American College of Radiology
ACR Appropriateness Criteria®

Urinary Tract Infection–Child

Variant 1: Child assigned male at birth (AMB). Younger than 2 months of age. First febrile urinary tract infection with appropriate response to medical management. Initial imaging.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
US kidneys and bladder	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	8	8	0	1	0	0	0	2	4	5	6

References	Study Quality
9 (10835062)	4
26 (11371951)	3
27 (12164349)	3
29 (14669099)	3
30 (12172827)	3
28 (12023172)	3
25 (10103346)	4
10 (24308231)	4
31 (24515519)	3
21 (24104957)	4
8 (25155732)	4
11 (23378477)	4
24 (25963184)	3
23 (24858915)	2
22 (27707778)	3
16 (-3192173)	4

Fluoroscopy voiding cystourethrography	May be appropriate (Disagreement)	Expert Opinion	☢☢ 0.1-1mSv	☢☢ 0.03-0.3 mSv [ped]	5	5	0	1	2	1	5	6	1	1	0

References	Study Quality
9 (10835062)	4
10 (24308231)	4
8 (25155732)	4
11 (23378477)	4
18 (28408468)	3
16 (-3192173)	4
17 (8320616)	3

Voiding urosonography	May be appropriate (Disagreement)	Expert Opinion	O 0 mSv	O 0 mSv [ped]	5	5	0	0	4	1	6	3	2	1	0

References	Study Quality
32 (11687676)	2
34 (9885609)	2
40 (26597418)	3
38 (21523607)	4
36 (22580901)	4
37 (22211993)	2
39 (24442338)	2
35 (29019761)	4
41 (27940735)	4
33 (17639371)	4

DMSA renal scan	Usually not appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	3	3	3	2	7	1	3	2	0	0	0

References	Study Quality
15 (10321827)	4
16 (-3192173)	4
14 (22698573)	4

Nuclear medicine cystography	Usually not appropriate	Limited	☢☢ 0.1-1mSv	☢☢ 0.03-0.3 mSv [ped]	2	2	8	2	2	0	4	1	1	0	0

References	Study Quality
19 (16732797)	3
20 (-3196026)	4

CT abdomen and pelvis with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	13	3	1	0	0	1	0	0	0
CT abdomen and pelvis without IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	15	2	0	1	0	0	0	0	0
CT abdomen and pelvis without and with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢☢ 10-30 mSv [ped]	1	1	16	1	0	0	1	0	0	0	0
CTU without and with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢☢ 10-30 mSv [ped]	1	1	13	2	1	1	1	0	0	0	0
MRI abdomen and pelvis without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	13	1	1	1	2	0	0	0	0
MRU without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	13	2	1	0	1	1	0	0	0
MRI abdomen and pelvis with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	12	2	0	3	1	0	0	0	0

Variant 2: Child assigned female at birth (AFAB). Younger than 2 months of age. First febrile urinary tract infection with appropriate response to medical management. Initial imaging.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
US kidneys and bladder	Usually appropriate	Limited	O 0 mSv	O 0 mSv [ped]	8	8	0	1	0	0	0	2	5	4	6

References	Study Quality
9 (10835062)	4
26 (11371951)	3
27 (12164349)	3
29 (14669099)	3
30 (12172827)	3
28 (12023172)	3
25 (10103346)	4
10 (24308231)	4
31 (24515519)	3
21 (24104957)	4
8 (25155732)	4
11 (23378477)	4
24 (25963184)	3
22 (27707778)	3
16 (-3192173)	4

Fluoroscopy voiding cystourethrography	May be appropriate	Limited	☢☢ 0.1-1mSv	☢☢ 0.03-0.3 mSv [ped]	5	5	0	0	2	3	8	3	0	1	0

References	Study Quality
9 (10835062)	4
42 (3492872)	4
18 (28408468)	3

Voiding urosonography	May be appropriate	Strong	O 0 mSv	O 0 mSv [ped]	5	5	0	0	1	2	9	2	3	0	0

References	Study Quality
32 (11687676)	2
34 (9885609)	2
40 (26597418)	3
38 (21523607)	4
36 (22580901)	4
37 (22211993)	2

