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Appendices

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Clinical effectiveness and cost-effectiveness of tests for the diagnosis and investigation of urinary tract infection in children: a systematic review and economic model

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Appendix 1

Advisory panel members

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Appendix 2

Detailed search strategies

This appendix presents the detailed searches carried out to inform the review.

Chosen strategy: strategy illustrated will run in the Ovid interfaces of MEDLINE

1 exp urinary tract infections/
2 bacterial infections/ or exp pseudomonas infections/ or exp klebsiella infections/ or gram negative infections/ or exp escherichia coli/ or exp proteus/ or exp enterococcus/
3 exp Staphylococcus/
4 exp leukocytes/
5 (microbial infection? or bacterial infection?).ti,ab.
6 (urinary or urine or urethra or bladder or ureter? or kidney or kidneys or renal).ti,ab.
7 exp urinary tract/
8 or/2-5
9 or/6-7
10 8 and 9
11 1 or 10
12 exp child, preschool/ or exp infant/
13 (infant? or baby or babies or toddler? or preschooler?).ti,ab.
14 or/12-13
15 11 and 14
16 (risk assessment? or exam or examination or feeding or slow weight gain or fever or vomiting or diarrh?).ti,ab.
17 (((sepsis or failure) adj2 thrive) or malaise or frequent urination or abdominal discomfort or abdominal pain).ti,ab.
18 (delayed bladder control or dysuria or (pain adj3 urination) or painful urination or difficult urination).ti,ab.
19 (urinalysis or urine analysis or urine sample? or urine specimen? or (urine adj3 collect?)).ti,ab.
20 (urine bags or dipstick? or dip stick? or urine microscopy).ti,ab.
21 (reagent strip? or colorimetric test? or gas analysis or impedance or luminescence).ti,ab.
22 (immunological test? or elisa or enzyme test? or bacterial oxygen consumption or turbidimetry or urine culture).ti,ab.
23 (bacterial culture or dipslide? or renal ultrasonography or planar imaging or radiography or urography or pyelography or kub or bladder imaging).ti,ab.
24 (cystography or cystourethrography or nuclear medicine or scintigraphy or cystogram?).ti,ab.
25 exp physical examination/ or exp fever/ or exp body weight changes/ or exp abdominal pain/ or exp urological manifestations/ or failure to thrive/
26 exp vomiting/ or diarrhea/ or exp sepsis/ or urinalysis/
27 exp microscopy/ or exp "indicators and reagents"/
28 colorimetry/ or electric impedance/ or exp immunoassay/ or exp fluorescent antibody technique/
29 exp diagnostic imaging/
30 exp nuclear medicine/ or exp cystoscopy/ or exp diagnostic techniques, urological/
31 or/16-30
32 15 and 31
33 vesico-ureteral reflux/ or pyelonephritis/ or bacteriuria/ or cystitis/
34 (failure adj2 thrive).ti,ab.
35 sepsis.tw.
36 ultrasonography.ti,ab.
37 exp succimer/ or exp organometallic compounds/ or technetium/ or exp sulfhydryl compounds/ or exp culture media/
38 urinary catheterization/ or ammonium chloride/ or c-reactive protein/ or urodynamics/ or urine/mi
39 (dmsa or urogram? or ultrasound? or (renal adj scan?)).ti,ab.
40 (spect or (planar adj image?) or (dip adj slide?) or cystoscopy).ti,ab.
41 ((bladder adj aspiration) or (acidification adj test?) or (cortical adj echogenicity)).ti,ab.
42 workup.ti,ab.
43 (radiographic or cystomanometry).ti,ab.
44 (bladder adj3 (investigat? or detect?)).ti,ab.
45 (kidney adj3 (investigat? or detect?)).ti,ab.
46 (urethra adj3 (investigat? or detect?)).ti,ab.
47 (renal adj3 (investigat? or detect?)).ti,ab.
48 (kidneys adj3 (investigat? or detect?)).ti,ab.
49 (urinary adj3 (investigat? or detect?)).ti,ab.
50 (infection? adj3 (urinary or urine or urethra or bladder or ureter? or kidney or kidneys or renal)).ti,ab.
51 (2 or 3 or 4 or 33) and 7
52 1 or 50 or 51

53 52 and 14
54 or/34-49
55 53 and 54
56 55 not 32

MEDLINE

First draft of search

(1966 to October week 5 2002)

1 exp urinary tract infections/ (27032)
2 bacterial infections/ or exp pseudomonas infections/ or exp klebsiella infections/ or gram negative infections/ or exp escherichia coli/ or exp proteus/ or exp enterococcus/ (217644)
3 exp Staphylococcus/ (41409)
4 exp leukocytes/ (398776)
5 (microbial infection? or bacterial infection?).ti,ab. (11874)
6 (urinary or urine or urethra or bladder or ureter? or kidney or kidneys or renal).ti,ab. (553654)
7 exp urinary tract/ (251201)
8 or/2-5 (645127)
9 or/6-7 (633796)
10 8 and 9 (27291)
11 1 or 10 (49809)
12 exp child, preschool/ or exp infant/ (827649)
13 (infant? or baby or babies or toddler? or preschooler?).ti,ab. (175142)
14 or/12-13 (857927)
15 11 and 14 (7594)
16 (risk assessment? or exam or examination or feeding or slow weight gain or fever or vomiting or diarrh?).ti,ab. (390002)
17 (((sepsis or failure) adj2 thrive) or malaise or frequent urination or abdominal discomfort or abdominal pain).ti,ab. (20335)
18 (delayed bladder control or dysuria or (pain adj3 urination) or painful urination or difficult urination).ti,ab. (1587)
19 (urinalysis or urine analysis or urine sample? or urine specimen? or (urine adj3 collect?)).ti,ab. (17696)
20 (urine bags or dipstick? or dip stick? or urine microscopy).ti,ab. (1074)
21 (reagent strip? or colorimetric test? or gas analysis or impedance or luminescence).ti,ab. (16858)
22 (immunological test? or elisa or enzyme test? or bacterial oxygen consumption or turbidimetry or urine culture).ti,ab. (48330)
23 (bacterial culture or dipslide? or renal ultrasonography or planar imaging or radiography or urography or pyelography or kub or bladder imaging).ti,ab. (25490)
24 (cystography or cystourethrography or nuclear medicine or scintigraphy or cystogram?).ti,ab. (28553)
25 exp physical examination/ or exp fever/ or exp body weight changes/ or exp abdominal pain/ or exp urological manifestations/ or failure to thrive/ (369317)
26 exp vomiting/ or diarrhea/ or exp sepsis/ or urinalysis/ (88329)
27 exp microscopy/ or exp "indicators and reagents"/ (477710)
28 colorimetry/ or electric impedance/ or exp immunoassay/ or exp fluorescent antibody technique/ (320665)
29 exp diagnostic imaging/ (811099)
30 exp nuclear medicine/ or exp cystoscopy/ or exp diagnostic techniques, urological/ (68980)
31 or/16-30 (2116054)
32 15 and 31 (2893)

Second draft of search

(1966 to October week 5 2002). This draft excludes items already found. Results in fullmed4.txt and fullmed5.txt.

1 exp urinary tract infections/ (27032)
2 bacterial infections/ or exp pseudomonas infections/ or exp klebsiella infections/ or gram negative infections/ or exp escherichia coli/ or exp proteus/ or exp enterococcus/ (217644)
3 exp Staphylococcus/ (41409)
4 exp leukocytes/ (398776)
5 (microbial infection? or bacterial infection?).ti,ab. (11874)
6 (urinary or urine or urethra or bladder or ureter? or kidney or kidneys or renal).ti,ab. (553654)
7 exp urinary tract/ (251201)
8 or/2-5 (645127)
9 or/6-7 (633796)
10 8 and 9 (27291)
11 1 or 10 (49809)
12 exp child, preschool/ or exp infant/ (827649)
13 (infant? or baby or babies or toddler? or preschooler?).ti,ab. (175142)
14 or/12-13 (857927)
15 11 and 14 (7594)
16 (risk assessment? or exam or examination or feeding or slow weight gain or fever or vomiting or diarrh?).ti,ab. (390002)
17 (((sepsis or failure) adj2 thrive) or malaise or frequent urination or abdominal discomfort or abdominal pain).ti,ab. (20335)
18 (delayed bladder control or dysuria or (pain adj3 urination) or painful urination or difficult urination).ti,ab. (1587)

19 (urinalysis or urine analysis or urine sample? or urine specimen? or (urine adj3 collect?)).ti,ab. (17696)
20 (urine bags or dipstick? or dip stick? or urine microscopy).ti,ab. (1074)
21 (reagent strip? or colorimetric test? or gas analysis or impedance or luminescence).ti,ab. (16858)
22 (immunological test? or elisa or enzyme test? or bacterial oxygen consumption or turbidimetry or urine culture).ti,ab. (48330)
23 (bacterial culture or dipslide? or renal ultrasonography or planar imaging or radiography or urography or pyelography or kub or bladder imaging).ti,ab. (25490)
24 (cystography or cystourethrography or nuclear medicine or scintigraphy or cystogram?).ti,ab. (28553)
25 exp physical examination/ or exp fever/ or exp body weight changes/ or exp abdominal pain/ or exp urological manifestations/ or failure to thrive/ (369317)
26 exp vomiting/ or diarrhea/ or exp sepsis/ or urinalysis/ (88329)
27 exp microscopy/ or exp "indicators and reagents"/ (477710)
28 colorimetry/ or electric impedance/ or exp immunoassay/ or exp fluorescent antibody technique/ (320665)
29 exp diagnostic imaging/ (811099)
30 exp nuclear medicine/ or exp cystoscopy/ or exp diagnostic techniques, urological/ (68980)
31 or/16-30 (2116054)
32 15 and 31 (2893)
33 vesico-ureteral reflux/ or pyelonephritis/ or bacteriuria/ or cystitis/ (23125)
34 (failure adj2 thrive).ti,ab. (2130)
35 sepsis.tw. (28242)
36 ultrasonography.ti,ab. (30181)
37 exp succimer/ or exp organometallic compounds/ or technetium/ or exp sulfhydryl compounds/ or exp culture media/ (204118)
38 urinary catheterization/ or ammonium chloride/ or c-reactive protein/ or urodynamics/ or urine/mi (30758)
39 (dmsa or urogram? or ultrasound? or (renal adj scan?)).ti,ab. (63607)
40 (spect or (planar adj image?) or (dip adj slide?) or cystoscopy).ti,ab. (12053)
41 ((bladder adj aspiration) or (acidification adj test?) or (cortical adj echogenicity)).ti,ab. (149)
42 workup.ti,ab. (3809)
43 (radiographic or cystomanometry).ti,ab. (38227)
44 (bladder adj3 (investigat? or detect?)).ti,ab. (246)
45 (kidney adj3 (investigat? or detect?)).ti,ab. (242)
46 (urethra adj3 (investigat? or detect?)).ti,ab. (7)
47 (renal adj3 (investigat? or detect?)).ti,ab. (984)
48 (kidneys adj3 (investigat? or detect?)).ti,ab. (63)
49 (urinary adj3 (investigat? or detect?)).ti,ab. (479)
50 (infection? adj3 (urinary or urine or urethra or bladder or ureter? or kidney or kidneys or renal)).ti,ab. (22555)
51 (2 or 3 or 4 or 33) and 7 (14093)
52 1 or 50 or 51 (48512)
53 52 and 14 (9186)
54 or/34-49 (398248)
55 53 and 54 (1988)
56 55 not 32 (1121)

Third draft of search

(1966 to October week 5 2002). This draft excludes items already found. Results in fullmed4.txt and fullmed5.txt.

1 exp urinary tract infections/di or pyelonephritis/di or bacteriuria/di or cystitis/di (6612)
2 bacterial infections/ or exp pseudomonas infections/ or exp klebsiella infections/ or gram negative infections/ or exp escherichia coli/ or exp proteus/ or exp enterococcus/ or exp staphylococcus/ (250261)
3 exp urinary tract/ (251201)
4 2 and 3 (2911)
5 (infection? adj3 (urinary or urine or urethra or ureter? or bladder or kidney or kidneys or renal)).ti,ab. (22555)
6 urinary tract infections/ or pyelonephritis/ or bacteriuria/ or cystitis/ (36723)
7 or/4-6 (47969)
8 (risk assessment? or exam or examination or feeding or slow weight gain or fever or vomiting or diarrh$).ti,ab. (421461)
9 (sepsis or (failure adj2 thrive) or malaise or frequent urination or abdominal discomfort or abdominal pain).ti,ab. (48312)
10 (delayed bladder control or dysuria or (pain adj2 urination) or painful urination or difficult urination).ti,ab. (1578)
11 (urinalysis or urinalyses or urine analys$ or urine sampl$ or (urine adj2 specimen?) or (urine adj2 collect$)).ti,ab. (23602)
12 (urine bag or urine bags or dip stick? or urine microscopy).ti,ab. (223)
13 (reagent strip? or colorimetric test$ or gas analysis or impedance or luminescence).ti,ab. (16858)
14 (immunological test? or elisa or enzyme test? or bacterial oxygen consumption or turbidimetry or urine culture?).ti,ab. (49212)

15 (bacterial culture? or dipslide? or ultrasound or ultrasonography or dipstick? or planar imaging or radiography or urography or pyelography or kub or bladder imaging).ti,ab. (110841)
16 (cystography or cystourethrography or scintigraphy or cystogram?).ti,ab. (24072)
17 exp physical examination/ or exp fever/ or exp body weight changes/ or exp abdominal pain/ or exp urological manifestations/ or failure to thrive/ (369317)
18 exp vomiting/ or diarrhea/ or exp sepsis/ or urinalysis/ (88329)
19 exp microscopy/ or exp "indicators and reagents"/ (477710)
20 colorimetry/ or electric impedance/ or exp immunoassay/ or exp fluorescent antibody technique/ (320665)
21 exp diagnostic imaging/ or exp cystoscopy/ or exp diagnostic techniques, urological/ (857129)
22 exp succimer/ or exp organometallic compounds/ or technetium/ or exp sulfhydryl compounds/ or exp culture media/ (204118)
23 urinary catheterization/ or ammonium chloride/ or c-reactive protein/ or urodynamics/ or urine/mi (30758)
24 (dmsa or urogram? or renal scan$ or spect or planar image? or dip slide? or cystoscopy).ti,ab. (14739)
25 (bladder aspiration or acidification test? or cortical echogenicity).ti,ab. (149)
26 (workup or radiographic or cystomanometry).ti,ab. (41941)
27 (bladder adj2 (investigat$ or detect$ or diagnos$)).ti,ab. (2851)
28 (kidney adj2 (investigat$ or detect$ or diagnos$)).ti,ab. (3829)
29 (urethra adj2 (investigat$ or detect$ or diagnos$)).ti,ab. (186)
30 (renal adj2 (investigat$ or detect$ or diagnos$)).ti,ab. (8746)
31 (kidneys adj2 (investigat$ or detect$ or diagnos$)).ti,ab. (878)
32 (urinary adj2 (investigat$ or detect$ or diagnos$)).ti,ab. (4439)
33 animal/ not (human/ and animal/) (2607560)
34 infant/ or child,preschool/ (630875)
35 adult/ not (adult/ and 34) (2177067)
36 exp neoplasms/ (1414496)
37 36 not (36 and 6) (1411481)
38 exp prostatic hyperplasia/ (10993)
39 exp pregnancy complications/ (202248)
40 exp pregnancy/ (482868)
41 exp diabetes/ (154314)
42 41 not (41 and 6) (153295)
43 exp multiple sclerosis/ (20918)
44 43 not (43 and 6) (20869)
45 exp spinal cord injuries/ (19647)
46 45 not (45 and 6) (19234)
47 exp prostate/ (15881)
48 exp aged/ (1257452)
49 48 not (48 and 34) (1180413)
50 middle age/ (1853948)
51 50 not (50 and 34) (1741644)
52 exp pneumonia,bacterial/ (7628)
53 52 not (52 and 6) (7534)
54 contraception/ or contraceptive devices/ or cesarean section/ (54227)
55 urinary tract infections/th (818)
56 bacterial infections/dt (13677)
57 antibiotics/tu (41019)
58 exp parasitic diseases/ (178865)
59 exp urologic surgical procedures,male/ (24061)
60 55 not (55 and 1) (513)
61 56 not (56 and 1) (13595)
62 57 not (57 and 1) (40585)
63 59 not (59 and 1) (24024)
64 or/8-32 (2350391)
65 7 and 64 (20524)
66 1 or 65 (23205)
67 66 not (33 or 35 or 37 or 38 or 39 or 40 or 42) (13699)
68 67 not (44 or 46 or 47 or 49 or 51 or 53) (11362)
69 68 not (54 or 60 or 61 or 62 or 58 or 63) (10052)
70 from 69 keep 1-1000 (1000)

This strategy seeks to find studies that are not explicitly (at least in terms of words in the title, abstract and subject indexing) about children. The yield is therefore large and has been reduced by careful limits such as removing records that focus on conditions and issues (such as contraception) that will not tend to be related to children. The search has low precision and after exploration the final strategy used with the other databases was based on MEDLINE draft 2.

PREMEDLINE

This was searched via Ovid on the web. The PREMEDLINE issue searched was dated 18 November 2002. Seven records were downloaded to PREMED.

The second MEDLINE strategy above was used: subject headings produced zero hits, but the search logic worked well. The final line was changed to read 55 or 32.

BIOSIS

Searched from 1985 to 11 December 2002, on the Edina service; 1225 hits downloaded in annual batches.

((((((((((((((al: (tomography or diagnosis or diagnosing or diagnostic+)) or (al: (spect or ct scan* or bladder aspiration or acidification or cortical echogenicity or workup* or cystomanometry or cat or computer assisted or tomograp))) or (al: (succimer or organometallic or technetium or sulfhydryl or catheteri* or ammonium chloride or c reactive protein or urodynamics or dmsa))) or (al: (cystogram+ or cystourethography or nuclear medicine or scintigraphy or cystoscopy))) or (al: (urography or urogram+ or pyelography or kub or bladder imag* or cystography))) or (al: (bacterial culture+ or ultrasonogra* or ultrasound or diagnostic imaging or echography or planar imag* or radiography))) or (al: (elisa or immunoassay+ or enzyme test+ or oxygen consumption or turbidimetry or urine culture+))) or (al: (colorimetric or colorimetry or gas analysis or impedance or luminescence or fluorescen* or immunological test*))) or (al: (dipstick+ or dip stick+ or dipslide+ or dip slide+ or urine microscopy or reagent+ or test strip+))) or (al: (dysuria or urinalysis or urinalyses or urine sample+ or urine specimen+ or urine collection or collecting urine or urine bag+))) or (al: (sepsis or thrive or malaise or frequent urination or polyuria or abdominal pain or abdominal discomfort))) or (al: (risk assessment+ or physical exam* or feeding or vomiting or diarrh*)))) and (((al: (child or children or infant+ or baby or babies or toddler+ or pediatric or paediatric)) and (((((al: (bladder or kidney+ or ureter or renal or urinary tract or cystitis or vesicoureteral reflux or pyelonephritis or bacteriuria)) and (al: (bacterial infection+ OR microbial infection+ or pseudomonas or klebsiella or gram negative infection+ or eschrichia coli or proteus or enterococcus or staphylococcus)))) or (al: (urinary tract infection+)))))))

Pascal

Pascal was searched using the Dialog search interface and for the period 1973 to January week 4 2003.

1	10003	(URINARY(W)TRACT(W) INFECTION? ?) OR PYELONEPHRITIS OR BACTERIURIA OR CYSTITIS
2	15142	(URINARY OR URINE OR URETHRA OR URETER? ? OR BLADDER OR KIDNEY? ? OR RENAL)(4N)(BACTERIAL OR PSEUDOMONAS OR KLEBSIELLA OR GRAM(W)NEGATIVE OR ESCHERICHIA(W)COLI OR PROTEUS OR ENTEROCOCCUS OR STAPHYLOCOCCUS OR INFECTION OR INFECTIONS)
3	19491	S1 OR S2
4	260198	RISK(W)ASSESSMENT OR RISK(W)ASSESSMENTS OR EXAM OR EXAMINATION OR FEEDING OR SLOW(W)WEIGHT(W)GAIN OR FEVER OR VOMITING OR DIARRHEA OR DIARRHOEA
5	17101	SEPSIS OR (FAILURE(W)THRIVE) OR MALAISE OR FREQUENT(W)URINATION OR ABDOMINAL(W)DISCOMFORT OR ABDOMINAL(W)PAIN
6	534	DELAYED(W)BLADDER(W) CONTROL OR DYSURIA OR (PAIN(4N)URINATION)
7	3	PAINFUL(W)URINATION OR DIFFICULT(W)URINATION
8	944	URINALYSIS OR URINALYSES
9	6839	URINE(W)(ANALYSIS OR ANALYSES OR SAMPLE? ? OR SAMPLING OR SPECIMEN? ? OR BAG? ? OR MICROSCOPY OR CULTURE? ?)
10	653	URINE(4N)(COLLECTION OR COLLECTING)
11	27	DIP(W)STICK? ?
12	558	REAGENT(W)STRIP? ?
13	66	COLORIMETRIC(W)(TEST OR TESTS OR TESTING)
14	2826	GAS(W)ANALYSIS
15	71394	IMPEDANCE OR LUMINESCENCE
16	394	(IMMUNOLOGICAL OR ENZYME)(W)(TEST? ? OR TESTING)
17	37532	ELISA OR BACTERIAL(W)OXYGEN(W)CONSUMPTION OR TURBIDIMETRY
18	1228	BACTERIAL(W)CULTURE? ?
19	138552	DIPSLIDE? ? OR ULTRASOUND OR ULTRASONOGRAPHY OR DIPSTICK? OR PLANAR(W)IMAGING OR RADIOGRAPHY OR UROGRAPHY OR PYELOGRAPHY OR KUB OR BLADDER(W)IMAGING
20	31238	CYSTOGRAPHY OR CYSTOURETHROGRAPHY OR SCINTIGRAPHY OR CYSTOGRAM? ?
21	964	DMSA OR UROGRAM? ?

