	5	5	1	1	1	4	6	1	0	0	0
DOTATATE PET/CT skull base to mid-thigh	May be appropriate (Disagreement)	Expert Opinion	☢☢☢ 1-10 mSv		5	5	1	2	0	1	7	2	1	0	0

References	Study Quality
1 (36737523)	4

MRI abdomen and pelvis without IV contrast	May be appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	4	4	0	1	0	8	5	0	0	0	0
CT abdomen and pelvis without IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	3	3	1	4	8	0	1	0	0	0	0
FDG-PET/CT skull base to mid-thigh	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢ 3-10 mSv [ped]	2	2	5	3	3	2	1	0	0	0	0
US abdomen endoscopic	Usually not appropriate	Limited	O 0 mSv	O 0 mSv [ped]	2	2	3	5	1	0	3	1	1	0	0

References	Study Quality
9 (30376977)	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.**