		39 (24442338)		2											
		35 (29019761)		4											
		33 (17639371)		4											
Nuclear medicine cystography	May be appropriate	Limited	☢☢ 0.1-1mSv	☢☢ 0.03-0.3 mSv [ped]	4	4	0	1	3	8	3	2	0	0	0
		References		Study Quality											
		19 (16732797)		3											
		42 (3492872)		4											
DMSA renal scan	Usually not appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	3	3	3	1	6	3	3	2	0	0	0
		References		Study Quality											
		15 (10321827)		4											
		16 (-3192173)		4											
		14 (22698573)		4											
CT abdomen and pelvis with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	14	3	0	0	0	1	0	0	0
CT abdomen and pelvis without IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	17	0	0	1	0	0	0	0	0
CT abdomen and pelvis without and with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢☢ 10-30 mSv [ped]	1	1	16	1	0	0	1	0	0	0	0
CTU without and with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢☢ 10-30 mSv [ped]	1	1	13	4	1	0	0	0	0	0	0
MRI abdomen and pelvis without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	14	1	1	1	1	0	0	0	0
MRU without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	13	2	0	1	2	0	0	0	0

MRI abdomen and pelvis with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	13	2	1	1	1	0	0	0	0

Variant 3: Child. 2 months to 6 years of age. First febrile urinary tract infection with appropriate response to medical management. Initial imaging.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
US kidneys and bladder	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	7	7	0	1	0	0	0	4	5	2	6

References	Study Quality
69 (15643258)	3
26 (11371951)	3
27 (12164349)	3
29 (14669099)	3
68 (10799427)	3
30 (12172827)	3
65 (19593590)	3
66 (21074813)	2
67 (11511988)	2
70 (16565830)	3
71 (16502071)	3
72 (15102643)	3
75 (17520245)	2
76 (17024392)	2
77 (12592126)	1
49 (11801699)	2
73 (12529459)	2
28 (12023172)	3
74 (15241674)	1
25 (10103346)	4

		1 (21873693)	4													
		31 (24515519)	3													
		16 (-3192173)	4													
		41 (27940735)	4													
		64 (-3196024)	3													
Fluoroscopy voiding cystourethrography	May be appropriate	Strong	☢☢ 0.1-1mSv	☢☢ 0.03-0.3 mSv [ped]	5	5	0	0	0	1	12	3	0	1	0	
		References	Study Quality													
		60 (15258842)	4													
		59 (16791609)	2													
		58 (16491412)	2													
		62 (20494369)	1													
		50 (12700963)	4													
		7 (21059720)	M													
		61 (20650499)	4													
		43 (24795142)	1													
		16 (-3192173)	4													
		41 (27940735)	4													
Nuclear medicine cystography	May be appropriate	Limited	☢☢ 0.1-1mSv	☢☢ 0.03-0.3 mSv [ped]	5	5	1	0	1	2	9	4	0	0	0	
		References	Study Quality													
		19 (16732797)	3													
		9 (10835062)	4													
		42 (3492872)	4													
		63 (25030771)	3													
		48 (10855622)	M													
Voiding urosonography	May be appropriate (Disagreement)	Expert Opinion	O 0 mSv	O 0 mSv [ped]	5	5	0	0	2	1	7	5	2	0	0	
		References	Study Quality													
		32 (11687676)	2													

		34 (9885609)	2												
		40 (26597418)	3												
		38 (21523607)	4												
		36 (22580901)	4												
		37 (22211993)	2												
		39 (24442338)	2												
		35 (29019761)	4												
		33 (17639371)	4												
DMSA renal scan	Usually not appropriate	Strong	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	3	3	4	3	9	0	0	1	0	0	0
		References	Study Quality												
		52 (17188624)	3												
		5 (21199053)	4												
		53 (18977988)	1												
		54 (18490378)	1												
		47 (16082551)	2												
		49 (11801699)	2												
		51 (18035134)	2												
		46 (11152787)	2												
		50 (12700963)	4												
		48 (10855622)	M												
		56 (21669900)	M												
		55 (1331546)	4												
		45 (22998917)	3												
		57 (24366989)	3												
		16 (-3192173)	4												
CT abdomen and pelvis with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	15	2	0	1	0	0	0	0	0
CT abdomen and pelvis without IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	16	1	0	1	0	0	0	0	0