22	295	(PLANAR OR RENAL)(W)(SCAN? ? OR SCANNING)
23	6955	SPECT OR DIP(W)SLIDE? ? OR CYSTOSCOPY
24	20	BLADDER(W)ASPIRATION
25	29	ACIDIFICATION(W)(TEST? ? OR TESTING) OR CORTICAL(W)ECHOGENICITY
26	14010	WORKUP OR RADIOGRAPHIC OR CYSTOMANOMETRY
27	2296	BLADDER(4N)(INVESTIGATION? ? OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
28	6350	KIDNEY? ?(4N)(INVESTIGATION? ? OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
29	565	URETHRA(4N)(INVESTIGATION? ? OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
30	6351	RENAL(4N)(INVESTIGATION? ? OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
31	9125	URINARY(4N)(INVESTIGATION? ? OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
32	449207	INFANT? ? OR PRESCHOOL OR PRESCHOOLER? ? OR CHILD OR CHILDREN OR BABY OR BABIES OR PAEDIATRIC? ? OR PEDIATRIC?
33	574159	S4:S31
34	1268	S3 AND S33 AND S32

LILACS

LILACS was searched on the BIREME website on 25 February 2003. The following search terms were used:

(Urinary tract infection$ or uti or infeccion urinaria) AND (child or children or baby or babies or infant or infants or paediatric$ or pediatric$ or ninos or ninas)

In total, 279 records were identified and scanned; 100 records were added to the Endnote Library.

COCHRANE LIBRARY

The 2002/4 issue of the Cochrane Library was searched using the CD-ROM.

1. (URINARY next (TRACT next INFECTION*))
2. (((URINARY-TRACT-INFECTIONS*:ME or PYELONEPHRITIS:ME) or BACTERIURIA:ME) or CYSTITIS:ME)
3. ((BACTERIAL-INFECTIONS:ME or PSEUDOMONAS-INFECTIONS*:ME) or KLEBSIELLA-INFECTIONS*:ME)
4. ((((GRAM-NEGATIVE-INFECTIONS:ME or ESCHERICHIA-COLI*:ME) or PROTEUS*:ME) or ENTEROCOCCUS*:ME) or STAPHYLOCOCCUS*:ME)
5. (URINARY and TRACT*:ME)
6. URINARY-TRACT*:ME
7. ((#3 or #4) and #6)
8. (INFECTION* near URINARY)
9. (INFECTION* near URINE)
10. (INFECTION* near URETHRA)(INFECTION* near URETER*)
11. (INFECTION* near BLADDER)
12. (INFECTION* near KIDNEY*)
13. (INFECTION* near RENAL)
14. (((((((((#1 or #2) or #7) or #8) or #9) or #10) or #11) or #12) or #13) or #14)
15. "RISK ASSESSMENT* OR EXAM OR EXAMINATION* OR FEEDING OR "SLOW WEIGHT GAIN" OR FEVER OR VOMITING OR DIARRH*
16. (((((((RISK next ASSESSMENT*) or EXAM) OR EXAMINATION*) OR FEEDING) OR (SLOW NEXT (WEIGHT NEXT GAIN))) OR FEVER) OR VOMITING) OR DIARRH*)
17. (((((SEPSIS or (FAILURE near THRIVE)) OR MALAISE) OR (FREQUENT NEXT URINATION)) OR (ABDOMINAL NEXT DISCOMFORT)) OR (ABDOMINAL NEXT PAIN))
18. (DELAYED AND ((BLADDER OR ((CONTROL or DYSURIA) OR (PAIN near URINATION))) AND ((PAINFUL OR URINATION) AND (DIFFICULT AND URINATION))))
19. (((((URINALYSIS or URINALYSES) OR (URINE next ANALYS*)) OR (URINE NEXT SAMPL*)) OR (URINE NEAR SPECIMEN*)) OR (URINE NEAR COLLECT*))
20. ((URINE or BAG) AND ((URINE or BAGS) AND ((DIP or STICK*) AND (URINE and MICROSCOPY))))
21. (((((REAGENT next STRIP*) or (COLORIMETRIC next TEST*)) OR (GAS

NEXT ANALYSIS)) OR IMPEDANCE) OR LUMINESCENCE)
22. ((IMMUNOLOGICAL or (TEST* or ELISA)) AND ((ENZYME or TEST*) AND (BACTERIAL AND ((OXYGEN or (CONSUMPTION or TURBIDIMETRY)) AND (URINE and CULTURE*)))))
23. ((BACTERIAL or ((((CULTURE* or DIPSLIDE*) or ULTRASOUND) or ULTRASONOGRAPHY) or DIPSTICK*)) AND ((PLANAR or ((((IMAGING or RADIOGRAPHY) or UROGRAPHY) or PYELOGRAPHY) or KUB)) AND (BLADDER and IMAGING)))
24. (((CYSTOGRAPHY or CYSTOURETHROGRAPHY) or SCINTIGRAPHY) or CYSTOGRAM*)
25. (((((PHYSICAL-EXAMINATION*:ME or FEVER*:ME) or BODY-WEIGHT-CHANGES*:ME) or ABDOMINAL-PAIN*:ME) or UROLOGICAL-MANIFESTATIONS*:ME) or FAILURE-TO-THRIVE:ME)
26. (((VOMITING*:ME or DIARRHEA:ME) or SEPSIS:ME) or URINALYSIS:ME)
27. (MICROSCOPY*:ME or INDICATORS-AND-REAGENTS*:ME)
28. (((COLORIMETRY:ME or ELECTRIC-IMPEDANCE:ME) or IMMUNOASSAY*:ME) or FLUORESCENT-ANTIBODY-TECHNIQUE*:ME)
29. ((DIAGNOSTIC-IMAGING*:ME or CYSTOSCOPY*:ME) or DIAGNOSTIC-TECHNIQUES-UROLOGICAL*:ME)
30. ((((SUCCIMER*:ME or ORGANOMETALLIC-COMPOUNDS*:ME) or TECHNETIUM:ME) or SULFHYDRYL-COMPOUNDS*:ME) or CULTURE-MEDIA*:ME)
31. (((URINARY-CATHETERIZATION*:ME or AMMONIUM-CHLORIDE*:ME) or C-REACTIVE-PROTEIN*:ME) or URODYNAMICS:ME)
32. ((((((DMSA or UROGRAM*) OR (RENAL next SCAN*)) OR SPECT) OR (PLANAR NEXT IMAGE*)) OR (DIP NEXT SLIDE*)) OR CYSTOSCOPY)
33. ((BLADDER or ASPIRATION) AND ((ACIDIFICATION or TEST*) AND (CORTICAL and ECHOGENICITY)))
34. ((WORKUP or RADIOGRAPHIC) or CYSTOMANOMETRY)
35. ((INVESTIGAT* or DETECT*) or DIAGNOS*)
36. ((((((((((#16 or #17) or #18) or #19) or #20) or #21) or #22) or #23) or #24) or #25) or #26) or #27)
37. (((((((((#28 or #29) or #30) or #31) or #32) or #33) or #34) or #35) or #36) or #37)
38. (#15 and #38)
39. ((((((CHILD or CHILDREN) or BABY) or BABIES) or INFANT) or INFANTS) or NEWBORN*)
40. (PEDIATRIC* or PAEDIATRIC*)
41. (CHILD-PRESCHOOL:ME or INFANT*:ME)
42. ((#40 or #41) or #42)
43. [0]
44. (#39 and #43)

Science Citation Index

The database was searched using the Datastar search interface for the period 1980 to 17 January 2003.

1	SCZZ	22615 (URINARY ADJ TRACT ADJ (INFECTION OR INFECTIONS)) OR PYELONEPHRITIS OR BACTERIURIA OR CYSTITIS
2	SCZZ	25913 (URINARY OR URINE OR URETHRA OR URETER OR URETERS OR BLADDER OR KIDNEY OR KIDNEYS OR RENAL) WITH (BACTERIAL OR PSEUDOMONAS OR KLEBSIELLA OR GRAM ADJ NEGATIVE OR ESCHERICHIA ADJ COLI OR PROTEUS OR ENTEROCOCCUS OR STAPHYLOCOCCUS OR INFECTION OR INFECTIONS)
3	SCZZ	31650 1 OR 2
4	SCZZ	357504 RISK ADJ ASSESSMENT OR RISK ADJ ASSESSMENTS OR EXAM OR EXAMINATION OR FEEDING OR SLOW ADJ WEIGHT ADJ GAIN OR FEVER OR VOMITING OR DIARRHEA OR DIARRHOEA
5	SCZZ	46980 SEPSIS OR (FAILURE ADJ THRIVE) OR MALAISE OR FREQUENT ADJ URINATION OR ABDOMINAL ADJ DISCOMFORT OR ABDOMINAL ADJ PAIN
6	SCZZ	808 DELAYED ADJ BLADDER ADJ CONTROL OR DYSURIA OR (PAIN WITH URINATION)
7	SCZZ	1992 URINALYSIS OR URINALYSES
8	SCZZ	11525 URINE ADJ (ANALYSIS OR ANALYSES OR SAMPLE OR SAMPLES OR SAMPLING OR

SPECIMEN OR SPECIMENS OR BAG OR BAGS OR MICROSCOPY OR CULTURE OR CULTURES)
9 SCZZ 1543 URINE WITH (COLLECTION OR COLLECTING)
10 SCZZ 64 DIP ADJ (STICK OR STICKS)
11 SCZZ 349 REAGENT ADJ (STRIP OR STRIPS)
12 SCZZ 121 COLORIMETRIC ADJ (TEST OR TESTS OR TESTING)
13 SCZZ 3049 GAS ADJ ANALYSIS
14 SCZZ 103131 IMPEDANCE OR LUMINESCENCE
15 SCZZ 671 (IMMUNOLOGICAL OR ENZYME) ADJ (TEST OR TESTS OR TESTING)
16 SCZZ 2587 BACTERIAL ADJ (CULTURE OR CULTURES)
17 SCZZ 137428 DIPSLIDE OR DIPSLIDES OR ULTRASOUND OR ULTRASONOGRAPHY OR DIPSTICK OR DIPSTICKS OR PLANAR ADJ IMAGING OR RADIOGRAPHY OR UROGRAPHY OR PYELOGRAPHY OR KUB OR BLADDER ADJ IMAGING
18 SCZZ 27154 CYSTOGRAPHY OR CYSTOURETHROGRAPHY OR SCINTIGRAPHY OR CYSTOGRAM OR CYSTOGRAMS
19 SCZZ 1600 DMSA OR UROGRAM OR UROGRAMS
20 SCZZ 470 (PLANAR OR RENAL) ADJ (SCAN OR SCANS OR SCANNING)
21 SCZZ 31940 SPECT OR DIP ADJ SLIDE OR DIP ADJ SLIDES OR CYSTOSCOPY
22 SCZZ 20 BLADDER ADJ ASPIRATION
23 SCZZ 54 ACIDIFICATION ADJ (TEST OR TESTS OR TESTING) OR CORTICAL ADJ ECHOGENICITY
24 SCZZ 29384 WORKUP OR RADIOGRAPHIC OR CYSTOMANOMETRY
25 SCZZ 3464 BLADDER WITH (INVESTIGATION OR INVESTIGATIONS OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
26 SCZZ 5429 KIDNEY WITH (INVESTIGATION OR INVESTIGATIONS OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
27 SCZZ 205 URETHRA WITH (INVESTIGATION OR INVESTIGATIONS OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
28 SCZZ 12240 RENAL WITH (INVESTIGATION OR INVESTIGATIONS OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
29 SCZZ 1301 KIDNEYS WITH (INVESTIGATION OR INVESTIGATION OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
30 SCZZ 8298 URINARY WITH (INVESTIGATION OR INVESTIGATIONS OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
31 SCZZ 694427 INFANT OR INFANTS OR PRESCHOOL OR PRESCHOOLER OR PRESCHOOLERS OR CHILD OR CHILDREN OR BABY OR BABIES OR PAEDIATRIC OR PAEDIATRICS OR PEDIATRIC OR PEDIATRICS
32 SCZZ 11 PAINFUL ADJ URINATION OR DIFFICULT ADJ URINATION
33 SCZZ 45960 ELISA OR BACTERIAL ADJ OXYGEN ADJ CONSUMPTION OR TURBIDIMETRY

In total, 2612 records were downloaded.

Conference proceedings Index on Dialog

This database is no longer available on Dialog. Conference papers were searched via Biosis and BL Inside Conferences.

BL Inside Conferences on Datastar

This database was searched for the period 1993 to 17 January 2003.

00001 (URINARY ADJ TRACT ADJ (INFECTION OR INFECTIONS)) OR

PYELONEPHRITIS OR BACTERIURIA OR CYSTITIS
00002 (URINARY OR URINE OR URETHRA OR URETER OR URETERS OR BLADDER OR KIDNEY OR KIDNEYS OR RENAL) WITH (BACTERIAL OR PSEUDOMONAS OR KLEBSIELLA OR GRAM ADJ NEGATIVE OR ESCHERICHIA ADJ COLI OR PROTEUS OR ENTEROCOCCUS OR STAPHYLOCOCCUS OR INFECTION OR INFECTIONS)
00003 1 OR 2
00004 RISK ADJ ASSESSMENT OR RISK ADJ ASSESSMENTS OR EXAM OR EXAMINATION OR FEEDING OR SLOW ADJ WEIGHT ADJ GAIN OR FEVER OR VOMITING OR DIARRHEA OR DIARRHOEA
00005 SEPSIS OR (FAILURE ADJ THRIVE) OR MALAISE OR FREQUENT ADJ URINATION OR ABDOMINAL ADJ DISCOMFORT OR ABDOMINAL ADJ PAIN
00006 DELAYED ADJ BLADDER ADJ CONTROL OR DYSURIA OR (PAIN WITH URINATION)
00007 PAINFUL ADJ URINATION OR DIFFICULT ADJ URINATION
00008 URINALYSIS OR URINALYSES
00009 URINE ADJ (ANALYSIS OR ANALYSES OR SAMPLE OR SAMPLES OR SAMPLING OR SPECIMEN OR SPECIMENS OR BAG OR BAGS OR MICROSCOPY OR CULTURE OR CULTURES)
00010 URINE WITH (COLLECTION OR COLLECTING)
00011 DIP ADJ (STICK OR STICKS)
00012 REAGENT ADJ (STRIP OR STRIPS)
00013 COLORIMETRIC ADJ (TEST OR TESTS OR TESTING)
00014 GAS ADJ ANALYSIS
00015 IMPEDANCE OR LUMINESCENCE
00016 (IMMUNOLOGICAL OR ENZYME) ADJ (TEST OR TESTS OR TESTING)
00017 ELISA OR BACTERIAL ADJ OXYGEN ADJ CONSUMPTION OR TURBIDIMETRY
00018 BACTERIAL ADJ (CULTURE OR CULTURES)
00019 DIPSLIDE OR DIPSLIDES OR ULTRASOUND OR ULTRASONOGRAPHY OR DIPSTICK OR DIPSTICKS OR PLANAR ADJ IMAGING OR RADIOGRAPHY OR UROGRAPHY OR PYELOGRAPHY OR KUB OR BLADDER ADJ IMAGING
00020 CYSTOGRAPHY OR CYSTOURETHROGRAPHY OR SCINTIGRAPHY OR CYSTOGRAM OR CYSTOGRAMS
00021 DMSA OR UROGRAM OR UROGRAMS
00022 (PLANAR OR RENAL) ADJ (SCAN OR SCANS OR SCANNING)
00023 SPECT OR DIP ADJ SLIDE OR DIP ADJ SLIDES OR CYSTOSCOPY
00024 BLADDER ADJ ASPIRATION
00025 ACIDIFICATION ADJ (TEST OR TESTS OR TESTING) OR CORTICAL ADJ ECHOGENICITY
00026 WORKUP OR RADIOGRAPHIC OR CYSTOMANOMETRY
00027 BLADDER WITH (INVESTIGATION OR INVESTIGATIONS OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
00028 KIDNEY WITH (INVESTIGATION OR INVESTIGATIONS OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
00029 URETHRA WITH (INVESTIGATION OR INVESTIGATIONS OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
00030 RENAL WITH (INVESTIGATION OR INVESTIGATIONS OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
00031 KIDNEYS WITH (INVESTIGATION OR INVESTIGATIONS OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
00032 URINARY WITH (INVESTIGATION OR INVESTIGATIONS OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
00033 INFANT OR INFANTS OR PRESCHOOL OR PRESCHOOLER OR PRESCHOOLERS OR CHILD OR

CHILDREN OR BABY OR BABIES OR PAEDIATRIC OR PAEDIATRICS OR PEDIATRIC OR PEDIATRICS
00034 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
00035 3 AND 33 AND (32 OR 34)

Six records were identified.

SIGLE

This was searched via the ARC WinSPIRS service for 1980 to 2002/06.

1	9	urinary tract with infection*
2	17	(urine or ureter* or kidney* or renal or bladder) with infection*
3	6	uti
4	0	(urine or ureter* or kidney* or renal or bladder) with pseudomonas
5	0	(urine or ureter* or kidney* or renal or bladder) with klebsiella
6	0	(urine or ureter* or kidney* or renal or bladder) with gram negative
7	5	(urine or ureter* or kidney* or renal or bladder) with coli
8	2	(urine or ureter* or kidney* or renal or bladder) with escherichia
9	0	(urine or ureter* or kidney* or renal or bladder) with proteus
10	0	(urine or ureter* or kidney* or renal or bladder) with enterococcus
11	1	(urine or ureter* or kidney* or renal or bladder) with staphylococcus
12	0	vesicoureteral reflux
13	13	pyelonephritis
14	3	bacteriuria
15	3	cystitis
*16	53	#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15

Dissertation Abstracts

This database was searched using the Datastar interface for the period 1861 to date.

00001 (URINARY ADJ TRACT ADJ (INFECTION OR INFECTIONS)) OR PYELONEPHRITIS OR BACTERIURIA OR CYSTITIS
00002 (URINARY OR URINE OR URETHRA OR URETER OR URETERS OR BLADDER OR KIDNEY OR KIDNEYS OR RENAL) WITH (BACTERIAL OR PSEUDOMONAS OR KLEBSIELLA OR GRAM ADJ NEGATIVE OR ESCHERICHIA ADJ COLI OR PROTEUS OR ENTEROCOCCUS OR STAPHYLOCOCCUS OR INFECTION OR INFECTIONS)
00003 1 OR 2
00004 RISK ADJ ASSESSMENT OR RISK ADJ ASSESSMENTS OR EXAM OR EXAMINATION OR FEEDING OR SLOW ADJ WEIGHT ADJ GAIN OR FEVER OR VOMITING OR DIARRHEA OR DIARRHOEA
00005 SEPSIS OR (FAILURE ADJ THRIVE) OR MALAISE OR FREQUENT ADJ URINATION OR ABDOMINAL ADJ DISCOMFORT OR ABDOMINAL ADJ PAIN
00006 DELAYED ADJ BLADDER ADJ CONTROL OR DYSURIA OR (PAIN WITH URINATION)
00007 PAINFUL ADJ URINATION OR DIFFICULT ADJ URINATION
00008 URINALYSIS OR URINALYSES
00009 URINE ADJ (ANALYSIS OR ANALYSES OR SAMPLE OR SAMPLES OR SAMPLING OR SPECIMEN OR SPECIMENS OR BAG OR BAGS OR MICROSCOPY OR CULTURE OR CULTURES)
00010 URINE WITH (COLLECTION OR COLLECTING)
00011 DIP ADJ (STICK OR STICKS)
00012 REAGENT ADJ (STRIP OR STRIPS)
00013 COLORIMETRIC ADJ (TEST OR TESTS OR TESTING)
00014 GAS ADJ ANALYSIS
00015 IMPEDANCE OR LUMINESCENCE
00016 (IMMUNOLOGICAL OR ENZYME) ADJ (TEST OR TESTS OR TESTING)
00017 ELISA OR BACTERIAL ADJ OXYGEN ADJ CONSUMPTION OR TURBIDIMETRY
00018 BACTERIAL ADJ (CULTURE OR CULTURES)
00019 DIPSLIDE OR DIPSLIDES OR ULTRASOUND OR ULTRASONOGRAPHY OR DIPSTICK OR DIPSTICKS OR PLANAR ADJ IMAGING OR RADIOGRAPHY OR UROGRAPHY OR PYELOGRAPHY OR KUB OR BLADDER ADJ IMAGING
00020 CYSTOGRAPHY OR CYSTOURETHROGRAPHY OR SCINTIGRAPHY OR CYSTOGRAM OR CYSTOGRAMS

00021 DMSA OR UROGRAM OR UROGRAMS
00022 (PLANAR OR RENAL) ADJ (SCAN OR SCANS OR SCANNING)
00023 SPECT OR DIP ADJ SLIDE OR DIP ADJ SLIDES OR CYSTOSCOPY
00024 BLADDER ADJ ASPIRATION
00025 ACIDIFICATION ADJ (TEST OR TESTS OR TESTING) OR CORTICAL ADJ ECHOGENICITY
00026 WORKUP OR RADIOGRAPHIC OR CYSTOMANOMETRY SEARCH TERM 'CYSTOMANOMETRY' NOT IN THIS DATABASE
00027 BLADDER WITH (INVESTIGATION OR INVESTIGATIONS OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
00028 KIDNEY WITH (INVESTIGATION OR INVESTIGATIONS OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
00029 URETHRA WITH (INVESTIGATION OR INVESTIGATIONS OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
00030 RENAL WITH (INVESTIGATION OR INVESTIGATIONS OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
00031 KIDNEYS WITH (INVESTIGATION OR INVESTIGATIONS OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
00032 URINARY WITH (INVESTIGATION OR INVESTIGATIONS OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
00033 INFANT OR INFANTS OR PRESCHOOL OR PRESCHOOLER OR PRESCHOOLERS OR CHILD OR CHILDREN OR BABY OR BABIES OR PAEDIATRIC OR PAEDIATRICS OR PEDIATRIC OR PEDIATRICS
00034 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
00035 3 AND 33 AND (32 OR 34)

NTIS

This database was searched on the Datastar system for the period 1970 to date.

00001 (URINARY ADJ TRACT ADJ (INFECTION OR INFECTIONS)) OR PYELONEPHRITIS OR BACTERIURIA OR CYSTITIS
00002 (URINARY OR URINE OR URETHRA OR URETER OR URETERS OR BLADDER OR KIDNEY OR KIDNEYS OR RENAL) WITH (BACTERIAL OR PSEUDOMONAS OR KLEBSIELLA OR GRAM ADJ NEGATIVE OR ESCHERICHIA ADJ COLI OR PROTEUS OR ENTEROCOCCUS OR STAPHYLOCOCCUS OR INFECTION OR INFECTIONS)
00003 1 OR 2
00004 RISK ADJ ASSESSMENT OR RISK ADJ ASSESSMENTS OR EXAM OR EXAMINATION OR FEEDING OR SLOW ADJ WEIGHT ADJ GAIN OR FEVER OR VOMITING OR DIARRHEA OR DIARRHOEA
00005 SEPSIS OR (FAILURE ADJ THRIVE) OR MALAISE OR FREQUENT ADJ URINATION OR ABDOMINAL ADJ DISCOMFORT OR ABDOMINAL ADJ PAIN
00006 DELAYED ADJ BLADDER ADJ CONTROL OR DYSURIA OR (PAIN WITH URINATION)
00007 PAINFUL ADJ URINATION OR DIFFICULT ADJ URINATION
00008 URINALYSIS OR URINALYSES
00009 URINE ADJ (ANALYSIS OR ANALYSES OR SAMPLE OR SAMPLES OR SAMPLING OR SPECIMEN OR SPECIMENS OR BAG OR BAGS OR MICROSCOPY OR CULTURE OR CULTURES)
00010 URINE WITH (COLLECTION OR COLLECTING)
00011 DIP ADJ (STICK OR STICKS)
00012 REAGENT ADJ (STRIP OR STRIPS)
00013 COLORIMETRIC ADJ (TEST OR TESTS OR TESTING)
00014 GAS ADJ ANALYSIS
00015 IMPEDANCE OR LUMINESCENCE

00016 (IMMUNOLOGICAL OR ENZYME) ADJ (TEST OR TESTS OR TESTING)
00017 ELISA OR BACTERIAL ADJ OXYGEN ADJ CONSUMPTION OR TURBIDIMETRY
00018 BACTERIAL ADJ (CULTURE OR CULTURES)
00019 DIPSLIDE OR DIPSLIDES OR ULTRASOUND OR ULTRASONOGRAPHY OR DIPSTICK OR DIPSTICKS OR PLANAR ADJ IMAGING OR RADIOGRAPHY OR UROGRAPHY OR PYELOGRAPHY OR KUB OR BLADDER ADJ IMAGING
00020 CYSTOGRAPHY OR CYSTOURETHROGRAPHY OR SCINTIGRAPHY OR CYSTOGRAM OR CYSTOGRAMS
00021 DMSA OR UROGRAM OR UROGRAMS
00022 (PLANAR OR RENAL) ADJ (SCAN OR SCANS OR SCANNING)
00023 SPECT OR DIP ADJ SLIDE OR DIP ADJ SLIDES OR CYSTOSCOPY
00024 BLADDER ADJ ASPIRATION
00025 ACIDIFICATION ADJ (TEST OR TESTS OR TESTING) OR CORTICAL ADJ ECHOGENICITY
00026 WORKUP OR RADIOGRAPHIC OR CYSTOMANOMETRY
00027 BLADDER WITH (INVESTIGATION OR INVESTIGATIONS OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
00028 KIDNEY WITH (INVESTIGATION OR INVESTIGATIONS OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
00029 URETHRA WITH (INVESTIGATION OR INVESTIGATIONS OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
00030 RENAL WITH (INVESTIGATION OR INVESTIGATIONS OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
00031 KIDNEYS WITH (INVESTIGATION OR INVESTIGATIONS OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
00032 URINARY WITH (INVESTIGATION OR INVESTIGATIONS OR DETECT OR DETECTION OR DETECTING OR DETECTED OR DIAGNOSIS OR DIAGNOSES OR DIAGNOSTIC)
00033 INFANT OR INFANTS OR PRESCHOOL OR PRESCHOOLER OR PRESCHOOLERS OR CHILD OR CHILDREN OR BABY OR BABIES OR PAEDIATRIC OR PAEDIATRICS OR PEDIATRIC OR PEDIATRICS
00034 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
00035 3 AND 33 AND (32 OR 34)

GreyLit network (http://www.osti.gov/graylit/)

The collections on this site were searched on 28 February 2003 using the following search terms:

Urinary tract infection* diagnos*
Uti diagnos*
Cystitis diagnos*
Pyelonephritis diagnos*
Bacteriuria

No relevant reports were found.

NHS EED

NHS EED was searched using the CRD internal search interface using the following search terms:

Urinary (W)tract(w)infection$ or uti or cystitits or pyelonephritis

Eight records were downloaded.

EMBASE

EMBASE was searched on the Ovid Internet interface on 20 November 2002.

First draft search

1 exp urinary tract infection/ (6254)
2 bacterial infection/ or gram negative infection/ or enterobacter infection/ or staphylococcus infection/ or exp leukocyte/ (130521)
3 vesicoureteral reflux/ or exp pyelonephritis/ or bacteriuria/ or exp cystitis/ (4658)
4 exp urinary tract/ (30814)
5 (infection? adj3 (urinary or urine or urethra or bladder or ureter? or kidney or kidneys or renal)).ti,ab. (5824)
6 (2 or 3) and 4 (1827)
7 or/1,5-6 (10003)

8 exp infant/ or preschool child/ (63588)
9 (infant? or baby or babies or toddler? or preschooler?).ti,ab. (41631)
10 or/8-9 (87280)
11 7 and 10 (1033)
12 exp physical examination/ or weight gain/ or growth retardation/ or fever/ or vomiting/ (50693)
13 exp feeding behavior/ (9803)
14 exp diarrhea/ or sepsis/ or "failure to thrive"/ or malaise/ (29889)
15 polyuria/ or abdominal discomfort/ or exp abdominal pain/ or dysuria/ or exp urinalysis/ (21153)
16 test strip/ or colorimetry/ or exp gas analysis/ or impedance/ or exp luminescence/ (38765)
17 exp immunoassay/ or enzyme assay/ or turbidimetry/ or urine culture/ or bacterium culture/ (67310)
18 exp echography/ or ultrasound/ or planar chromatography/ or exp urologic examination/ or exp scintigraphy/ (93139)
19 exp thiol derivative/ or ammonium chloride/ or "c reactive protein"/ or urodynamics/ (13118)
20 bladder aspiration/ or exp computer assisted tomography/ or exp emission tomography/ (78550)
21 (risk assessment? or exam or examination or feeding or slow weight gain or fever or vomiting or diarrh?).ti,ab. (126362)
22 (sepsis or (failure adj2 thrive) or malaise or frequent urination or abdominal discomfort or abdominal pain).ti,ab. (18269)
23 (delayed bladder control or dysuria or (pain adj3 urination) or painful urination or difficult urination).ti,ab. (564)
24 (urinalysis or urine analysis or urine sample? or urine specimen? or (urine adj3 collect?)).ti,ab. (7025)
25 (urine bags or distick? or dip stick? or urine microscopy or reagent strip?).ti,ab. (151)
26 (colorimetric test? or gas analysis or impedance or luminescence or immunological test?).ti,ab. (6559)
27 (elisa or enzyme test? or bacterial oxygen consumption or turbidimetry or urine culture).ti,ab. (19582)
28 (bacterial culture or dipslide? or ultrasonography or planar imag? or radiography or urography or pyelography or kub or bladder imag?).ti,ab. (18115)
29 (cystography or cystourethrography or nuclear medicine or scintigraphy or cystogram?).ti,ab. (9129)
30 (dmsa or urogram? or ultrasound or renal scan?).ti,ab. (26816)
31 (spect or planar imag? or dip slide? or cystoscopy or bladder aspiration).ti,ab. (6227)
32 (acidification test? or cortical echogenicity or workup? or radiographic or cystomanometry).ti,ab. (12375)
33 (bladder adj3 (investigat? or detect?)).ti,ab. (126)
34 (kidney adj3 (investigat? or detect?)).ti,ab. (100)
35 (urethra adj3 (investigat? or detect?)).ti,ab. (4)
36 (renal adj3 (investigat? or detect?)).ti,ab. (378)
37 (kidneys adj3 (investigat? or detect?)).ti,ab. (23)
38 (urinary adj3 (investigat? or detect?)).ti,ab. (191)
39 or/12-38 (465240)
40 11 and 39 (710)

The second and final search used a combination of the search structures in draft 1 above and MEDLINE draft 2 strategy (above).

Project registers

National Research Register (core NICE)

Issue 2003/1 of the NRR was searched on the Internet.

The search strategy was:

URINARY next (TRACT next INFECTION)
UTI OR CYSTITIS
PYELONEPHRITIS OR URINARY-TRACT-INFECTIONS*:ME
BACTERIURIA OR BACTERIURIA:ME
#1 or #2 or #3 or #4

Twenty-six records of ongoing and completed research were downloaded.

Controlled Clinical Trials

The meta-Register of controlled trials was searched on 24 February 2003 for 'urinary tract infection% or uti'. Of the 40 records identified, three were relevant. Two were on the NRR and the single non-NRR record was printed out.

Internet

This topic is very difficult to search for precisely on the Internet. Altavista (www.altavista.co.uk) was searched on 28 February 2003 using the search string:

(urinary near tract near infection near diagnosis) and (child or children or infant or infants or pediatric or paediatrics or baby or babies)

In total, 683 results were returned. The first 200 were scanned for relevance and to yield further papers.

Additional searches

Additional searches for product names associated with diagnostic tests for UTI were conducted.

MEDLINE

(1966 to April week 3 2003 (OVID http://gateway.uk.ovid.com/athens)

1 exp Urinary Tract Infections/
2 testuria.ti,ab,sh
3 uricult.ti,ab,sh
4 bacturcult.ti,ab,sh
5 combi.ti,ab,sh
6 multistix.ti,ab,sh
7 nephur.ti,ab,sh
8 uristix.ti,ab,sh
9 uriglox.ti,ab,sh
10 urocomb.ti,ab,sh
11 (bac-up-dip or bac?u?dip or BUD).ti,ab,sh
12 chemstrip.ti,ab,sh
13 clinitek.ti,ab,sh
14 bm.ti,ab,sh
15 stat.ti,ab,sh
16 super.ti,ab,sh
17 combur.ti,ab,sh
18 (iris or international remote).ti,ab,sh
19 bactoscan.ti,ab,s
20 urotron.ti,ab,sh
21 filtracheck.ti,ab,sh
22 (automated urine analy?er).ti,ab,sh
23 euron.ti,ab,sh
24 urine collection pad.ti,ab,sh
25 uriscreen.ti,ab,sh
26 or /2-25
27 1 and 26

NB. Explosion of UTI selects its more specific terms Bacteriuria, Pyuria and Schistosomiasis haematobia.

EMBASE 1980 to 2003 Week 17 (OVID http://gateway.uk.ovid.com/athens)

1 exp Urinary Tract Infection/ or BACTERIURIA/
2 testuria.ti,ab,sh
3 uricult.ti,ab,sh
4 bacturcult.ti,ab,sh
5 combi.ti,ab,sh
6 multistix.ti,ab,sh
7 nephur.ti,ab,sh
8 uristix.ti,ab,sh
9 uriglox.ti,ab,sh
10 (bac-up-dip or bac?u?dip or BUD).ti,ab,sh
11 chemstrip.ti,ab,sh
12 clinitek.ti,ab,sh
13 bm.ti,ab,sh
14 stat.ti,ab,sh
15 super.ti,ab,sh
16 combur.ti,ab,sh
17 labstix.ti,ab,sh
18 (iris or international remote).ti,ab,sh
19 bactoscan.ti,ab,sh
20 urotron.ti,ab,sh
21 filtracheck.ti,ab,sh
22 automated urine analy?er.ti,ab,sh
23 euron.ti,ab,sh
24 urine collection pad.ti,ab,sh
25 uriscreen.ti,ab,sh

NB. Explosion of UTI selects its associated terms Gonococcal Urethritis and Kidney Infection-Abscess, Tuberculosi, Pyonephrosis

Appendix 3

Search strategies for information used to populate the decision model

MEDLINE (1966 to April week 1 2003), using the Ovid Web interfaces, was searched for information to answer the following questions. The searches inevitably retrieved many duplicate records and records were deduplicated.

Decision model question	Total records retrieved	Unique records loaded into database
1.1 Incidence and prevalence of UTI in infants	242	242
1.3 Incidence and prevalence of UTI in preschool children	113	113
1.5 Incidence and prevalence of UTI in children over 5 years	414	152
1.2 Consequences of missed UTI in infants	364	347
1.4 Consequences of missed UTI in preschool children	111	108
1.6 Consequences of missed UTI in children over 5 years	203	184
2.1 What proportion of infants with symptoms of UTI do not see a GP?	22	14
2.4 What proportion of preschool children with symptoms of UTI do not see a GP?	33	11
2.7 What proportion of children over 5 with symptoms of UTI do not see a GP?	15	9
2.2 How many GP consultations per year are there for suspected UTI in infants?	4	4
2.5 How many GP consultations per year are there for suspected UTI in preschool children?	2	1
2.8 How many GP consultations per year are there for suspected UTI in children over 5?	3	1
2.3 What proportion of true-positive cases in infants are referred for imaging?	12	7
2.6 What proportion of true-positive cases in preschool children are referred for imaging?	2	1
2.9 What proportion of true-positive cases in children over 5 are referred for imaging?	9	1
3.1 What proportion of infants presenting with suspected UTI are treated without diagnostic test?	9	9
3.4 What proportion of preschool children presenting with suspected UTI are treated without diagnostic test?	5	4
3.7 What proportion of children over 5 presenting with suspected UTI are treated without diagnostic test?	7	6
3.2 What proportion of infants are given a diagnostic test before any treatment?	98	97
3.5 What proportion of preschool children are given a diagnostic test before any treatment?	24	24
3.8 What proportion of children over 5 are given a diagnostic test before any treatment?	51	23
3.3 If infants are treated for UTI without a diagnostic test what proportion of these are subsequently referred for imaging?	5	1
3.6 If preschool children are treated for UTI without a diagnostic test what proportion of these are subsequently referred for imaging?	0	0
3.9 If children over 5 are treated for UTI without a diagnostic test what proportion of these are subsequently referred for imaging?	2	0
4.1 What percentage of infants get which imaging technique?	5	4
4.5 What percentage of preschool children get which imaging technique?	0	0
4.9 What percentage of children over 5 get which imaging technique?	2	2
4.2, 4.3 and 4.4 What proportion of infants who have an imaging test have severe/mild/no reflux?	132	125
4.6, 4.7 and 4.8 What proportion of preschool children who have an imaging test have severe/mild/no reflux?	0	0
4.10, 4.11 and 4.12 What proportion of children over 5 who have an imaging test have severe/mild/no reflux?	22	18
5.1 and 5.2 What is the disutility associated with an acute or a missed UTI in infants?	15	12

continued

Decision model question	Total records retrieved	Unique records loaded into database
5.3 and 5.4 What is the disutility associated with an acute or a missed UTI in preschool children?	8	6
5.5 and 5.6 What is the disutility associated with an acute or a missed UTI in children over 5?	8	6
6.1 and 6.2 and 6.3 What is the disutility associated with each imaging technique in infants, preschool children and children over 5?	8	1

Answers to the following questions were also derived from other information sources:

Decision model question	Information source
2.3 How many GP consultations per year are there for suspected UTI in infants?	McCormick[278]
2.6 How many GP consultations per year are there for suspected UTI in preschool children?	McCormick[278]
2.9 How many GP consultations per year are there for suspected UTI in children over 5?	McCormick[278]

The search strategies for the questions are shown below:

Questions 1.1 (set 4), 1.3 (set 6) and 1.5 (set 9)

1 exp *urinary tract infections/ep or exp *bacteriuria/ep
2 exp infants/
3 1 and 2
4 Child, Preschool/
5 1 and 5
6 6 not 3
7 child/
8 1 and 8
9 8 not (3 or 6)

Questions 1.2 (set 11), 1.4 (set 14) and 1.6 (set 17)

1 exp *urinary tract infections/co or exp *bacteriuria/co
2 exp *urinary tract infections/ or exp *bacteriuria/
3 missed diagnos$.ti,ab.
4 untreated infection$.ti,ab.
5 missed infection$.ti,ab.
6 (consequences or effects).ti,ab.
7 or/3-6
8 2 and 7
9 1 or 8
10 exp infants/
11 9 and 10
12 children, preschool/
13 9 and 12
14 13 not 11
15 child/
16 9 and 15
17 16 not (11 or 14)

Questions 2.1 (set 7), 2.4 (set 10), and 2.7 (set 13)

1 exp *urinary tract infections/ or exp *bacteriuria/
2 exp infants/
3 (undiagnosed or untreated or missed diagnos$).ti,ab.
4 (unrecognised or unrecognized).ti,ab.
5 (fail$ adj4 (attend or present)).ti,ab.
6 or/3-5
7 1 and 2 and 6
8 children, preschool/
9 1 and 8 and 6
10 9 not 7
11 child/
12 1 and 11 and 6
13 12 not (7 or 10)

Questions 2.2 (set 15), 2.5 (set 18) and 2.8 (set 21)

1 exp urinary tract infections/
2 exp bacteriuria/
3 (consult or consultation or consultation or visit or visits or attendance$).ti,ab.
4 "REFERRAL AND CONSULTATION"/
5 exp great britain/
6 (england or wales or scotland or ireland or uk or gb).in.
7 united kingdom.in.
8 great britain.in.
9 audit.ti,ab. or medical audit/
10 or/1-2
11 or/3-4,9
12 or/5-9
13 10 and 11 and 12
14 infants/
15 13 and 14
16 children, preschool/

17 13 and 16
18 17 not 15
19 child/
20 13 and 19
21 20 not (15 or 18)

Questions 2.3 (set 39), 2.6 (set 42) and 2.9 (set 45)
1 exp urinary tract infections/
2 exp bacteriuria/
3 "REFERRAL AND CONSULTATION"/
4 exp great britain/
5 (england or wales or scotland or ireland or uk or gb).in.
6 united kingdom.in.
7 great britain.in.
8 infants/
9 children, preschool/
10 child/
11 exp Diagnostic Imaging/
12 (refer or referral or referrals or referred).ti,ab.
13 imaging.ti,ab.
14 scintigraphy.ti,ab.
15 urography.ti,ab.
16 (cystography or tomography or ct).ti,ab.
17 (radiography or renography).ti,ab.
18 (ultrasound or ultrasonography).ti,ab.
19 dmsa.ti,ab.
20 cystosonography.ti,ab.
21 vcug.ti,ab.
22 or/11,13-21
23 or/1-2
24 or/3,12
25 or/4-7
26 22 and 23 and 24 and 25
27 26 and 8
28 26 and 9
29 28 not 27
30 26 and 10
31 30 not (27 or 29)
32 positive.ti,ab.
33 "sensitivity and specificity"/
34 positives.ti,ab.
35 or/32-34
36 23 and 35
37 36 and 25
38 37 and 8
39 27 or 38
40 37 and 9
41 40 or 29
42 41 not 39
43 37 and 10
44 31 or 43
45 44 not (39 or 42)

Questions 3.1 (set 15), 3.4 (set 18) and 3.7 (set 21)
1 exp *urinary tract infections/
2 exp *urinary tract infections/di
3 primary care.mp. or exp Primary Health Care/
4 family practice.mp. or Family Practice/
5 (family practitioner$ or general practi$).ti,ab.
6 or/3-5
7 2 and 6
8 (test or tests or result$).ti,ab.
9 1 and 8
10 9 and 6
11 ((untested or without) adj3 test$).ti,ab.
12 1 and 11
13 or/7,10,12
14 exp infants/
15 13 and 14
16 children, preschool/
17 13 and 16
18 17 not 15
19 children/
20 13 and 19
21 20 not (15 or 18)

Questions 3.2 (set 23), 3.5 (set 25) and 3.8 (set 27)
1 exp *urinary tract infections/
2 exp *urinary tract infections/di
3 primary care.mp. or exp Primary Health Care/
4 family practice.mp. or Family Practice/
5 (family practitioner$ or general practi$).ti,ab.
6 or/3-5
7 2 and 6
8 (test or tests or result$).ti,ab.
9 1 and 8
10 9 and 6
11 ((untested or without) adj3 test$).ti,ab.
12 1 and 11
13 or/7,10,12
14 exp infants/
15 13 and 14
16 children, preschool/
17 13 and 16
18 17 not 15
19 children/
20 13 and 19
21 20 not (15 or 18)
22 2 and 14
23 22 not (15 or 18 or 21)
24 2 and 16
25 24 not (15 or 18 or 21 or 23)
26 2 and 19
27 26 not (15 or 18 or 21 or 23 or 25)

Questions 3.3 (set 10), 3.6 (set 12) and 3.9 (set 14)
1 exp *urinary tract infections/
2 exp infants/
3 children, preschool/
4 children/
5 investigation$.ti,ab.
6 primary care/ or primary care.ti,ab.
7 family practice/ or family practice.ti,ab.