CT abdomen and pelvis without and with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢☢ 10-30 mSv [ped]	1	1	16	1	0	1	0	0	0	0	0
CTU without and with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢☢ 10-30 mSv [ped]	1	1	13	3	1	1	0	0	0	0	0
MRI abdomen and pelvis without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	14	1	0	1	2	0	0	0	0
MRU without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	14	2	0	1	0	0	1	0	0
MRI abdomen and pelvis with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	13	2	0	2	1	0	0	0	0

Variant 4: Child. Older than 6 years of age. First febrile urinary tract infection with appropriate response to medical management. Initial imaging.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
US kidneys and bladder	May be appropriate (Disagreement)	Expert Opinion	O 0 mSv	O 0 mSv [ped]	5	5	0	0	2	1	8	3	1	1	1
	References		Study Quality												
	16 (-3192173)		4												
Voiding urosonography	May be appropriate (Disagreement)	Expert Opinion	O 0 mSv	O 0 mSv [ped]	5	5	2	0	5	3	3	3	1	0	0
	References		Study Quality												
	16 (-3192173)		4												
Fluoroscopy voiding cystourethrography	Usually not appropriate	Limited	☢☢ 0.1-1mSv	☢☢ 0.03-0.3 mSv [ped]	3	3	5	3	4	3	1	0	2	0	0
	References		Study Quality												
	16 (-3192173)		4												

CT abdomen and pelvis with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	13	3	0	0	1	0	1	0	0
CT abdomen and pelvis without IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	16	0	0	2	0	0	0	0	0
CT abdomen and pelvis without and with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢☢ 10-30 mSv [ped]	1	1	15	1	1	0	0	1	0	0	0
CTU without and with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢☢ 10-30 mSv [ped]	1	1	13	2	1	0	1	1	0	0	0
MRI abdomen and pelvis without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	13	2	0	0	1	2	0	0	0
MRU without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	12	3	0	0	1	1	1	0	0
Nuclear medicine cystography	Usually not appropriate	Limited	☢☢ 0.1-1mSv	☢☢ 0.03-0.3 mSv [ped]	1	1	9	5	2	0	0	1	0	0	0

References	Study Quality
16 (-3192173)	4

MRI abdomen and pelvis with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	12	3	0	0	2	0	1	0	0
DMSA renal scan	Usually not appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	1	1	9	6	0	1	0	1	0	0	0

References	Study Quality
16 (-3192173)	4

Variant 5: Child. Atypical or recurrent febrile urinary tract infections. Initial imaging.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
US kidneys and bladder	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	8	8	0	0	0	0	0	0	4	7	7

References	Study Quality
69 (15643258)	3
26 (11371951)	3
27 (12164349)	3
29 (14669099)	3
68 (10799427)	3
30 (12172827)	3
65 (19593590)	3
66 (21074813)	2
67 (11511988)	2
70 (16565830)	3
71 (16502071)	3
72 (15102643)	3
75 (17520245)	2
76 (17024392)	2
77 (12592126)	1
49 (11801699)	2
73 (12529459)	2
28 (12023172)	3
74 (15241674)	1
25 (10103346)	4
82 (23790712)	4
84 (23525769)	4
31 (24515519)	3
16 (-3192173)	4
41 (27940735)	4
64 (-3196024)	3

Fluoroscopy voiding cystourethrography	Usually appropriate	Moderate	☢☢ 0.1-1mSv	☢☢ 0.03-0.3 mSv [ped]	7	7	1	0	0	1	4	3	1	5	3

References	Study Quality
1 (21873693)	4
43 (24795142)	1
83 (26475948)	4
16 (-3192173)	4
41 (27940735)	4

Voiding urosonography	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	7	7	0	0	1	1	3	4	2	7	0

References	Study Quality
32 (11687676)	2
34 (9885609)	2
40 (26597418)	3
38 (21523607)	4
36 (22580901)	4
37 (22211993)	2
39 (24442338)	2
35 (29019761)	4
33 (17639371)	4

Nuclear medicine cystography	May be appropriate	Limited	☢☢ 0.1-1mSv	☢☢ 0.03-0.3 mSv [ped]	5	5	1	0	0	5	6	4	0	1	0