8 (family practitioner$ or general practi$).ti,ab.
9 or/6-8
10 1 and 2 and 5 and 9
11 1 and 3 and 5 and 9
12 11 not 10
13 1 and 4 and 5 and 9
14 13 not 11

Questions 4.1 (set 9), 4.5 (set 10), and 4.9 (set 11)
1 exp *urinary tract infections/
2 exp infants/
3 children, preschool/
4 children/
5 exp DIAGNOSTIC IMAGING/
6 exp great britain/
7 (england or ireland or wales or scotland or uk or united kingdom or gb or great britain).ti,ab,in.
8 or/6-7
9 1 and 2 and 5 and 8
10 (1 and 3 and 5 and 8) not 9
11 (1 and 4 and 5 and 8) not (9 or 10)

Questions 4.2 (set 10), 4.3 (set 10), and 4.4 (set 10)
1 exp infants/
2 children, preschool/
3 children/
4 exp DIAGNOSTIC IMAGING/
5 exp Vesico-Ureteral Reflux/
6 (vesicoureteral reflux or vesico ureteral reflux).ti,ab.
7 or/5-6
8 4 and 7
9 1 and 8
10 limit 9 to english language

Questions 4.6 (set 12), 4.7 (set 12), and 4.8 (set 12)
1 exp infants/
2 children, preschool/
3 children/
4 exp DIAGNOSTIC IMAGING/
5 exp Vesico-Ureteral Reflux/
6 (vesicoureteral reflux or vesico ureteral reflux).ti,ab.
7 or/5-6
8 4 and 7
9 1 and 8
10 limit 9 to english language
11 (2 and 8) not 10
12 limit 11 to english language

Questions 4.10 (set 14), 4.11 (set 14) and 4.12 (set 14)
1 exp infants/
2 children, preschool/
3 children/
4 exp DIAGNOSTIC IMAGING/
5 exp Vesico-Ureteral Reflux/
6 (vesicoureteral reflux or vesico ureteral reflux).ti,ab.
7 or/5-6
8 4 and 7
9 1 and 8
10 limit 9 to english language
11 (2 and 8) not 10
12 limit 11 to english language
13 (3 and 8) not (10 or 12)
14 limit 13 to english language

Questions 5.1 (set 21) and 5.2 (set 21); questions 5.3 (set 25) and 5.4 (set 25)
1 exp *urinary tract infections/
2 (sf36 or sf 36 or eq5d or eq 5d or euroqol or euro qol).ti,ab.
3 (short form or shortform or sf 36 or sf thirty six or sf36).ti,ab.
4 (hrql or hrqol or h qol or hql or hqol or hr qol).ti,ab.
5 (hye or hyes or health$ year$ equivalent$ or utilit$).ti,ab.
6 health related quality.ti,ab.
7 rosser.ti,ab.
8 (standard gamble$ or time trade$ or timetrade$ or tto or willingness).ti,ab.
9 (disutilit$ or daly or dalys or disability adjusted).ti,ab.
10 "quality of life"/
11 quality adjusted life year/
12 health status indicators/
13 (qaly$ or quality adjusted life or life quality).ti,ab.
14 (qwb or qwbs or uwellbeing or factor analysis).ti,ab.
15 (preference$ or state or states or hspv).ti,ab.
16 hui.ti,ab.
17 or/2-16
18 1 and 17
19 infant/
20 18 and 19
21 limit 20 to english language
22 child,preschool/
23 18 and 22
24 limit 23 to english language
25 24 not 21
26 child/
27 18 and 26
28 limit 27 to english language
29 28 not (21 or 25)

Questions 6.1 (set 21), 6.2 (set 21) and 6.3 (set 21)
1 exp diagnostic imaging/
2 exp urinary tract infections/
3 1 and 2

4 (sf36 or sf 36 or eq5d or eq 5d or euroqol or euro qol).ti,ab.
5 (short form or shortform or sf 36 or sf thirty six or sf36).ti,ab.
6 (hrql or hrqol or h qol or hql or hqol or hr qol).ti,ab.
7 (hye or hyes or health$ year$ equivalent$ or utilit$).ti,ab.
8 health related quality.ti,ab.
9 rosser.ti,ab.
10 (standard gamble$ or time trade$ or timetrade$ or tto or willingness).ti,ab.
11 (disutilit$ or daly or dalys or disability adjusted).ti,ab.
12 "quality of life"/
13 quality adjusted life year/
14 health status indicators/
15 (qaly$ or quality adjusted life or life quality).ti,ab.
16 (qwb or qwbs or uwellbeing or factor analysis).ti,ab.
17 (qwb or qwbs or wellbeing or factor analysis).ti,ab.
18 (preference$ or state or states or hspv).ti,ab.
19 hui.ti,ab.
20 or/4-19
21 3 and 20

Appendix 4

QUADAS and details of criteria for scoring studies

1.	**Was the spectrum of patients representative of the patients who will receive the test in practice?**	
	Yes	UTI diagnosis: unselected of consecutive population of children suspected of having a UTI Further investigation: patients with confirmed UTI.
	No	All other patient spectra including retrospectively selected patient spectra.
	Unclear	If insufficient details are provided to make a judgement as to whether the patient spectrum would be scored as 'yes'.

2.	**Were selection criteria clearly described?**	
	Yes	Enough details are provided of how patients were selected so that the selection process could be replicated.
	No	Insufficient details are presented.
	Unclear	Not applicable.

3.	**Is the reference standard likely to correctly classify the target condition?**	
	Yes	UTI diagnosis: culture. Further investigation: diagnosis of APN: acute DMSA scan (<4 weeks) diagnosis of reflux: MCUG diagnosis of scarring: follow-up DMSA scan (at least 8 weeks).
	No	All other reference standards.
	Unclear	If details of the reference standard are not reported.

4.	**Is the time period between reference standard and index test short enough to be reasonably sure that the target condition did not change between the two tests?**	
	Yes	UTI diagnosis: should be performed on the same sample of urine. Further investigation: within 3 months.
	No	If not as above.
	Unclear	If details are not reported.

5.	**Did the whole sample or a random selection of the sample, receive verification using a reference standard of diagnosis?**	
	Yes	If the whole sample or a random selection of the sample received the same reference standard.
	No	If only a selected sample received the reference standard.
	Unclear	If it is not clear whether all the patients received the reference standard.

6.	**Did patients receive the same reference standard regardless of the index test result?**
Yes	If all patients received the same reference standard.
No	If some patients received a different reference standard.
Unclear	If it is not clear whether all patients received the same reference standard.

7.	**Was the reference standard independent of the index test (i.e. the index test did not form part of the reference standard)?**
Yes	If the index test and reference standard were independent.
No	If the index test formed part of the reference standard.
Unclear	If it is not clear if the index test and reference standard were independent.

8a.	**Was the execution of the index test described in sufficient detail to permit replication of the test?**
8b.	**Was the execution of the reference standard described in sufficient detail to permit its replication?**
Yes	If sufficient details of test execution are reported.
No	If sufficient details are not reported.
Unclear	Not applicable.

9a.	**Were the index test results interpreted without knowledge of the results of the reference standard?**
9b.	**Were the reference standard results interpreted without knowledge of the results of the index test?**
Yes	If the index test was interpreted without knowledge of the results of the reference standard and vice versa. If one test was clearly interpreted before the results of the other test were available then this should be scored as 'yes'.
No	If the person interpreting the index test was aware of the results of the reference standard or vice versa.
Unclear	If no information is provided regarding whether tests were interpreted blindly.

10.	**Were the same clinical data available when test results were interpreted as would be available when the test is used in practice?**
Yes	Dipstick or near patient tests: if clinical data were available. Culture or microscopy: if clinical data were not available. Further investigation: if clinical data were available.
No	If not as above.
Unclear	If details on the availability of clinical data are not reported.

11. Were uninterpretable/intermediate test results reported?		
	Yes	If details are provided on uninterpretable/intermediate test results.
	No	If there appear to be some uninterpretable/intermediate but the results of these are not reported.
	Unclear	If it is not clear whether there were any uninterpretable/intermediate test results.

12. Were withdrawals from the study explained?		
	Yes	If all patients recruited into the study were accounted for.
	No	If there appear to be patients who were recruited into the study who are not accounted for.
	Unclear	If it is not clear whether any withdrawals occurred.

Appendix 5

Included studies: diagnosis of UTI

TABLE 40 *Included studies of tests for the diagnosis of UTI*

Study details	Patient details	Reference standard	Index test
Ahmad, 1991[38] **Study design** Prospective cohort **Country** England **Setting (teaching)** Secondary care (NR)	**Patient spectrum** Infants with a wide range of symptoms seen in outpatient clinics or admitted to hospital **Recurrent UTI:** NR **Urine sampling methods** Combination: urine collection bags applied following cleaning of skin with chlorohexidine wipes. Disposable nappies put on by parents according to their normal routine with no specific instructions given about cleaning of the perineum. Nappies that had been on for longer than 4 hours or that were soiled by faeces were excluded **Number of patients (number of girls):** 45 (NR) **Age: mean (range):** NR (1–23 months)	**Reference standard** Culture **Reference standard execution** Bag specimen **Definition of a positive test result** $>10^5$ cfu ml^{-1} of the same single species. Mixed growth classed as negative	**Test 1:** Urine collection: pad specimen: urine was extracted by compressing nappy fibres in a disposable syringe. Nappies with ultra-absorbent gel-like material were not used in this study. Half of each sample was sent for culture on MacConkey and blood agar plates **Definition of positive result test 1:** $>10^5$ cfu ml^{-1} of the same single species. Mixed growth classed as negative
Anad, 2001[39] **Study design** Prospective cohort **Country** UK **Setting (teaching)** Secondary care (non-teaching)	**Patient spectrum** No details provided **Recurrent UTI:** NR **Urine sampling methods** Combination: except for two samples, all specimens were obtained by clean-catch in younger children, midstream in older children and SPA, catheter samples or Newcastle urine collection pad in infants and children who were still in nappies **Number of patients (number of girls):** 279 (490 urine specimens) (191) **Age: mean (range):** NR (4 days to 15 years)	**Reference standard** Culture **Reference standard execution** No details **Definition of a positive test result** >10 cfu ml^{-1} of urine or any cfu in a urine sample obtained by SPA. Urine cultures with either mixed growth or unusual organisms were excluded from further analysis	**Test 1:** Dipstick (Nephu-Test + Leuco (Boehringer Mannheim) **Definition of positive result test 1:** LE and/or nitrite positive **Test 2:** Microscopy: simple microscopy of fresh uncentrifuged urine for pus cells **Definition of positive result test 2:** Any WBC hpf^{-1} **Test 3:** Combination: dipstick and microscopy **Definition of positive result test 3:** Both tests positive

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Armengol, 2000[40] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (non-teaching)	**Patient spectrum** Outpatients aged <4 years with suspected UTI **Recurrent UTI:** NR **Urine sampling methods** Catheter specimen **Number of patients (number of girls):** 260 (NR) **Age: mean (range):** NR (<4 years)	**Reference standard** Culture **Reference standard execution** No details **Definition of a positive test result** $\geq 10^5$ cfu ml^{-1} of a uropathogen	**Test 1:** Dipstick **Definition of positive result test 1:** Positive nitrite and/or any LE, including trace **Test 2:** Microscopy for bacteriuria, no further details **Definition of positive result test 2:** Any bacteria, including 'rare' and 'occasional'. **Test 3:** Microscopy for pyuria **Definition of positive result test 3:** $\geq$ 5 WBC hpf^{-1}
Armengol, 2001[230] **Study design** Retrospective cohort **Country** USA **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Children aged <4 years seen as outpatients , identified using computerised records. Children were included if a urine sample had been obtained by catheterisation and a UA and culture performed **Recurrent UTI:** NR **Urine sampling methods** Catheter specimen: no further details **Number of patients (number of girls):** 260 (NR) **Age: mean (range):** NR (<4 years)	**Reference standard** Culture **Reference standard execution** Performed on 5% sheep blood-Trypticase agar and MacConkey agar. Organisms were speciated by an automatic method **Definition of a positive test result** $\geq 10^3$ cfu ml^{-1} of a uropathogen	**Tests 1–3:** Dipstick: standard dipstick analysis **Definition of positive result test 1:** Nitrite positive **Definition of positive result test 2:** LE positive **Definition of positive result test 3:** Either or both positive **Tests 4–6:** Microscopy: urine centrifuged for 6 minutes at 2300 rpm. Sediment resuspended in drop of supernatant and examined either manually or with an automated method with a light microscope (Yellow Iris 900, (International Remote Imaging Systems, Chatsworth, CA, USA) **Definition of positive result test 4:** Presence of any bacteria **Definition of positive result test 5:** $\geq$ 5 WBC hpf^{-1} **Definition of positive result test 6:** Either or both positive

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Aronson, 1973[41] **Study design** Prospective cohort **Country** Sweden **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Children with suspected UTI (100), myelomeningocele (13) and glomerulonephritis (7) **Recurrent UTI:** NR **Urine sampling methods** Combination: CVU specimen obtained simultaneously with or immediately after performing a suprapubic bladder puncture. CVU specimens collected in sterile polyethylene bag (Hollister U-BAG) in infants **Number of patients (number of girls):** 120 (62) **Age: mean (range):** NR (0–12 years)	**Reference standard** Culture or microscopy **Reference standard execution** Standard bacterial culture or microscopy for pyuria of SPA urine **Definition of a positive test result** $\geq 10^2$ cfu ml^{-1} in SPA urine >10 cells mm^{-3}	***Age <18 months*** **Test 1:** Urine sampling: standard bacterial culture of CVU vs SPA culture **Definition of positive result test 1:** $>10^5$ cfu ml^{-1} **Test 2:** Urine sampling: microscopy for pyuria using a counting chamber: CVU vs SPA microscopy **Definition of positive result test 2:** >250 cells mm^{-3} ***Age 3–12 years*** **Test 3:** Urine sampling: standard bacterial culture of CVU vs SPA culture **Definition of positive result test 3:** $>10^5$ cfu ml^{-1} **Test 4:** Urine sampling: microscopy for pyuria using a counting chamber: CVU vs SPA microscopy **Definition of positive result test 4:** >250 cells mm^{-3} ***Age <18 months*** **Test 5:** Microscopy: leucocyte counts from SPA urine vs SPA culture **Definition of positive result test 5:** >10 cells mm^{-3} **Test 6:** Microscopy/urine sampling: leucocyte counts from CVU vs SPA culture **Definition of positive result test 6:** >250 cells mm^{-3} ***Age 3–12 years*** **Test 7:** Microscopy: leucocyte counts from SPA urine vs SPA culture **Definition of positive result test 7:** >10 cells mm^{-3} **Test 8:** Microscopy: leucocyte counts from CV urine vs SPA culture **Definition of positive result test 8:** >250 cells mm^{-3}

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Arslan, 2002[42] **Study design** Prospective cohort **Country** Turkey **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Children admitted to hospital with symptoms suggesting UTI. Inclusion criteria for infants were: fever with no apparent source, vomiting, decreased appetite and irritability; for toddlers: abdominal pain and voiding frequency with or without fever; and for older children: dysuria, frequency, urgency and abdominal/flank pain with or without fever **Recurrent UTI:** NR **Urine sampling methods** Combination: in infants an adhesive, sealed, sterile collecting bag was used to obtain a urine sample after disinfection of the skin of the genitals. In toilet-trained children, a midstream urine sample was taken **Number of patients (number of girls):** 100 (52) **Age: mean (range):** NR (2 days to 15 years)	**Reference standard** Culture **Reference standard execution** Quantitative urine culture performed using a loop calibrated to deliver 0.01 ml to inoculate sheep blood agar and eosin metilen blue agar culture plates. All plates were incubated at 35°C and read at 24 and 48 hours for bacterial identification and colony count **Definition of a positive test result** $> 10^5$ cfu ml^{-1} of a single pathogen	**Test 1:** Microscopy: Gram stain alone **Definition of positive result test 1:** Any organisms in 20 oifs **Test 2:** Microscopy: pyuria plus Gram stain. Microscopy for pyuria performed on a centrifuged urine sample **Definition of positive result test 2:** > 5 WBCs **Test 3:** Combination: overall UA. LE and nitrite performed in fresh and uncentrifuged urine using an automated urine analyser. (IRIS 500; IRIS Company, Los Angeles, CA, USA). Microscopy for bacteria and pyuria on centrifuged urine sample. **Definition of positive result test 3:** Positive if nitrite, LE, direct microscopy without Gram stain for bacteria or microscopy for WBC was positive

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Bachur, 2001[43] **Study design** Retrospective cohort **Country** USA **Setting (teaching)** Secondary care (NR)	**Patient spectrum** Children aged <2 years with fever (temperature ≥ 38°C) who were seen in the emergency department, identified from medical records **Recurrent UTI:** NR **Urine sampling methods** Not clear: mixture of catheterisation, SPA and CVU **Number of patients (number of girls):** 8815 (NR) **Age: mean (range):** NR (<2 years)	**Reference standard** Culture **Reference standard execution** No details **Definition of a positive test result** ≥ 10^3 cfu ml^{-1} from SPA, ≥ 10^4 cfu ml^{-1} from catheterised specimens, ≥ 10^5 cfu ml^{-1} from clean-voided specimens. Cultures were considered contaminated if more than one organism or non-pathogens were isolated. Cases with contaminated cultures were removed from further analysis	**Test:** Combination: overall UA: dipstick (Multistix; Bayer Corporation, Elkhart, IN, USA) and microscopy, urine centrifuged at 2000 rpm for 5 minutes **Definition of positive result test:** Positive dipstick (LE and/or nitrite positive) and/or pyuria (≥ 5 WBC hpf^{-1})
Baum, 1972[44] **Study design** Prospective cohort **Country** UK **Setting (teaching)** Secondary care, samples taken in the community	**Patient spectrum** Infants and children of both genders; no further details **Recurrent UTI:** NR **Urine sampling methods** Fresh, clean urine samples; sampling details NR **Number of patients (number of girls):** 73 (NR) **Age: mean (range):** NR	**Reference standard** Culture **Reference standard execution** Urine sample plated in the routine fashion. Incubated for 18 hours at 37°C **Definition of a positive test result** Negative: no significant growth or no growth; positive: significant growth	**Test 1:** Culture: dipslide with MacConkey medium on one side and nutrient agar on the other, inoculated immediately, dispatched together with clean urine sample to laboratory. Incubated for 18 hours at 37°C **Definition of positive result test 1:** Significant growth (no further details)

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Boreland, 1986[45] **Study design** Prospective cohort **Country** UK **Setting (teaching)** Not clear (NR)	**Patient spectrum** Paediatric inpatients and outpatients **Recurrent UTI:** NR **Urine sampling methods** Not clear **Number of patients (number of girls):** 700 (samples) (NR) **Age: mean (range):** NR (0–14 years)	**Reference standard** Culture **Reference standard execution** Blotting paper strip technique of Leigh and Williams[279] using both blood agar and MacConkey agar **Definition of a positive test result** $\geq 10^5$ cfu ml^{-1}, pure or mixed (not more than two species)	**Test 1:** Dipstick: nitrite or blood or protein (N-Labstix SG strips, Ames; read visually, $n = 536$) **Definition of positive result test 1:** Any one or more of the three positive **Test 2:** Dipstick: nitrite or blood or protein (N-Multistix SG strips), read photometrically by Clinitek 200 reflectance photometer, Ames; $n = 164$) **Definition of positive result test 2:** Any one or more of the three positive **Tests 3–5:** Dipstick (N-Labstix SG strips, read visually, $n = 536$) **Definition of positive result test 3:** Nitrite positive **Definition of positive result test 4:** Blood positive **Definition of positive result test 5:** Protein positive **Tests 6–8:** Dipstick (N-Multistix SG strips, read photometrically by Clinitek 200 reflectance photometer, $n = 164$) **Definition of positive result test 6:** Nitrite positive **Definition of positive result test 7:** Blood positive **Definition of positive result test 8:** Protein positive
Braude, 1967[46] **Study design** Prospective cohort **Country** UK **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Symptomatic patients or (if asymptomatic) routine examination of the urine suggestive of infection **Recurrent UTI:** NR **Urine sampling methods** Combination: non-catheter specimens (midstream and/or bag) taken from 68 patients and compared with catheter **Number of patients (number of girls):** 68 (49) **Age: mean (range):** 3.2 years (9 days to 11 years)	**Reference standard** Catheter specimen **Reference standard execution** Polybactrin catheterisation specimen, assessment of infection by combination of culture and microscopy **Definition of a positive test result** $>10^4$ cfu ml^{-1} and/or >10 cells mm^{-3}	***All children:*** **Test 1:** Urine sampling: non-catheter specimen (bag or midstream), assessment of infection by combination of culture and microscopy **Definition of positive result test 1:** one or more of the bacterial counts, cell counts or combined counts positive by previously described criteria ***Age ≤ 5 years*** **Test 2:** Urine sampling: as above **Definition of positive result test 2:** As above