References	Study Quality
19 (16732797)	3

DMSA renal scan	May be appropriate (Disagreement)	Expert Opinion	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	5	5	1	0	2	3	6	2	1	2	0

References	Study Quality
83 (26475948)	4

CT abdomen and pelvis with IV contrast	May be appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	4	4	3	2	3	4	5	1	0	0	0

References	Study Quality
80 (18845984)	3
82 (23790712)	4
81 (19782999)	4
83 (26475948)	4

MRU without and with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	2	2	9	2	2	0	4	0	1	0	0
CT abdomen and pelvis without IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	12	5	0	1	0	0	0	0	0
CT abdomen and pelvis without and with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢☢ 10-30 mSv [ped]	1	1	12	4	1	0	0	1	0	0	0
CTU without and with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢☢ 10-30 mSv [ped]	1	1	10	2	1	2	2	1	0	0	0
MRI abdomen and pelvis without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	12	2	0	2	1	0	1	0	0
MRI abdomen and pelvis with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	10	3	0	3	0	2	0	0	0

Variant 6: Child. Established vesicoureteral reflux. Follow-up imaging.

Procedure	Appropriateness Category	SOE	Adults RRL	Peds RRL	Rating	Median	Final Tabulations								
							1	2	3	4	5	6	7	8	9
Fluoroscopy voiding cystourethrography	Usually appropriate	Limited	☢☢ 0.1-1mSv	☢☢ 0.03-0.3 mSv [ped]	8	8	0	0	0	0	1	1	3	7	6

References	Study Quality

		61 (20650499)		4												
US kidneys and bladder	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	8	8	0	0	0	0	1	1	2	6	8
		References		Study Quality												
		69 (15643258)		3												
		29 (14669099)		3												
		68 (10799427)		3												
		67 (11511988)		2												
		70 (16565830)		3												
		71 (16502071)		3												
		72 (15102643)		3												
		61 (20650499)		4												
		31 (24515519)		3												
Nuclear medicine cystography	Usually appropriate	Limited	☢☢ 0.1-1mSv	☢☢ 0.03-0.3 mSv [ped]	7	7	1	0	0	0	5	2	6	4	0
		References		Study Quality												
		61 (20650499)		4												
Voiding urosonography	Usually appropriate	Strong	O 0 mSv	O 0 mSv [ped]	7	7	0	0	0	0	2	2	7	5	2
		References		Study Quality												
		32 (11687676)		2												
		34 (9885609)		2												
		40 (26597418)		3												
		38 (21523607)		4												
		36 (22580901)		4												
		37 (22211993)		2												
		39 (24442338)		2												
		35 (29019761)		4												
		33 (17639371)		4												

DMSA renal scan	May be appropriate	Limited	☢☢☢ 1-10 mSv	☢☢☢ 0.3-3 mSv [ped]	6	6	0	0	0	1	5	5	3	3	1

References	Study Quality
61 (20650499)	4
85 (28681079)	3

MRU without and with IV contrast	May be appropriate (Disagreement)	Expert Opinion	O 0 mSv	O 0 mSv [ped]	5	5	1	2	0	2	7	3	2	0	0

References	Study Quality
87 (16786563)	3
86 (24500707)	3

CT abdomen and pelvis with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	15	0	1	0	1	1	0	0	0
CT abdomen and pelvis without IV contrast	Usually not appropriate	Expert Consensus	☢☢☢ 1-10 mSv	☢☢☢☢ 3-10 mSv [ped]	1	1	15	0	2	0	1	0	0	0	0
CT abdomen and pelvis without and with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢☢ 10-30 mSv [ped]	1	1	15	1	1	0	0	0	1	0	0
CTU without and with IV contrast	Usually not appropriate	Expert Consensus	☢☢☢☢ 10-30 mSv	☢☢☢☢☢ 10-30 mSv [ped]	1	1	13	2	0	0	3	0	0	0	0
MRI abdomen and pelvis without IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	13	1	0	1	2	1	0	0	0
MRI abdomen and pelvis with IV contrast	Usually not appropriate	Expert Consensus	O 0 mSv	O 0 mSv [ped]	1	1	13	1	0	1	1	1	1	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.**