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Bulloch, 2000[47] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (non-teaching)	**Patient spectrum** Previously healthy patients aged <21 years presenting to an emergency department of a children's hospital who had a specimen collected for urine culture were eligible for the study. The decision to obtain a urine culture and the method of urine collection were made by the evaluating physician. A convenience sample was used: patients were involved when one of the investigators was available. Patients were excluded if they were referred for evaluation of an abnormal UA or positive urine culture, if they were receiving antibiotics, if they had an underlying medical problem requiring repeat catheterisation, if they were unable to obtain an adequate volume of urine or if they were known to have an underlying renal and/or genitourinary abnormality. All children aged <2 years (n = 51) were being evaluated for a fever without focus **Recurrent UTI:** NR **Urine sampling methods** Combination: clean catch (n = 89) or catheterised specimens (n = 70) **Number of patients (number of girls):** 159 (122) **Age: mean (range):** 5.8 years (4 weeks to 19 years)	**Reference standard** Culture **Reference standard execution** Urine plated on MacConkey agar and sheep blood agar using a 0.01-ml calibrated loop. Incubated for 48 hours at 35°C and examined daily for growth **Definition of a positive test result** $>10^4$ cfu ml^{-1} from catheterised specimen, $\geq 10^5$ cfu ml^{-1} from midstream specimens. Considered contaminated if more than three organisms were isolated	**Test 1:** Urine clarity: urine placed in red-topped blood tube, held against standard white background with black printed 11 font text. If urine was not clear 0.1 ml of 0.1 mol l^{-1} acetic acid solution was added to dissolve any phosphates and visual inspection repeated. Two observers independently performed the inspection **Definition of positive result test 1:** To be considered clear (negative), printed text had to be legible through urine. If there was a discrepancy between observers the specimen was considered positive. **Tests 2, 3:** Dipstick: trained laboratory technician tested the unspun sample with a dipstick: LE read after 2 minutes classed as negative, trace, small, moderate or large. Nitrite read after 1 minute as positive or negative (Clinitek 200; Ames, Tarrytown, NJ, USA) **Definition of positive result test 2:** At least small LE **Definition of positive result test 3:** Positive nitrite **Tests 4, 5:** Microscopy: urine centrifuged for 5 minutes at 2200 rpm and microscopy performed. Volume of 0.5 ml used for resuspension of urinary sediment **Definition of positive result test 4:** $\geq$ 5 WBC hpf^{-1} **Definition of positive result test 5:** Any bacteria **Test 6:** Dipstick: abnormal dipstick **Definition of positive result test 6:** At least small LE or positive nitrite **Test 7:** Microscopy: Abnormal microscopy **Definition of positive result test 7:** $\geq$ 5 WBC hpf^{-1} or any bacteria **Test 8:** Combination **Definition of positive result test 8:** Abnormal dipstick or microscopy

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Caballero, 2001[48] **Study design** Retrospective cohort **Country** Spain **Setting (teaching)** Secondary care (NR)	**Patient spectrum** Retrospective study of children aged <6 years in whom urinary sediment and culture were obtained in the emergency department **Recurrent UTI:** NR **Urine sampling methods** Midstream: samples collected by midstream method from older children and from sterile pads in non-toilet-trained children **Number of patients (number of girls):** 511 (300) **Mean age (range):** 2 (<6 years)	**Reference standard** Culture **Reference standard execution** No details reported, two samples cultured from each child **Definition of a positive test result** $>10^5$ cfu ml^{-1} of a single specimen. Considered contaminated when more than one species was present. UTI considered absent if two urine cultures were negative or one of them was negative and the other contaminated. In no case was one culture positive and the other negative in the same child	**Tests 1 and 2:** Microscopy: microscopy of sediment following centrifuging urine at 2000 rpm for 5 minutes. The number of leucocytes seen visually was counted **Definition of positive result test 1:** >18 leucocytes in the urine sediment **Definition of positive result test 2:** Any leucocytes in the urine
Cervilla, 2001[49] **Study design** Prospective cohort **Country** Spain **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Children with fever >38.1°C and/or other signs or symptoms related to UTI. All children were tested with dipsticks for LE, nitrite and blood **Recurrent UTI:** Combination **Urine sampling methods** Combination: culture samples: CVU samples from older children, SPA or catheter for younger children Dipstick and microscopy samples: bag specimens **Number of patients (number of girls):** 102 (74) **Mean age (range):** 4.1 years (<1 month to 14 years)	**Reference standard** Culture **Reference standard execution** Routine culture performed before administration of antibiotics. Performed where UTI was suspected (positive dipstick test or a negative test with previous history of UTI, renal abnormality, or neurogenic bladder disorder) **Definition of a positive test result** $\geq 10^5$ cfu ml^{-1} for CVU samples; $\geq 10^4$ cfu ml^{-1} for catheter samples; ≥ 100 cfu ml^{-1} for SPA samples. Mixed culture results were repeated	**Test 1:** Clinical features: temperature **Definition of positive result test 1:** >38.1°C **Test 2:** Microscopy: no details **Definition of positive result test 2:** Not clear **Test 3:** Dipstick **Definition of positive result test 3:** Blood, LE or nitrite positive

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Cid, 1992[50] **Study design** Prospective cohort **Country** Spain **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Febrile infants with suspicion of UTI **Recurrent UTI:** NR **Urine sampling methods** Not clear: sterile urine samples obtained from urine collection bags **Number of patients (number of girls):** 100 (61) **Mean age (range):** NR (1–24 months)	**Reference standard** Culture **Reference standard execution** Incubated for 18 hours at 37°C **Definition of a positive test result** $\geq 10^5$ cfu ml^{-1} of the same organism in two consecutive urine cultures	**Test 1:** Culture: semi-quantitative urine culture comprised three agar plates: CLED (green) on one side, MacConkey (brown/red) and *Enterococcus* culture media (no colour). Urine added to test and incubated for 16–24 hours at 37°C (Uricult-plus) The removable section of the tube (containing the agar) was removed and the sensitivity of the colonies was compared with a standard model **Definition of positive result test 1:** NR
Cohen, 1997[51] **Study design** Prospective cohort **Country** Israel **Setting (teaching)** Primary care (not secondary care)	**Patient spectrum** Infants presenting with fever, irritability and no signs of toxicity and no obvious focus of infection on clinical exam. Not sufficiently sick to justify hospitalisation **Recurrent UTI:** NR **Urine sampling methods** Combination: urine samples were collected from each infant either by catheter or by SPA, and from disposable nappy. Nappies contaminated with faeces or that had been on the infant for >3 hours were excluded. **Number of patients (number of girls):** 38 (24) **Age: mean (range):** NR (1–24 months)	**Reference standard** Culture **Reference standard execution** Culture of samples obtained by SPA or catheter on blood agar and MacConkey plates **Definition of a positive test result:** $\geq 10^5$ cfu ml^{-1}	**Test 1:** Urine sampling: culture of sample extracted from lining of disposable nappy under sterile conditions **Definition of positive result test 1:** $\geq 10^5$ cfu ml^{-1}

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Craver, 1997[52] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (NR)	**Patient spectrum** All children examined at a children's hospital emergency room and suspected of having a UTI were studied. All tests were performed on the basis of clinical necessity determined by the emergency room physician **Recurrent UTI:** NR **Urine sampling methods** Combination: catheterisation, midstream clean catch or a urine bag **Number of patients (number of girls):** 236 (136) **Age: mean (range):** NR (3 weeks to 21 years)	**Reference standard** Culture **Reference standard execution** Blood and MacConkey agar plates were each inoculated with 0.01 and 0.001 ml of urine and incubated at 35°C, observed daily for 48 hours. For any growth of one or two organisms the child's symptoms and response to antibiotics were further investigated to determine whether the culture represented infection **Definition of a positive test result** >50,000 cfu of one or two pathogens from a clean-catch or urine bag or $>10^3$ cfu ml^{-1} from catheterised samples	**Tests 1 and 2:** Dipstick: unspun urine tested. At 1 minute nitrite was reported as negative or positive, blood was reported as negative, trace, 1+, 2+ or 3+, and protein was interpreted as negative, trace, 1+, 2+ or 3+. Proteinuria of trace or more was confirmed by mixing equal parts of 3% sulfosalicyclic acid with centrifuged urine and evaluating the precipitation as none, trace, 1+, 2+ or 3+. At 2 minutes the LE was reported as negative, trace, 1+, 2+ or 3+ (Ames Multistix10SG, Miles, Elkhart, IN, USA) **Definition of positive result test 1:** LE at least trace, nitrite positive with blood at least trace **Definition of positive result test 2:** LE at least trace, nitrite positive with blood at least 1+ **Test 3:** Microscopy: performed on 10 ml of urine spun at 1800 rpm for 5 minutes. Supernatant decanted and sediment pellet resuspended in 1ml of urine and examined on a 6.6-μl slide chamber (Kova slide chamber; Hycor Biomedical, Irvine, CA, USA) **Definition of positive result test 3:** WBC >10, any bacteria **Test 4:** Combination **Definition of positive result test 4:** LE at least trace, nitrite positive with blood at least trace, any WBC >10 **Test 5:** Combination **Definition of positive result test 5:** LE at least trace, nitrite positive with blood at least 1+, any WBC >10

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Dayan, 2000[54] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (non-teaching)	**Patient spectrum** Convenience sample of children aged < 4 years undergoing bladder catheterisation to screen for an acute UTI. Patients were being evaluated for UTI mainly secondary to an unexplained fever. Patients were recruited from an urban paediatric emergency department. Patients were excluded if their final diagnosis was a condition that was associated with sterile pyuria **Recurrent UTI:** NR **Urine sampling methods** Catheter specimen: early- and late-stream catheterised specimens were obtained **Number of patients (number of girls):** 87 (36) **Age: median (range):** median 98 days (3–1330 days)	**Reference standard** Culture **Reference standard execution** Later stream samples used: 0.01 ml of urine inoculated via a calibrated loop onto plates containing sheep-blood agar and MacConkey agar. Incubated at 35°C and examined at 24 and 48 hours **Definition of a positive test result** Single organism growth of ≥ 50,000 cfu ml^{-1}. Equivocal culture defined as single organism growth ≥ 1000 but < 50,000 cfu ml^{-1}. Negative defined as 'not positive': included equivocal findings	***Early sample*** **Test 1:** Culture: as reference standard **Definition of positive result test 1:** As reference standard: positive or equivocal finding. **Test 2:** Microscopy: Gram stain: unspun urine completed using automated preparation system (MIDAS 2) **Definition of positive result test 2:** Any organisms per oif ***Late sample*** **Test 3:** Microscopy: Gram stain. Unspun urine completed using automated preparation system (MIDAS 2) **Definition of positive result test 3:** Any organisms per oif ***Early sample*** **Tests 4–6:** Microscopy: UA. Completed with centrifuged urine (Yellow IRIS) **Definition of positive result test 4:** Any bacteria present **Definition of positive result test 5:** ≥ 5 WBC hpf^{-1} **Definition of positive result test 6:** ≥ 10 WBC hpf^{-1} ***Late sample*** **Tests 7–9:** Microscopy: UA. Completed with centrifuged urine (Yellow IRIS) **Definition of positive result test 7:** Any bacteria present **Definition of positive result test 8:** ≥ 5 WBC hpf^{-1} **Definition of positive result test 9:** ≥ 10 WBC hpf^{-1}

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Dayan, 2002[53] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Consecutive febrile infants (rectal temperature ≥ 38°C) aged 1–60 days. Infants were excluded if they received antibiotics within 48 hours of evaluation, if urine collection was attempted but not obtained, or if a Gram stain was not completed secondary to laboratory unavailability **Recurrent UTI:** Initial UTI **Urine sampling methods** Combination: Samples only included if obtained by urethral catheterisation (n = 225) or SPA (n = 7) **Number of patients (number of girls):** 246 (232 included in analysis) (118) **Age: mean (range):** 36 days (2–60 days)	**Reference standard** Culture **Reference standard execution** 0.001 ml of urine inoculated using a calibrated loop onto MacConkey agar and Columbia agar with 5% sheep blood, incubated at 35°C and examined at 24 and 48 hours **Definition of a positive test result** ≥ 10,000 cfu ml^{-1} for catheter samples and ≥ 1000 cfu ml^{-1} for SPA samples of a single urinary pathogen. All other cultures considered negative	**Test 1:** Microscopy: Gram stain prepared by automated system using uncentrifuged urine read manually (Midas II) **Definition of positive result test 1:** Identification of any organism **Tests 2–5:** Dipstick: tests for nitrite and LE, uncentrifuged urine (Super UA automated urine analyser) **Definition of positive result test 2:** Any positive nitrite **Definition of positive result test 3:** Any positive LE **Definition of positive result test 4:** Nitrite and LE positive **Definition of positive result test 5:** Nitrite or LE positive **Tests 6 and 7:** Microscopy: automated microscopy of uncentrifuged urine (Yellow IRIS) **Definition of positive result test 6:** ≥ 5 WBC hpf^{-1} **Definition of positive result test 7:** ≥ 10 WBC hpf^{-1}
Demi, 1993[55] **Study design** Prospective cohort **Country** Italy **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Neonatal inpatients **Recurrent UTI:** NR **Urine sampling methods** Urine bag **Number of patients (number of girls):** 247 (NR) **Age: mean (range):** NR (neonates; follow-up testing at intervals over 3 year)	**Reference standard** Culture **Reference standard execution** Urine culture where dipstick positive or patient symptomatic. No details of technique **Definition of a positive test result** NR	**Tests 1 and 2:** Dipstick: 2–3 second immersion (Boehringer Mannheim) **Definition of positive result test 1:** LE positive **Definition of positive result test 2:** Nitrite positive

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Dosa, 1973[56] **Study design** Prospective cohort **Country** UK **Setting (teaching)** Secondary care (NR)	**Patient spectrum** Two groups of children were investigated: *Group A:* 422 healthy newborn infants (274 male, 148 female) aged 3–10 days old *Group B:* 35 infants <12 months old suspected of having a UTI because earlier routine urine cultures had yielded $>10^5$ bacteria ml^{-1} of urine. 22 of these infants had a meningomyelocele that may have led to some stasis of urine within the bladder **Recurrent UTI:** NR **Urine sampling methods** Combination: *Group A*: adhesive bag. Second sample of midstream urine collected without the bag if any test (reference standard or index) was positive in initial sample ($n = 66$). Third sample collected by SPA if any of the second samples were positive by either test ($n = 9$) *Group B:* all samples SPA **Number of patients (number of girls):** 422 + 35 (NR) **Age: mean (range):** NR (<12 months)	**Reference standard** Culture **Reference standard execution** No details **Definition of a positive test result** $\geq 10^5$ cfu ml^{-1}	*Group A* **Tests 1–3:** Dipstick: test for glucose: protruding tip changes to blue–green when the urinary glucose concentration exceeds 2–3 mg 100 ml^{-1} (Uriglox) **Definition of positive result:** No colour change **Test 1:** Initial examination only **Test 2:** Initial and second examinations combined **Test 3:** Initial, second and third examination combined *Group B* **Test 4:** Dipstick: group B: test for glucose: protruding tip changes to blue–green when the urinary glucose concentration exceeds 2–3 mg 100 ml^{-1} (Uriglox) **Definition of positive result test 4:** No colour change

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Farrell, 2002[57] **Study design** Prospective cohort **Country** UK **Setting (teaching)** Secondary care (NR)	**Patient spectrum** A convenience, non-consecutive sample from children attending a children's hospital either as outpatients (12) or as inpatients (8) was recruited. In 12 urine samples were required as part of routine surveillance care, while in eight microscopy was requested to confirm either the existence or absence of UTI in the presence of signs of acute illness. Children treated with antibiotics within 7 days of the proposed date of urine specimen collection were excluded. However, children receiving long-term prophylactic antibiotic treatment were eligible for inclusion **Recurrent UTI:** NR **Urine sampling methods** Combination: urine specimens collected by bag and pad from all children. The bag was applied, having first made a large-bore perforation in the bag with a sterile needle to allow some draining of urine into the pad. The pad was then placed over the bag and then the child's nappy was secured. This ensured that the bag and pad contained the same urine sample **Number of patients (number of girls):** 20 (16) **Age: mean (range):** 16 months (2–27 months)	**Reference standard** Microscopy and culture **Reference standard execution** Urine collected via urine specimen bag (Biotrol Urinocol, B.B. Braun Medical, Sheffield, UK). Urine was retrieved from the bag and decanted into a sterile specimen container. Within 30 minutes of collection samples were sent to the laboratory for standard hospital microbiological analysis **Definition of a positive test result** WBC present (test 1), bacteria present (test 2)	**Test 1:** Urine sampling: microscopy of pad sample (Euron Urine Collection Pad; Ontex, Buggenhout) **Definition of positive result test 1:** WBC present **Test 2:** Urine sampling: culture of pad sample (Euron Urine Collection Pad) **Definition of positive result test 2:** Bacteria present

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Feasey, 1999[58] **Study design** Prospective cohort **Country** UK **Setting (teaching)** Secondary care (non-teaching)	**Patient spectrum** Convenience sample of 50 children taken from the population of children presenting on the acute services paediatric unit of a district general hospital in whom urine microscopy and culture were indicated. Children who were able to cooperate with the collection of a midstream specimen of urine were excluded and included children had to provide at least two specimens of urine. Children were excluded if the specimen was contaminated by faeces, or if the child commenced a course of antibiotics before both specimens were collected **Recurrent UTI:** NR **Urine sampling methods** Combination: two urine specimens collected from each child. One specimen was collected using a Newcastle urine collection pad and the other by the method normally used in the unit, usually a sterile adhesive bag. Half the children had pad specimens collected first and half had bag specimens collected first **Number of patients (number of girls):** 50 (NR) **Age: mean (range):** NR (1 day to 5 years)	**Reference standard** Culture **Reference standard execution** Bag specimen, no further details **Definition of a positive test result** $\geq 10^5$ cfu ml^{-1} of a single organism. All other results (including contaminated specimens) classed as negative	**Test 1:** Urine sampling: culture: pad specimen **Definition of positive result test 1:** $\geq 10^5$ cfu ml^{-1} of a single organism

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Fennell, 1977[59] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Community	**Patient spectrum** Children were selected from a clinic population known to have recurrent bacteriuria on the basis of willingness and ability to learn the home culturing methods. 20/50 children had an associated structural abnormality of the urinary tract **Recurrent UTI:** Recurrent UTI **Urine sampling methods** Clean catch: first urine specimen of the morning **Number of patients (number of girls):** 50 (49) **Age: median (range):** 9 years (NR, boy was aged 2 years)	**Reference standard** Culture **Reference standard execution** Children followed regularly at clinic at bimonthly intervals. If home testing indicated recurrent bacteriuria child was reassessed at clinic as soon as possible. In the clinic another urine specimen was procured by the clean-catch method. A calibrated loop was used to streak on blood agar. When bacteriuria was suspected (by symptoms, home testing or UA) two additional urine specimens were cultured by the standard pour plate technique. Colony counts were also obtained on all first voided specimens brought to clinic on ice **Definition of a positive test result** $>10^5$ cfu ml^{-1} in both specimens	**Test 1:** Culture: following dipstick test, urine was poured into a roll-tube; after 10 seconds of exposure to the nutrient agar coating was discarded by inverting the tube and the tube was loosely sealed (not airtight). Incubated at 37°C for 24 hours in home incubator. Number of colonies within a unit circle on a transparent flexible plastic strip was counted (Bacturcult; Wampole Laboratories) **Definition of positive result test 1:** Classified by parents after 24 hours as <10 colonies, 10–50 colonies or >50 colonies per unit area **Test 2:** Dipstick: dipped into urine and withdrawn immediately [Bac-U-Dip (BUD); Warner-Chilcott] **Definition of positive result test 2:** Pink or red colour change

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Fernandez, 1996[61] **Study design** Case–control **Country** Spain **Setting (teaching)** Secondary care (NR)	**Patient spectrum** Previously healthy children who presented to the emergency department who required a urine culture: previous positive culture (n = 19), evaluation of febrile illness (n = 13), other clinical presentation (n = 8), due to a previously contaminated urine culture specimen (n = 8) **Recurrent UTI:** NR **Urine sampling methods** Two consecutive urine samples were collected: one in a perineal bag followed by SPA **Number of patients (number of girls):** 61 (48 completed) (20 completed) **Age: mean (range):** ≤ 12 months	**Reference standard** Culture **Reference standard execution** Culture of SPA urine samples (no further details) **Definition of a positive test result** Pure growth of >1000 cfu ml^{-1} in the SPA specimen	**Test 1:** Culture of perineal bag specimens (no further details) **Definition of positive result test 1:** >10^5 cfu ml^{-1}
Fernandez, 2000[60] **Study design** Prospective cohort **Country** Spain **Setting (teaching)** Emergency department (NR)	**Patient spectrum** Children aged 1–24 months, presence of fever (>38°C) **Recurrent UTI:** NR **Urine sampling methods** Combination: urine specimen collected by urethral catheterisation (57%) or from a bag attached to the perineum (43%). If bag specimens were positive for leucocyturia or nitrituria, or patients were deemed to be at high risk of UTI, then specimens were also collected by urethral catheterisation (done for 75 patients) **Number of patients (number of girls):** 175 (115) **Age: mean (range):** 9.8 months (median 8 months) (1–24 months)	**Reference standard** Culture **Reference standard execution** Urine cultured on blood agar and examined in 24–48 hours **Definition of a positive test result** >50,000 cfu ml^{-1}	**Test 1:** Dipstick: Nitrite analysis (Multistix; Bayer) **Definition of positive result test 1:** Nitrite **Test 2:** Microscopy: **Definition of positive result test 2:** Presence of leucocytes **Test 3:** Microscopy: uncentrifuged urine Gram stained and drop placed on slide, dried and examined under microscope **Definition of positive result test 3:** Gram stain positive **Test 4:** Combination **Definition of positive result test 4:** Leucocyturia or nitrituria **Test 5:** Combination **Definition of positive result test 5:** Leucocyturia or Gram stain positive **Test 6:** Combination **Definition of positive result test 6:** Leucocyturia and nitrituria **Test 7:** Combination **Definition of positive result test 7:** Leucocyturia and Gram stain positive

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Giraldez, 1998[62] **Study design** Prospective cohort **Country** Venezuela **Setting (teaching)** Secondary care (NR)	**Patient spectrum** Children with fever of unknown source, and/or symptoms of UTI who were seen at a paediatric emergency department **Recurrent UTI:** NR **Urine sampling methods** Combination: bag specimens and 'Urolab' **Number of patients (number of girls):** 50 (22) **Age: mean (range):** 3.9 years (0.4–12 years)	**Reference standard** Culture **Reference standard execution** Incubated for 48 hours **Definition of a positive test result** $\geq 10^5$ cfu ml^{-1}	**Test 1:** Dipstick: nitrite **Definition of positive result test 1:** Positive **Test 2:** Dipstick: LE **Definition of positive result test 2:** Positive **Test 3:** Dipstick: nitrite and LE **Definition of positive result test 3:** Both positive **Test 4:** Microscopy: urine sediment, assume that specimen was centrifuged **Definition of positive result test 4:** $\geq$ 10 WBC hpf^{-1}
Godard, 1979[63] **Study design** Prospective cohort **Country** Switzerland **Setting (teaching)** Community (not secondary care)	**Patient spectrum** Girls aged 1–5 years. 86 consulted for acute illnesses, and the remainder for vaccinations or health control **Recurrent UTI:** NR **Urine sampling methods** Combination: either by midstream urine (n = 57) or by voiding in a usual pot previously disinfected by alcohol. For non-midstream urine a 5-ml sample was taken from the pot by a plastic syringe. Sample collection method was the same in office in 278 cases and different in 19 cases **Number of patients (number of girls):** 309 (309) **Age: mean (range):** NR (1–5 years)	**Reference standard** Culture **Reference standard execution** Office culture, no details reported. Patients with colony counts $\geq 10^5$ ml^{-1} in both dipslides submitted to a third urine culture using an ideal method of collection (bladder puncture, or midstream urine after local cleaning) **Definition of a positive test result** $\geq 10^5$ cfu ml^{-1} sent for a third culture. No details of how this was considered positive	**Test 1:** Culture: urine specimen inoculated immediately on dipslide. Dipslide kept in warm place (kitchen or living room) and returned to medical office within several to 24 hours. Colony counts estimated by comparison with photographic standards after 24 hours (NR) **Definition of positive result test 1:** $\geq 10^5$ cfu ml^{-1}

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Gorelick, 2000[64] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Girls aged <2 years presenting to the emergency department with fever (≥ 38.3°C). Children with definitive sources of fever (e.g. confirmed bacterial infection, specific viral infection and recognisable febrile disease) were excluded. Children with possible but not definitive sources of fever (e.g. upper respiratory tract infection, gastroenteritis, otitis media or non-specific viral syndrome) were included **Recurrent UTI:** NR **Urine sampling methods** All specimens obtained by urethral catheterisation **Number of patients (number of girls):** 1469 (1469) **Age: mean (range):** 11 months (<2 years)	**Reference standard** Culture **Reference standard execution** No further details **Definition of a positive test result** Pure growth of ≥ 10^4 cfu ml^{-1} of a pathogenic species of bacteria	**Test 1:** Clinical features: the clinical decision rule developed from various demographic, historical and physical examination results. Developed using multiple logistic regression to identify variables associated with UTI. Following variables were selected: <12 months old, white race, temperature ≥ 39°C, fever for ≥ 2 days, absence of another source of fever on examination **Definition of positive result test 1:** Presence of two or more of these five variables. Cut-off selected to maximise sensitivity
Hardy, 1976[65] **Study design** Prospective cohort **Country** UK **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Routine screening for UTI of all inpatient admissions. Children in whom bacterial growth was obtained from first bag specimen. Patients whose condition demanded immediate antimicrobial therapy where delay caused by screening could not be justified were also entered. In the latter group all three specimens were taken without prior screening. Most common reasons for admission were neonatal jaundice, poor feeding, poor weight gain, vomiting, diarrhoea, fever and febrile convulsions **Recurrent UTI:** NR **Urine sampling methods** Combination: all children provided bag, clean-catch and SPA specimens **Number of patients (number of girls):** 30 (10) **Age: mean (range):** 16 weeks (2 days to 3 years)	**Reference standard** SPA culture **Reference standard execution** SPA by Pryles' method[280] Culture on CLED media for 18 hours, WBCs counted unstained on centrifuged urine **Definition of a positive test result:** ≥ 10^4 cfu ml^{-1} pure growth	**Test 1:** Urine sampling: culture: bag vs SPA **Definition of positive result test 1:** ≥ 10^4 cfu ml^{-1} pure growth; mixed growth classed as negative **Test 2:** Urine sampling: culture: clean-catch vs SPA **Definition of positive result test 2:** ≥ 10^4 cfu ml^{-1} pure growth; mixed growth classed as negative **Test 3:** Microscopy: SPA vs SPA culture **Definition of positive result test 3:** >10 WBC mm^{-3} **Test 4:** Microscopy: bag vs SPA culture **Definition of positive result test 4:** >10 WBC mm^{-3} **Test 5:** Microscopy: clean-catch vs SPA culture **Definition of positive result test 5:** >10 WBC mm^{-3}

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Hiraoka, 1995[66] **Study design** Prospective cohort **Country** Japan **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** 41 of 89 samples were from children without previous UTI **Recurrent UTI:** Combination **Urine sampling methods** Combination: 55 midstream, 20 catheter and 14 indwelling catheter **Number of patients (number of girls):** 53 (89 samples) (29) **Age: mean (range):** 6.7 years (1 month to 15 years)	**Reference standard** Culture **Reference standard execution** Standard culture, 1-μl calibrated loop, 48-hour culture **Definition of a positive test result** 10^5 cfu ml^{-1} midstream specimens, 10^3 cfu ml^{-1} catheter specimens	**Test 1:** Microscopy: bacterial count ml^{-1} (Kova Slide 10 Grid, Miles-Sankyo) **Definition of positive result test 1:** NS **Test 2:** Microscopy: leucocyte count μl^{-1} (Kova Slide 10 Grid) **Definition of positive result test 2:** ≥ 10 WBC μl^{-1}
Hoberman, 1993[68] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (NR)	**Patient spectrum** Urine specimens obtained by bladder catheterisation in the emergency department of a children's hospital. No further details **Recurrent UTI:** NR **Urine sampling methods** Catheter specimens **Number of patients (number of girls):** 698 (NR) **Age: mean (range):** NR (<2 years)	**Reference standard** Culture **Reference standard execution** Quantitative urine culture performed using loop calibrated to deliver 0.001 ml to inoculate plates containing sheep blood agar, Columbia CNA agar and MacConkey agar. Plates incubated at 35–37°C and examined at 24 and 48 hours **Definition of a positive test result** Growth of single pathogen at concentration of >50,000 cfu ml^{-1}	**Test 1:** Microscopy: standard: specimens >1 ml centrifuged at 2000 rpm for 10 minutes, samples <1 ml examined uncentrifuged. Unstained specimens examined microscopically for pyuria and bacteriuria **Definition of positive result test 1:** Pyuria ≥ 5 wbc hpf^{-1} and bacteriuria of any bacteria per hpf **Test 2:** Microscopy: enhanced UA: performed on uncentrifuged urine. Urine drawn into Neubauer haemocytometer and WBCs counted on each side of the chamber. Smears prepared using two drops of uncentrifuged urine on sterile slide and Gram-stained **Definition of positive result test 2:** Pyuria of ≥ 10 wbc mm^{-3} and bacteriuria of any bacteria per 10 oifs

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Hoberman, 1994[69] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Children aged <2 years, seen in the emergency department, from whom a urine sample was obtained by catheterisation were eligible for inclusion. 95% of specimens obtained during diagnostic evaluation for fever **Recurrent UTI:** NR **Urine sampling methods** Catheter specimen **Number of patients (number of girls):** 2181 (NR) **Age: mean (range):** NR (<2 years)	**Reference standard** Culture **Reference standard execution** Calibrated loop (0.001 ml) used to inoculate plates containing sheep's blood agar, Columbia CNA agar and MacConkey agar. All plates incubated at 35–37°C and examined at 24 and 48 hours **Definition of a positive test result** > 50,000 cfu ml^{-1}. Samples with multiple organisms were considered to have contaminated specimens, classed as negative	**Test 1:** Microscopy: uncentrifuged urine, leucocyte count on a Neubauer haemocytometer **Definition of positive result test 1:** >10 WBC mm^{-3} **Test 2:** Microscopy: presence of bacteria, by smear (air dried and Gram stained), oif (NS) **Definition of positive result test 2:** any bacteria **Test 3:** Microscopy: combination of above **Definition of positive result test 3:** >10 WBC mm^{-3} and any bacteria
Hoberman, 1996[67] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Children seen in a hospital emergency department from whom a urine specimen for UA and culture was obtained by bladder catheterisation. Urine specimens were obtained as part of a diagnostic evaluation of fever from 95% of children and of sepsis in 5% **Recurrent UTI:** NR **Urine sampling methods** Catheter specimens **Number of patients (number of girls):** 4253 (NR) **Age: mean (range):** NR (<24 months)	**Reference standard** Culture **Reference standard execution** Quantitative urine culture using loop calibrated to deliver 0.001 ml to inoculate plates containing sheep blood agar and MacConkey agar, incubated at 35–37°C and examined at 24 and 48 hours for a colony count and bacterial identification **Definition of a positive test result** ≥ 50,000 cfu ml^{-1} of a single urinary pathogen	**Test 1:** Microscopy: presence of pyuria. Uncentrifuged urine drawn into Neubauer haemocytometer by capillary action **Definition of positive result test 1:** ≥ 10 WBC mm^{-3} **Tests 2, 3:** Microscopy: uncentrifuged urine drawn into Neubauer haemocytometer by capillary action. WBC counted. Smears were prepared using uncentrifuged urine on a slide within a standardised marked area, air dried and Gram stained **Definition of positive result test 2:** Presence of pyuria and bacteriuria: ≥ 10 WBC mm^{-3} and any bacteria per hpf **Definition of positive result test 3:** Presence of pyuria or bacteriuria: ≥ 10 WBC mm^{-3} or any bacteria per hpf

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Holland, 1968[70] **Study design** Prospective cohort **Country** Ireland **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** NR **Recurrent UTI:** NR **Urine sampling methods** Midstream: all midstream for tests 1 and 3, for test 2 mainly midstream, but also routine collections (42%) and catheter collections (5%) **Number of patients (number of girls):** Test 1: 70 (51) Test 2: 372 (206) Test 3: 126 (49), age 1 month to 15 years **Age: mean (range):** NR (Not clear at least 2.5–7 years)	**Reference standard** Culture **Reference standard execution** Pour plate colony count method **Definition of a positive test result** $>10^5$ cfu ml^{-1}	**Test 1:** Chemical: Greiss nitrate reduction test with the addition of nitrate to the urine before testing. Reported in 4 hours **Definition of positive result test 1:** Pink or red colour change **Test 2:** Chemical: TTC test. Reported in 4 hours **Definition of positive result test 2:** Formation of red precipitate **Test 3:** Dipstick: Stat-Test (Mallinckrodt Pharmaceuticals), also nitrate reduction test **Definition of positive result test 3:** Production of red colour
Kohler, 1970[71] **Study design** Prospective cohort **Country** Sweden **Setting (teaching)** Community (not secondary care)	**Patient spectrum** Study was part of a general healthy control, partly of 4-year-old children (n = 948) and partly of schoolgirls (n = 1065) **Recurrent UTI:** NR **Urine sampling methods** Midstream: midstream morning samples collected at home under standardised conditions. The sample was chilled with ice cubes in a plastic bag and delivered during the day to the laboratory **Number of patients (number of girls):** 2016 (1514) **Age: mean (range):** NR (4–19 years)	**Reference standard** Culture **Reference standard execution** No details reported **Definition of a positive test result** $\geq 10^5$ cfu ml^{-1}	**Test 1:** Dipstick: Test for glucose (Uriglox) **Definition of positive result test 1:** No colour change

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Kunin, 1977[72] **Study design** Cohort **Country** USA **Setting (teaching)** Community (not secondary care)	**Patient spectrum** Girls with previous bacteriuria were tested at 3-month intervals for periods of 3 months to 6 years. Some girls were included more than once in the analysis **Recurrent UTI:** Recurrent UTI **Urine sampling methods** Clean catch: CVU collected by mother **Number of patients (number of girls):** 21 (21) **Age: mean (range):** preschool	**Reference standard** Culture **Reference standard execution** Dipslides taken to laboratory incubated and read at 24–48 hours (Uricult, Orion Laboratories, Helsinki, Finland) **Definition of a positive test result** $>10^5$ cfu ml^{-1}. If nitrite tests negative a positive slide culture was confirmed by a second culture	Mothers given three test strips every 3 months: **Test 1:** Dipstick: nitrite dipslide performed on three consecutive first morning urine specimens (Microstix-Nitrite; Ames, Elkhart, IN, USA) **Definition of positive result test 1:** Any shade of pink appearing within 30 seconds after wetting strip classed as positive
Labbe, 1982[73] **Study design** Prospective cohort **Country** Canada **Setting (teaching)** Community (non-teaching)	**Patient spectrum** Home-based study: children followed at a paediatric UTI clinic who presented with at least two UTIs in the previous 12 months. Patients who received prophylactic antibiotics were excluded **Recurrent UTI:** Recurrent UTI **Urine sampling methods** Not clear: no details on method of collection for urine culture samples, assume dipstick samples were collected by mother **Number of patients (number of girls):** 32 (131 samples) (31) **Age: mean (range):** 6 years (23 months to 15 years)	**Reference standard** Culture **Reference standard execution** If nitrite test was positive then the child was taken to the clinic for a urine culture. Children also had regular 3-monthly appointments at the clinic, during which time a sample of urine was taken for culture. **Definition of a positive test result** $>10^5$ cfu ml^{-1} of a single organism, intermediate cultures (10^4–10^5) were repeated	**Test 1:** Dipstick: home-based study: test performed by mothers, who had received detailed instructions on how to perform it. Mothers tested morning urine samples on Mondays and Thursdays and if child was symptomatic (N-Uristix; Ames) **Definition of positive result test 1:** Colour change from beige to pink

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Lagos, 1994[74] **Study design** Prospective cohort **Country** Chile **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Children presenting suspected of UTI. Children divided into three groups: *Group A:* children with some symptoms of urinary tract inflammation (559) *Group B:* febrile children with urinary tract symptoms (252) *Group C:* children with nutritional or gastrointestinal disorders, alterations of urine appearance or previous history of UTI without further follow-up (169) Children who had received antibiotics with systematic effects that acted against Gram-negative bacteria in the previous 4 days were excluded **Recurrent UTI:** NR **Urine sampling methods** Combination: midstream samples, for children who could not produce midstream SPA samples were obtained. Analysis only included first sample of urine in each patient **Number of patients (number of girls):** 990 (737) **Age: mean (range):** (<15 years; includes <24 months)	**Reference standard** Culture and microscopy **Reference standard execution** Cultured on selective (Levine) and non-selective agar (blood). Culture followed by microscopy without centrifugation **Definition of a positive test result** $\geq 10^5$ cfu ml^{-1} of a single bacterial isolates with leucocyturia $\geq$ 10 cells mm^{-3} or two urine cultures with the same characteristics	**Tests 1, 2:** Dipstick: interpreted according to manufacturers' instructions (Combur-9R; Boehringer Mannheim) **Definition of positive result test 1:** LE positive **Definition of positive result test 2:** Nitrite positive **Test 3:** Clinical features: naked eye examination of urine in tube **Definition of positive result test 3:** Not limpid **Test 4:** Combination **Definition of positive result test 4:** LE or nitrite positive **Test 5:** Combination **Definition of positive result test 5:** LE positive or not limpid **Test 6:** Combination **Definition of positive result test 6:** LE or nitrite positive or not limpid

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Lejeune, 1991[75] **Study design** Prospective cohort **Country** France **Setting (teaching)** Secondary care (NR)	**Patient spectrum** Consecutive urine samples from infants aged <18 months **Recurrent UTI:** NR **Urine sampling methods** Not clear **Number of patients (number of girls):** 243 (NR) **Age: mean (range):** NR (21 days to 18 months)	**Reference standard** Combination **Reference standard execution** Microscopy and culture, details not reported **Definition of a positive test result** $>25 \times 10^9$ WBC l^{-1} for boys or $>50 \times 10^9$ WBC l^{-1} for girls aged < 8 days; $>10^9$ WBC l^{-1} for those aged > 8 days and a bacterial count of $>10^5$ cfu ml^{-1} with a maximum of two bacterial species. Samples with $<10^4$ cfu ml^{-1} or with more than two bacterial species were considered contaminated. Classed as negative	**Tests 1–6:** Dipstick: (Multistick 8, SG; Ames) read by Clinitek System photometer (Ames) **Definition of positive result test 1:** LE positive **Definition of positive result test 2:** Nitrite positive **Definition of positive result test 3:** Protein positive **Definition of positive result test 4:** LE and nitrite positive **Definition of positive result test 5:** LE and protein positive **Definition of positive result test 6:** LE and nitrite and protein positive
Lin, 2000[77] **Study design** Prospective cohort **Country** Taiwan **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** All febrile infants (rectal temperature >38°C) admitted to the paediatric department aged <12 months. Patients were excluded if they had received antibiotics or SPA or bladder catheterisation within 24 hours **Recurrent UTI:** NR **Urine sampling methods** All specimens obtained by SPA **Number of patients (number of girls):** 230 (104) **Age: median (range):** 1 month (3 days to 12 months)	**Reference standard** Culture **Reference standard execution** Quantitative urine cultures using loop calibrated to deliver ± 0.01 ml used to inoculate plates containing sheep blood agar, Columbia CNA agar and MacConkey agar. Plates incubated at 35–37°C and examined at 24–48 hours for colony count and bacterial identification **Definition of a positive test result** Growth of a single urinary pathogen at a concentration of ≥ 1000 cfu ml^{-1} considered significant. Cultures with growth of mixed organisms or non-pathogenic Gram-positive cocci were considered contaminated	**Test 1:** Microscopy: standard microscopy. Specimens centrifuged at 2000 rpm for 10 minutes and examined microscopically for pyuria, reported as number of leucocytes per hpf (NR) **Definition of positive result test 1:** ≥ 5 WBC hpf^{-1} **Test 2:** Microscopy: Haemocytometer WBC counts, uncentrifuged urine examined microscopically using counting chamber (Kova slide chamber) **Definition of positive result test 2:** ≥ 10 WBC μl^{-1}

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Lin, 2000[76] **Study design** Prospective cohort **Country** Taiwan **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** All febrile (rectal temperature >38°C) infants aged < 8 weeks who presented to the emergency department or paediatric clinic. All infants were hospitalised. Infants who had received an antibiotic agent or who had undergone SPA or bladder catheterisation within 24 hours were excluded. Children had to provide >5 ml of urine on a single aspiration **Recurrent UTI:** NR **Urine sampling methods** All specimens obtained by SPA **Number of patients (number of girls):** 162 (68) **Age: mean (range):** NR (<8 weeks)	**Reference standard** Culture **Reference standard execution** Quantitative culture performed. Loop calibrated to deliver ±0.01 ml used to inoculate plates containing sheep blood agar, Columbia CNA agar and MacConkey agar. Plates incubated at 35–37°C and examined at 24–48 hours for colony count and bacterial identification **Definition of a positive test result** Growth of a single urinary pathogen at a concentration of ≥ 100 cfu ml^{-1}. Cultures with growth of mixed organisms or non-pathogenic Gram-positive cocci were considered contaminated and classed as negative	**Test 1:** Microscopy: standard UA. Samples centrifuged at 2000 rpm for 10 minutes and examined microscopically for pyuria, reported as number of leucocytes per hpf **Definition of positive result test 1:** ≥ 5 WBC hpf^{-1} **Test 2:** Microscopy: haemocytometer WBC counts. Uncentrifuged urine specimens examined microscopically on a slide chamber. Average leucocyte number per small grid counted and transformed to total cells per µl (Kova slide 10; Hycor Biomedical, Irvine, CA, USA), glass disposable cell counting chamber) **Definition of positive result test 2:** ≥ 10 WBC μl^{-1} **Test 3:** CRP: no details, part of full evaluation of sepsis. **Definition of positive result test 3:** >20 mg l^{-1} **Test 4:** ESR: no details, part of full evaluation of sepsis. **Definition of positive result test 4:** >30 mm h^{-1} **Test 5:** Peripheral WBC: no details, part of full evaluation of sepsis. **Definition of positive result test 5:** >15,000 μl^{-1}
Liptak, 1993[78] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Children with neurogenic bladder secondary to spinal cord disease or injury **Recurrent UTI:** NR **Urine sampling methods** Catheter specimens **Number of patients (number of girls):** 141 (329 specimens) (NR) **Age: mean (range):** NR (2 weeks to 21 years)	**Reference standard** Culture **Reference standard execution** Performed using 0.01 ml calibrated loop to inoculate MacConkey agar and blood plate **Definition of a positive test result** ≥ 10^5 cfu ml^{-1} of a single organism or of the predominant organism in a mixed culture where there were three or fewer total organisms	**Tests 1–3:** Dipstick (Chemstrip 9; Boehringer Mannheim) **Definition of positive result test 1:** LE positive **Definition of positive result test 2:** Nitrite positive **Definition of positive result test 3:** Either LE or nitrite or both positive **Test 4:** Clinical features **Definition of positive result test 4:** Signs and symptoms including: urinary odour and cloudiness, fever, malaise, haematuria, pain (NA) **Test 5:** Microscopy: WBCs and/or bacteria **Definition of positive result test 5:** ≥ 10 WBC hpf^{-1} or any bacteria

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Littlewood, 1977[79] **Study design** Prospective cohort **Country** UK **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Children attending a general paediatric outpatient clinic. None was receiving antibiotics **Recurrent UTI:** NR **Urine sampling methods** Combination: suprapubic, midstream, clean-catch or bag **Number of patients (number of girls):** 189 (NR) **Age: mean (range):** NR (2 weeks to 14 years)	**Reference standard** Culture **Reference standard execution** Culture on well-dried CLED plates (Oxoid), incubation at 37°C for 18 hours **Definition of a positive test result** $\geq 10^5$ organisms ml^{-1}	**Test 1:** Microscopy: centrifuged urine, bacteria count **Definition of positive result test 1:** ≥ 10 organisms per microscopic field
Lockhart, 1995[80] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Emergency department (teaching)	**Patient spectrum** Infants (aged <6 months) who presented to a paediatric emergency department over an 8-month period, and from whom urine was obtained for culture using a sterile technique. Patients were excluded if insufficient urine was obtained for both Gram stain and UA **Recurrent UTI:** NR **Urine sampling methods** Combination: SPA (three specimens) or catheterisation (remainder) **Number of patients (number of girls):** 207 (NR) **Age: mean (range):** NR (≤ 6 months)	**Reference standard** Culture **Reference standard execution** Quantitative urine culture using a 0.1-ml calibrated loop to inoculate blood agar and MacConkey agar culture plates. Plates were incubated and read at 24 and 48 hours **Definition of a positive test result** Pure growth of more than 1000 cfu ml^{-1}	**Test 1:** Microscopy: Gram stains on 25 μl of uncentrifuged urine. Stains were read by microbiology technicians and results were verified by supervising microbiologists **Definition of positive result test 1:** Any organisms in 20 oifs **Test 2:** UA: qualitative studies performed using an automated urine analyser (Clinitek 200 Plus; Miles): LE, nitrite, microscopy for bacteria and microscopy for pyuria on uncentrifuged sample **Definition of positive result test 2:** Any one of the following: more than trace LE, nitrite positive, >5 WBC on unstained microscopy, at least 'slight' bacteriuria

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Lohr, 1993[81] **Study design** Retrospective cohort **Country** USA **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Urine specimens, from patients whose physicians requested the urine studies to assist in ruling out or documenting a UTI, which were subjected to both UA and culture in an on-site outpatient clinic laboratory were reviewed for a 3-year period. Urine specimens collected for follow-up evaluations of previous UTI were excluded. Children with neurogenic bladders or other urinary tract abnormalities or who were known to have persistent bacteriuria were excluded **Recurrent UTI:** NR **Urine sampling methods** Combination: midstream void (n = 604), catheterisation (n = 76) and SPA (n = 9) **Number of patients (number of girls):** 689 (NR) **Age: mean (range):** NR (1 month to 16 years)	**Reference standard** Culture **Reference standard execution** 0.001-ml calibrated wire loop to inoculate sheep blood agar and MacConkey agar plates **Definition of a positive test result** >1000 cfu ml^{-1} for SPA, $>10^4$ cfu ml^{-1} for catheter specimens and $>10^5$ cfu ml^{-1} for midstream voided specimens of a single urinary tract pathogen	**Tests 1–3:** Dipstick: non-centrifuged sample (Ames Multistix reagent strip read with a Cliniteck 10 Analyser; Miles, Elkhart, IN, USA) **Definition of positive result test 1:** LE: at least trace **Definition of positive result test 2:** Nitrite: positive **Definition of positive result test 3:** LE and/or nitrite **Test 4:** Microscopy: drop of urine taken from sediment of a 10/12-ml sample centrifuged at 1800 rpm for 6 minutes **Definition of positive result test 4:** >5 WBC hpf^{-1} **Tests 5, 6:** Microscopy: drop of urine taken from sediment of a 10/12-ml sample centrifuged at 1800 rpm for 6 minutes. Examined with Gram stain to detect bacteria if they could not be detected in the unstained sediment and if any of the other tests were positive **Definition of positive result test 5:** any bacteria per hpf or oif **Definition of positive result test 6:** >5 WBC hpf^{-1} and/or any bacteria per hpf or oif **Tests 7–9:** Combination **Definition of positive result test 7:** LE and nitrite and/or >5 WBC hpf^{-1} **Definition of positive result test 8:** LE and nitrite and/or any bacteria per hpf or oif **Definition of positive result test 9:** Combination of all tests
Manson, 1985[82] **Study design** Prospective cohort **Country** UK **Setting (teaching)** Community (not secondary care)	**Patient spectrum** Primary schoolgirls **Recurrent UTI:** Other **Urine sampling methods** Midstream: collection by trained children's nurse **Number of patients (number of girls):** 2234 (2234) **Age: mean (range):** NR (4–12 years)	**Reference standard** Culture **Reference standard execution** Standard calibrated loop (1 μl) plated onto CLED agar and MacConkey agar **Definition of a positive test result** $\geq 10^5$ cfu ml^{-1}	**Test 1:** Microscopy: protocol 1: undiluted urine + borate buffer + acridine orange (Bactoscan) **Definition of positive result test 1:** 10^5 counts ml^{-1} **Test 2:** Microscopy: protocol 6: urine diluted (1:2) with distilled water + borate buffer + acridine orange (Bactoscan) **Definition of positive result test 2:** $\geq 10^5$ counts ml^{-1}

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Marret, 1995[83] **Study design** Prospective cohort **Country** Singapore **Setting (teaching)** Not clear (NR)	**Patient spectrum** Children with suspected UTI **Recurrent UTI:** NR **Urine sampling methods** Combination: sterile bag, midstream voided specimens, catheterisation and SPA **Number of patients (number of girls):** 69 (NR) **Age: mean (range):** NR (2 weeks to 14 years)	**Reference standard** Culture **Reference standard execution** No details **Definition of a positive test result** No details	**Tests 1–4:** Dipstick: test for bacteria (FiltraCheck-UTI) **Definition of positive result test 1:** No details **Test 2:** Dipstick: detection of LE and nitrites (Combur-9) **Definition of positive result test 2:** Not clear
Marsik, 1986[84] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (NR)	**Patient spectrum** NR **Recurrent UTI:** NR **Urine sampling methods** Combination: clean-catch, catheterised or SPA samples (numbers by each method NR) **Number of patients (number of girls):** 402 (601 samples) (NR) **Age: mean (range):** NR (0–21 years)	**Reference standard** Culture **Reference standard execution** Accepted techniques (Barry *et al.*, 1975[281]) **Definition of a positive test result** Clean-catch: single isolate of Gram-positive $\geq 10^4$ cfu ml^{-1}, or Gram-negative $\geq 10^5$ cfu ml^{-1} Catheterised: $\geq 10^4$ cfu ml^{-1} any organism SPA: any number of bacteria per ml	**Tests 1–4:** Dipstick: (Chemstrip LN; Biodynamics) **Definition of positive result test 1:** LE positive **Definition of positive result test 2:** Nitrite positive **Definition of positive result test 3:** LE or nitrite positive **Definition of positive result test 4:** LE and nitrite positive

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Matthai, 1995[85] **Study design** Prospective cohort **Country** India **Setting (teaching)** Secondary care (NR)	**Patient spectrum** Children with suspected UTI; none of the children had received antibiotics in the 24 hours before the study **Recurrent UTI:** NR **Urine sampling methods** Clean catch: freshly voided midstream clean-catch **Number of patients (number of girls):** 376 (NR) **Age: mean (range):** NR (6 months to 5 years)	**Reference standard** Culture **Reference standard execution** Cultured on blood agar and MacConkey agar and observed for 48 hours **Definition of a positive test result** $> 10^5$ cfu ml^{-1}	**Test 1:** Urine albumin: proteinuria: quantitatively estimated by the sulphosalicylic acid method **Definition of positive result test 1:** Not clear **Tests 2–4:** Microscopy: pyuria: unstained centrifuged samples and examined for leucocytes and erythrocytes **Definition of positive result test 2:** >5 WBC hpf^{-1} **Definition of positive result test 3:** >10 WBC hpf^{-1} **Definition of positive result test 4:** >20 WBC hpf^{-1} **Test 5:** Microscopy: bacteriuria: performed on unstained and Gram-stained sediment **Definition of positive result test 5:** Not clear **Test 6:** Combination: proteinuria, pyuria and bacteriuria **Definition of positive result test 6:** >10 WBC hpf^{-1} for pyuria, not clear for others **Test 7:** Pyuria and bacteriuria positive **Definition of positive result test 7:** >10 WBC hpf^{-1} for pyuria, not clear for others **Test 8:** Combination: pyuria and proteinuria positive **Definition of positive result test 8:** >10 WBC hpf^{-1} for pyuria, not clear for others **Test 9:** Combination: proteinuria and bacteriuria positive **Definition of positive result test 9:** Not clear **Test 10:** Combination: any two positive **Definition of positive result test 10:** >10 WBC hpf^{-1} for pyuria, not clear for others **Test 11:** Combination: any one positive **Definition of positive result test 11:** >10 WBC hpf^{-1} for pyuria, not clear for others

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Mongeau, 1972[86] **Study design** Prospective cohort **Country** Canada **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Children selected at random from a renal clinic to provide a urine specimen **Recurrent UTI:** NR **Urine sampling methods** Not clear **Number of patients (number of girls):** 100 (65) **Age: mean (range):** NR (3–16 years)	**Reference standard** Culture **Reference standard execution** Regular urine culture **Definition of a positive test result** $\geq 10^5$ cfu ml^{-1} or urinary pathogens. Growth of 104 considered doubtful, classed as negative	**Test 1:** Culture: miniature culture plate smeared with a dipstick after its immersion in the urine. After 19–24 hours incubation at 37°C. Read after 24 hours (Testuria) **Definition of positive result test 1:** No growth (0–2 colonies), suspicious growth (3–25 colonies) positive growth (>25 colonies). Suspicious classed as negative **Test 2:** Culture: semi-quantitative culture medium. Slide covered with nutrient agar on one side and MacConkey agar on the other dipped into freshly voided urine. Incubated at 37°C for 18 hours, results read semi-quantitatively. Read after 24 hours (Uricult) **Definition of positive result test 2:** $\geq 10^5$ cfu ml^{-1}, doubtful classed as negative
Morton, 1982[87] **Study design** Prospective cohort **Country** Nigeria **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Children suspected of having UTI and who had not taken antimicrobials in the previous 7 days **Recurrent UTI:** NR **Urine sampling methods** Combination: SPA performed about 20 minutes after drinking. If the aspiration failed one further attempt was made after a further drink. Following cleaning of the external genitalia midstream urine specimens were collected **Number of patients (number of girls):** Not clear (NR) **Age: mean (range):** NR (<10 years; includes infants)	**Reference standard** Culture **Reference standard execution** Samples plated out by loop onto MacConkey medium or blood agar for 18 hours at 37°C. Performed by SPA for comparison of test 1, urine specimen unclear for other tests **Definition of a positive test result** Virtually any growth from SPA, $\geq 10^5$ cfu ml^{-1} from midstream samples	**Test 1:** Culture: performed on MSU **Definition of positive result test 1:** $>10^5$ cfu ml^{-1} **Tests 2, 3:** Microscopy: uncentrifuged urine for WBCs: not stained **Definition of positive result test 2:** >10 cells mm^{-3} **Definition of positive result test 3:** >15 organisms hpf^{-1} **Test 4:** Microscopy: uncentrifuged urine for bacteria: Gram stained **Definition of positive result test 4:** >15 organisms hpf^{-1} **Test 5:** Microscopy: urine sediment, obtained by centrifugation at 2500 rpm for 5 minutes, for bacteria: Gram stained **Definition of positive result test 5:** >15 organisms hpf^{-1}

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Navarrete, 1966[88] **Study design** Prospective cohort **Country** Not clear **Setting (teaching)** Secondary care (NR)	**Patient spectrum** Urine samples were obtained from hospitalised children. Reasons for urine samples were: children presenting with general symptoms and fever, and for gastrointestinal symptoms including nausea, vomiting and diarrhoea or for control of a previously positive sample **Recurrent UTI:** NR **Urine sampling methods** Not clear: external genitalia cleaned with sterile solution, sterile bag was positioned with sticky tape **Number of patients (number of girls):** 140 (60) **Age: mean (range):** NR, 91% <2 years (1 month to 6 years)	**Reference standard** Culture **Reference standard execution** Quantitative culture was performed **Definition of a positive test result** $\geq 10^5$ cfu ml^{-1}	**Tests 1 and 2:** Culture: 2 cm^3 of urine was used for the test. Readings were taken every 30 minutes for 9 hours (Uriscreen) **Definition of positive result test 1:** Results after 4 hours **Definition of positive result test 2:** Results after 9 hours
Ordonez, 1994[89] **Study design** Prospective cohort **Country** Spain **Setting (teaching)** Secondary care (NR)	**Patient spectrum** Children presenting to the service with fever and/or a suspicion of UTI **Recurrent UTI:** NR **Urine sampling methods** Bag specimens **Number of patients (number of girls):** 100 (40) **Age: mean (range):** NR (1–24 months)	**Reference standard** Culture **Reference standard execution** Sample incubated for 18 hours at 37°C **Definition of a positive test result** $\geq 10^5$ cfu ml^{-1} of the same organism in two consecutive urine cultures	**Test 1:** Clinical features: semi-quantitative urine culture comprised three agar plates: CLED (green) on one side, MacConkey (brown/red) and *Enterococcus* culture media (no colour). Urine added to test and incubated for 16–24 hours at 37°C (Uricult-plus) **Definition of positive result test 1:** The removable section of the tube (containing the agar) was removed and the sensitivity of the colonies was compared with a standard model **Tests 2, 3:** Dipstick (Multistix; Ames) **Definition of positive result test 2:** Nitrite **Definition of positive result test 3:** Nitrite positive

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Palmer, 1997[90] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Consecutive children undergoing urodynamic evaluation for various indications. Indications for urodynamic evaluation included various aetiologies of neurogenic and non-neurogenic bladder dysfunction. All children were asymptomatic for UTI at the time of the study. Children on suppressive or therapeutic antibiotic regimens were maintained on that agent **Recurrent UTI:** No **Urine sampling methods** Catheter specimens **Number of patients (number of girls):** 200 (NR) **Age: mean (range):** NR (0–15 years)	**Reference standard** Culture **Reference standard execution** Uncentrifuged urine was mixed and inoculated onto plates of eosin-methylene blue and Columbia CNA soy agar supplemented with 5% sheep blood. Incubated overnight at 35–37°C with 5–10% carbon dioxide **Definition of a positive test result:** ≥ 50,000 cfu ml^{-1}	**Test 1:** An aliquot of urine was tested immediately according to manufacturer's specifications. A 1.5–2-ml urine sample was transferred into a test-tube containing the reagent powder; four drops of 10% hydrogen peroxide were added and mixed (Uriscreen; no further details) **Definition of positive result test 1:** Formation of foam sufficient to form a complete ring or layer on the surface of the liquid within 1–2 minutes
Parmington, 1989[91] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** All patients presenting to the paediatric emergency department, in whom both a urine culture was ordered and a nitrite dipstick result recorded **Recurrent UTI:** NR **Urine sampling methods** Not clear **Number of patients (number of girls):** 305 (214) **Age: mean (range):** NR (includes <2 years, age range NR)	**Reference standard** Culture **Reference standard execution** NS **Definition of a positive test result** NS	*Total population* **Test 1:** Dipstick **Definition of positive result test 1:** Nitrite

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Pryles, 1965[92] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Infants and children attending consecutive paediatric renal clinics. One urine specimen per patient was obtained at each clinic; patients could contribute several samples over several visits **Recurrent UTI:** NR **Urine sampling methods** Clean-catch **Number of patients (number of girls):** 136 (275 urine specimens) (114) **Age: mean (range):** NR (infants and children)	**Reference standard** Culture **Reference standard execution** No further details **Definition of a positive test result** $\geq 10^5$ cfu ml^{-1}	**Tests 1 and 2:** Microscopy: well-mixed aliquot was examined in a Neubauer counting chamber and a cell count performed **Definition of positive result test 1:** $\geq$ 10 WBC mm^{-3} **Definition of positive result test 2:** $\geq$ 100 WBC mm^{-3} **Test 3:** Microscopy: aliquot centrifuged at 3000 rpm for 3 minutes, supernatant fluid poured off and sediment diluted to 0.5 ml with more uncentrifuged urine and mixed well **Definition of positive result test 3:** $\geq$ 5 WBC mm^{-3}
Purwar, 1972[93] **Study design** Prospective cohort **Country** India **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** NR **Recurrent UTI:** NR **Urine sampling methods** Not clear: urine specimens for routine examination were collected in clean test tubes or bottles. For culture samples were clean-voided midstream samples with strict aseptic precautions in sterile test-tubes, in very few cases catheter specimens were taken **Number of patients (number of girls):** 232 (62) **Age: mean (range):** NR (2 months to 14 years)	**Reference standard** Culture **Reference standard execution** Colony counts performed 24–48 hours after incubating sterilised urine inoculated agar plate **Definition of a positive test result** $>10^4$ cfu ml^{-1}	**Test 1:** Microscopy: Gram-stained film of a loopful of uncentrifuged urine **Definition of positive result test 1:** Any bacteria

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Pylkkanen, 1979[94] **Study design** Prospective cohort **Country** Finland **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Patients seen at a general outpatient clinic with symptoms suggestive of UTI or with a high leukocyte count or an abnormal quantitative bacterial culture from a CVU specimen **Recurrent UTI:** NR **Number of patients (number of girls):** 477 (not reported) **Age: mean (range):** not reported (not reported, 164 infants included)	**Reference standard** Culture **Reference standard execution** Suprapubic aspiration sample cultured on Uricult dipslides and blood agar plates **Definition of a positive test result** Both cultures showed consistent bacterial growth	**Tests 1 and 2:** Leukocyte count by microscopy of CVU specimen **Definition of positive result test 1:** ≥ 200 leukocytes mm^{-3} **Definition of positive result test 2:** ≥ 11 leukocytes mm^{-3} **Tests 3 and 4:** Bacterial count by microscopy of CVU specimen **Definition of positive result test 3:** ≥ 30 bacteria/microscope field **Definition of positive result test 4:** >1 bacteria/microscope field **Tests 5 and 6:** Quantitative bacterial culture of CVU **Definition of positive result test 5:** ≥ 10^5 bacteria ml^{-1} **Definition of positive result test 6:** ≥ 10^4 bacteria ml^{-1}
Ramage, 1999[95] **Study design** Prospective cohort **Country** UK **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Infants in whom urine culture was indicated, with paired urine cultures obtained by SPA and clean-catch within a 48-hour period, in the absence of prior or intervening antibiotic 58 specimen pairs from 49 patients **Recurrent UTI:** NR **Urine sampling methods** Combination: clean-catch specimens and paired SPA specimens **Number of patients (number of girls):** 49 (58 specimens) (27) **Age: mean (range):** 0.36 years (<24 months)	**Reference standard** Culture of SPA specimen **Reference standard execution** Specimen obtained by SPA as described by Nelson and Peters.[282] Culture on 'Till-U-Test' dipslide plate incubated at 37°C for 16 hours **Definition of a positive test result** Presence of growth of any organism	**Test 1:** Urine sampling: as for reference standard, but sample obtained by clean-catch by nursing staff or parents supervised by nursing staff **Definition of positive result test 1:** ≥ 10^5 cfu ml^{-1}
Rich, 1976[96] **Study design** Prospective cohort **Country** UK **Setting (teaching)** Community (not secondary care)	**Patient spectrum** Population screening in six primary schools and one secondary school **Recurrent UTI:** Other **Urine sampling methods** Midstream **Number of patients (number of girls):** 1329 (1329) **Age: mean (range):** NR (4–16 years)	**Reference standard** Culture **Reference standard execution** Supervised collection, dipslide **Definition of a positive test result** Three supervised midstream sample with ≥ 10^5 cfu ml^{-1}	**Tests 1 and 2:** Culture: home dipslide, after explanatory letter to parents and explanation to children by nurse **Definition of positive result test 1:** ≥ 10^5 cfu ml^{-1}. Unsatisfactory samples (n = 213) classed as negative **Definition of positive result test 2:** ≥ 10^5 cfu ml^{-1} (negative includes unreturned dipslides)

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Santos, 1982[97] **Study design** Prospective cohort **Country** Brazil **Setting (teaching)** Not clear (NR)	**Patient spectrum** Children with possible UTI **Recurrent UTI:** NR **Urine sampling methods** Combination: bag samples from infants, midstream from older children **Number of patients (number of girls):** 2000 (1314) **Age: mean (range):** NR (<12 years)	**Reference standard** Culture **Reference standard execution** Urine diluted and plated on MacConkey and blood agar. Incubated for 24 hours at 37°C **Definition of a positive test result** Not clear	**Test 1:** Microscopy: quantitative bacterioscopy: urine Gram stained, area was standardised and reading of homogenised urine smears was used to calculate the quantity of bacteria per ml and their morpho-tinctorial condition **Definition of positive result test 1:** Not clear **Test 2:** Microscopy for the presence of leucocyturia: urine was centrifuged at 2000 rpm for 5 minutes, stained with the dye of Sterheimer-Malbin, and number of leucocytes counted **Definition of positive result test 2:** Not clear
Saxena, 1975[98] **Study design** Prospective cohort **Country** India **Setting (teaching)** Not clear (NR)	**Patient spectrum** Children in whom a clinical diagnosis of UTI was made and who were referred for laboratory confirmation. All children were ambulatory and continent **Recurrent UTI:** NR **Urine sampling methods** Midstream samples **Number of patients (number of girls):** 70 (45) **Age: mean (range):** NR (4–12 years)	**Reference standard** Culture **Reference standard execution** Semiquantitative urine culture performed within 1 hour of collection on MacConkey agar and blood agar plates **Definition of a positive test result** NR	**Test 1:** Microscopy: urine sample was shaken well and a drop placed on a Neubaur counting chamber **Definition of positive result test 1:** >10 WBC mm^{-3}

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Scherstein, 1968[99] **Study design** Prospective cohort **Country** Sweden **Setting (teaching)** Community (not secondary care)	**Patient spectrum** Screening of 4-year-old children and schoolgirls; no further details reported **Recurrent UTI:** Combination **Urine sampling methods** Midstream: samples were clean-voided, midstream specimens from first morning voiding, after overnight fast **Number of patients (number of girls):** 719 (592) **Age: mean (range):** NR (4 to 18 years)	**Reference standard** Culture **Reference standard execution** Culture as previously described[283] **Definition of a positive test result** Positive when two or more consecutive samples of $>10^5$ organisms ml^{-1}	**Test 1:** Dipstick: test paper A, prepared in the laboratory: for the adsorbent part, 2-diethylaminoethanol-substituted paper, washed with phosphate buffer, was used. Glucose oxidase, peroxidase and *o*-tolidine were used for the colour reagent. Reagents were fixed on a plastic stick. Test performed by immersing adsorbent part in urine (max. 0.5 cm) and allowing urine to pass to colour reaction part by capillary action. Reaction evaluated 3 minutes after urine reached colour reaction part **Definition of positive result test 1:** If no colour after 3 minutes, test negative for glucose and therefore positive for bacteriuria
Schreiter, 1971[100] **Study design** Prospective cohort **Country** Germany **Setting (teaching)** Secondary care (NR)	**Patient spectrum** Children admitted to the paediatric department with suspected or confirmed UTI. 349 children aged 0–1 years and 660 1–14 years. Children with confirmed glomerulonephritis were excluded. Some children were receiving chemotherapy (n = 188), the rest were not (n = 821) **Recurrent UTI:** NR **Urine sampling methods** Not clear: no details reported **Number of patients (number of girls):** 1009 (614) **Age: mean (range):** NR (0–14 years)	**Reference standard** Culture **Reference standard execution** Urine streaked on blood agar and an endoplate. Urine centrifuged and sediment streaked on fructose bouillon. Incubated for 24 hours at 37°C and colonies counted **Definition of a positive test result** $>10^5$ cfu ml^{-1}	**Test 1:** Microscopy: leucocytes counted. no details. Aged <1 year. Children who did not receive chemotherapy **Definition of positive result test 1:** >20 LE μl^{-1} **Test 2:** Microscopy: leucocytes counted. No details. Aged 1–14 years. Children who did not receive chemotherapy **Definition of positive result test 2:** >20 LE μl^{-1} **Test 3:** Microscopy: leucocytes counted. No details. Aged <1 year. Children who did chemotherapy **Definition of positive result test 3:** >20 LE μl^{-1} **Test 4:** Microscopy: leucocytes counted. No details. Aged 1–14 years. Children who did receive chemotherapy **Definition of positive result test 4:** >20 LE μl^{-1}

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Sharief, 1998[101] **Study design** Prospective cohort **Country** UK **Setting (teaching)** Secondary care (non-teaching)	**Patient spectrum** Children in whom UTI was a possibility; unselected children with fever, no urinary tract symptoms **Recurrent UTI:** NR **Urine sampling methods** Combination: 188 clean-catch, 167 bag **Number of patients (number of girls):** 325 (131) **Age: mean (range):** 39.5 months (2 days to 16 years)	**Reference standard** Culture **Reference standard execution** NS **Definition of a positive test result** UTI defined as pure growth of $\geq 10^5$ cfu ml^{-1}, inconclusive culture defined as 10^4–10^5 cfu ml^{-1}, and pyuria, $<10^4$ cfu ml^{-1}, and mixed growth were taken to be negative	**All tests:** Dipstick (Multistix 8 SG; (Bayer), read on a Clinitex 10 reflectance meter (Bayer) ***Total study population:*** **Definition of positive result test 1:** LE positive **Definition of positive result test 2:** Nitrite positive **Definition of positive result test 3:** LE and nitrite positive ***Infants < 1 year*** **Definition of positive result test 4:** LE positive **Definition of positive result test 5:** Nitrite positive **Definition of positive result test 6:** LE and nitrite positive ***Total study population:*** **Definition of positive result test 7:** LE or nitrite positive ***Infants < 1 year*** **Definition of positive result test 8:** LE or nitrite positive

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Shaw, 1991[103] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (NR)	**Patient spectrum** All children who were examined in the paediatric emergency department who had a urine specimen collected for culture between 08.00 h and 24.00 h (when a laboratory technician was available). The evaluating physician made the decision to order a urine culture and chose the method of specimen collection **Recurrent UTI:** NR **Urine sampling methods** Combination: urine collected in a urine bag or by midstream, clean-catch techniques were cultured using dipslide (Uricult). Urine obtained by urethral catheterisation cultured in laboratory **Number of patients (number of girls):** 491 (309) **Age: mean (range):** 6 years (14 days to 19 years)	**Reference standard** Culture **Reference standard execution** Either dipslide (Uricult, Medical Technology Corp., Somerset, NJ, USA) or inoculated onto blood and MacConkey agar plates with a 0.01-ml calibrated loop. Cultures and dipslides incubated at 35°C and examined for growth daily for 2 days **Definition of a positive test result** $\geq 10^5$ cfu ml^{-1} of one or two urinary pathogens for clean-catch specimens or $\geq 10^3$ cfu ml^{-1} for catheterised specimens	***All children*** **Tests 1, 2:** Dipstick: LE measurement, read after 2 minutes as negative, trace, small (1+), moderate (2+) or large (3+); nitrite read at 60 seconds and recorded as negative or positive. Performed by trained laboratory technician (Multistix 10 SG) **Definition of positive result test 1:** at least small LE or positive nitrite **Definition of positive result test 2:** at least trace LE or positive nitrite **Definition of positive result test 3:** at least small LE and positive nitrite **Tests 4–6:** Microscopy: centrifuged at 2200 rpm for 5 minutes **Definition of positive result test 4:** at least 10 WBC hpf^{-1} or moderate bacteria **Definition of positive result test 5:** at least 5 WBC hpf^{-1} or few bacteria **Definition of positive result test 6:** at least 10 WBC hpf^{-1} and moderate bacteria ***Aged <2 years*** **Tests 7 and 8:** Dipstick: as above **Definition of positive result test 7:** at least trace LE or positive nitrite **Definition of positive result test 8:** at least small LE and positive nitrite **Tests 9 and 10:** Microscopy: as above **Definition of positive result test 9:** at least 5 WBC hpf^{-1} or few bacteria **Definition of positive result test 10:** at least 10 WBC hpf^{-1} and moderate bacteria

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Shaw, 1998[102] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Patients presenting to a children's hospital emergency department with unexplained fever ≥ 38.3°C or symptoms of UTI. It was standard practice in the department to obtain urine specimens on such patients **Recurrent UTI:** NR **Urine sampling methods** Combination: in 1% of patients urine was obtained, after sterile preparation, by midstream clean-catch. The remainder of specimens were obtained by catheterisation, as per standard practice in the unit **Number of patients (number of girls):** 3873 (2363) **Age: mean (range):** 9 months (<2 years girls, <1 year boys)	**Reference standard** Culture **Reference standard execution** Quantitative cultures performed in the microbiology laboratory. Urine inoculated onto blood and MacConkey agar plates with a 0.1-ml calibrated loop, incubated at 35°C, and examined daily for growth for 2 days **Definition of a positive test result:** ≥ 10^4 cfu ml^{-1} of a urinary tract pathogen. Mixed organisms of non-pathogens were considered contaminated and classed as negative	**Tests 1, 2:** Dipstick: performed in the haematology laboratory, results interpreted visually according to standard colour charts. LE read after 2 minutes and recorded as negative, trace, small (+1), moderate (+2) or large (+3). Nitrate read at 60 seconds and recorded as positive or negative (Multistix 10SG 228; Bayer, Elkhart, IN, USA) **Definition of positive result test 1:** At least trace LE or positive nitrite (n = 3394) **Definition of positive result test 2:** At least moderate LE or positive nitrite (n = 3394) **Test 3:** Microscopy: cell count using uncentrifuged urine (Neubauer haemocytometer, Reichert) **Definition of positive result test 3:** ≥ 10 WBC mm^{-3} (n = 2193) **Tests 4, 5:** Microscopy: Gram stain, smears were prepared using uncentrifuged urine (NR) **Definition of positive result test 4:** Any bacteria (n = 2305) **Definition of positive result test 5:** Single organism (n = 2305) **Tests 6, 7:** Microscopy: cell count using uncentrifuged urine. Gram stain, smears were prepared using uncentrifuged urine (Neubauer haemocytometer, Reichert) **Definition of positive result test 6:** Cell count ≥ 10 WBC mm^{-3} or positive Gram stain (n = 2016) **Definition of positive result test 7:** Cell count ≥ 10 WBC mm^{-3} and positive Gram stain (n = 2016) **Tests 8, 9:** Combination: dipstick analysis as before. Urine centrifuged for 5 minutes at 2200 rpm and number of leucocytes and bacteria per hpf recorded. Microscopy only performed if any component of the dipstick was positive (protein, blood, glucose, LE, nitrite, ketones) **Definition of positive result test 8:** Dipstick positive or ≥ 5 WBC hpf^{-1} or any bacteria per hpf (n = 3394) **Definition of positive result test 9:** Dipstick positive and ≥ 5 WBC hpf^{-1} and bacteraemia per hpf

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Struthers, 2003[104] **Study design** Prospective cohort **Country** UK **Setting (teaching)** Secondary care (non-teaching)	**Patient spectrum** Children aged <6 years, whose urine was being collected, in a paediatric admissions department. There were no specific exclusions, but children were only included when study team was on duty. Unit policy was that all unwell or febrile young children should have a urine sample collected; this will include children with symptoms of UTI and children with non-specific symptoms **Recurrent UTI:** NR **Urine sampling methods** Combination: clean-catch (n = 105), SPA (n = 3), midstream (n = 2) **Number of patients (number of girls):** 110 samples (NR) **Age: mean (range):** 23 months (2 days to 62 months)	**Reference standard** Culture **Reference standard execution** No details **Definition of a positive test result** $>10^5$ cfu ml^{-1}, mixed growths were classed as negative	**Test 1:** Clinical features: questionnaire on urine odour given to parents at time of sample collection **Definition of positive result test 1:** One or more positive replies
Tahirovic, 1988[105] **Study design** Prospective cohort **Country** Yugoslavia **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Unselected patients **Recurrent UTI:** NR **Urine sampling methods** Midstream **Number of patients (number of girls):** 306 (NR) **Age: mean (range):** NR (0–14 years)	**Reference standard** Culture **Reference standard execution** Quantitative culture **Definition of a positive test result** $\geq 10^5$ cfu ml^{-1}	**Test 1:** Dipstick (Urocomb 8 test Pliva; Boehringer Mannheim) **Definition of positive result test 1:** Nitrite positive **Test 2:** Dipstick: nitrite test after sterile incubation for 4 hours at 37°C, for samples initially nitrite negative (Urocomb 8 test Pliva) **Definition of positive result test 2:** Nitrite positive **Test 3:** Dipstick: nitrite test after sterile incubation with $NaNO_3$ for 4 hours at 37°C, for samples initially nitrite negative (Urocomb 8 test Pliva) **Definition of positive result test 3:** Nitrite positive

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Todd, 1974[106] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Community (non-teaching)	**Patient spectrum** Children with recurrent urinary tract infections. 13 of the children had underlying anatomical or physiological abnormalities of the urinary tract, 12 were receiving suppressant medications **Recurrent UTI:** Recurrent UTI **Urine sampling methods** Combination: not clearly reported for home specimen collection. For reference standard culture, a midflow catheter specimen or clean-catch midstream sample was required **Number of patients (number of girls):** 25 (22) **Age: mean (range):** NR (3–14 years)	**Reference standard** Culture **Reference standard execution** Midflow catheter quantitative urine culture performed according to the calibrated loop method. Culture performed if home tests indicated UTI positive, and samples from all children were cultured at 1–2-month intervals. Reference standard was not clearly reported **Definition of a positive test result** $>10^3$ cfu ml^{-1} or if two clean-catch midstream urine cultures (one for boys) $>10^5$ cfu ml^{-1} of a single organism	**Test 1:** Dipstick: urine specimens taken after overnight fasting tested weekly at home. The first morning specimen was tested with Uriglox Strips (Kabi, Stockholm, Sweden). If glucose was present infection was assumed to be absent. If glucose was absent on two consecutive specimens the children were seen in the clinic to confirm the presence of infection **Definition of positive result test 1:** Absence of glucose (no blue colour)
Vangone, 1985[107] **Study design** Prospective cohort **Country** Italy **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** No further details **Recurrent UTI:** NR **Urine sampling methods** Combination: sterile bag, catheter Midstream: no further details **Number of patients (number of girls):** 561 (NR) **Age: mean (range):** NR (15 days to 15 years)	**Reference standard** Culture **Reference standard execution** No details reported **Definition of a positive test result** $>10^5$ cfu ml^{-1}	**Tests 1 and 2:** Microscopy: fresh, unstained, uncentrifuged urine, bacterial count using a Neubauer haemocytometer **Definition of positive result test 1:** >5 bacteria ml^{-1} **Definition of positive result test 2:** >10 bacteria ml^{-1}

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Vickers, 1991[108] **Study design** Prospective cohort **Country** UK **Setting (teaching)** Secondary care (NR)	**Patient spectrum** Consecutive children who attended an outpatient clinic (many because of previous UTI diagnosis) or who were admitted to hospital with a wide range of diagnoses and symptoms and signs that included unexplained pyrexia, abdominal pain, haematuria, malaise and weight loss. A few had known chronic renal failure **Recurrent UTI:** Combination **Urine sampling methods** Combination: midstream specimens or sterile urine bags in younger children **Number of patients (number of girls):** 357 (NR) **Age: mean (range):** NR (6 weeks to 18 years)	**Reference standard** Combination **Reference standard execution** As with index tests **Definition of a positive test result** Patients were considered positive if urine microscopy and culture results were both positive, and to have uninfected urine when the culture result was negative, irrespective of the microscopic findings. If the initial urine specimen showed uncertain results on microscopy or culture, a repeat specimen was taken as soon as possible. Urine samples were obtained repeatedly until a specimen fulfilled criteria for a UTI or no infection	**Test 1:** Microscopy: samples examined three times at x400 magnification. Samples examined for red and white blood cells, epithelial cells, crystals, debris and bacteria. Neubauer counting chamber with a mirrored surface was used in all examinations **Definition of positive result test 1:** $\geq 10^7$ bacteria of the same morphology per ml; negative if no bacteria seen; uncertain for any other result. For 2×2 analysis uncertain classed as negative **Test 2:** Culture: urine plated onto MacConkey and blood agar and the interval between the collection and plating noted **Definition of positive result test 2:** $>10^5$ cfu ml^{-1} of one species; negative if $<10^4$ cfu ml^{-1}; uncertain if growth of more than one species was observed. For 2×2 analysis uncertain classed as negative

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Waisman, 1999[109] **Study design** Prospective cohort **Country** Israel **Setting (teaching)** Secondary care (NR)	**Patient spectrum** A random sample of children presenting to the emergency department of a children's medical centre with symptoms suggesting UTI. Inclusion criteria were: for infants, fever with no apparent source, vomiting, decreased appetite and irritability; for toddlers, abdominal pain and voiding frequency with or without fever; and for older children, dysuria, frequency, urgency and abdominal flank pain with or without fever. Children receiving antibiotics were excluded from the study **Recurrent UTI:** NR **Urine sampling methods** Combination: SPA for neonates, catheterisation for girls ≤ 3 years and urine bags for boys until they were toilet trained, clean-catch for older children **Number of patients (number of girls):** 121 (82) **Age: mean (range):** NR (1 month to 17 years)	**Reference standard** Culture **Reference standard execution** Commercial Diaslide methods (Diathec Diagnostica). Hinged case containing two opposing agar media, both agar surfaces inoculated with a streaking dilution **Definition of a positive test result** $>10^5$ cfu ml^{-1} for clean-catch or urine bag, 10^3 for catheterised and SPA samples	**Test 1:** Uriscreen (catalase test): aliquot of urine placed in a test-tube containing Uriscreen reagent powder, four drops of 10% hydrogen peroxide added and shaken gently (Uriscreen; Diathec Diagnostica, Rehovot, Israel) **Definition of positive result test 1:** Formation of foam sufficient to form a complete ring or layer on the surface of the liquid within 1–2 minutes of the addition of the hydrogen peroxide **Test 2:** Dipstick: aliquot of uncentrifuged urine tested for presence of nitrite or LE (Multistix; Bayer, Elkhart, IN, USA) **Definition of positive result test 2:** Positive if the dipstick turned pink or red for nitrites or purple (from trace to +2) for leucocytes within 2 minutes of contact with the urine **Test 3:** Microscopy: uncentrifuged urine screened initially with automated urine analyser, specimens found to be positive underwent centrifugation and the sediment was examined by standard microscopy (Urotron RL9; Boehringer Mannheim) **Definition of positive result test 3:** >10 leucocytes hpf^{-1}

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Wammanda, 2000[110] **Study design** Prospective cohort **Country** Nigeria **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Consecutive children presenting at a paediatric hospital unit with features suggestive of urinary tract infection as well as other clinical conditions necessitating infection screen, in whom urine culture was carried out as part of the infection screen **Recurrent UTI:** NR **Urine sampling methods** Combination: clean-catch midstream urine collected in a sterile container in older children. For infants, collected in a sterile urine bag attached to their perineum after cleaning with dilute Savlon **Number of patients (number of girls):** 185 (67) **Age: mean (range):** NR (2 days to 12 years)	**Reference standard** Culture **Reference standard execution** Blood agar and MacConkey agar plated simultaneously. Incubated for 18–24 hours. **Definition of a positive test result** $\geq 10^5$ cfu ml^{-1}	**Test 1:** Microscopy: for leucocyturia: 10 ml of urine centrifuged, supernant fluid decanted and remainder shaken to mix; drop placed on slide and examined under high power **Definition of positive result test 1:** $\geq$ 10 cells hpf^{-1} **Test 2:** Dipstick: nitrite using Multistix 10 SG test strip according to manufacturer's instructions (Multistix; Bayer) **Definition of positive result test 2:** Manufacturer's instructions

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Weinberg, 1991[111] **Study design** Retrospective cohort **Country** USA **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Children who had a complete UA, quantitative urine Gram-stained smear and urine culture performed as part of an evaluation for urinary tract infection or acute febrile illness of uncertain cause. Follow-up specimens were excluded from the analysis. Children came from a clinic serving children from birth to aged 18 years **Recurrent UTI:** NR **Urine sampling methods** Combination: the method of urine collection was at the discretion of the physician caring for the patient: catheter (n = 261), bag (n = 186), SPA (n = 253) and clean-catch (n = 319). **Number of patients (number of girls):** 1019 (NR) **Age: mean (range):** NR	**Reference standard** Culture **Reference standard execution** 0.001-ml calibrated loop was used to plate and streak the urine on MacConkey's and CNA agar. Organism identification and quantification were by standard microbiological techniques **Definition of a positive test result** $\geq 10^5$ cfu ml^{-1}	**Tests 1–4:** Microscopy: drop of well-mixed uncentrifuged urine transferred to slide and stained using Gram stain reagents. Five oifs were examined and the averaged results reported as number of microorganisms seen. **Definition of positive result test 1:** Any **Definition of positive result test 2:** $\geq$ 1 oif^{-1} **Definition of positive result test 3:** $\geq$ 2 oif^{-1} **Definition of positive result test 4:** $\geq$ 5 oif^{-1} **Tests 5–7:** Dipstick: used in accordance with manufacturer's instructions (Multistix; Ames) **Definition of positive result test 5:** Nitrite positive **Definition of positive result test 6:** LE positive **Definition of positive result test 7:** Nitrite or LE positive **Tests 8, 9:** Microscopy: urine centrifuged for 5 minutes at 2000 rpm, resuspended after supernatant was decanted. Placed in disposable slide chamber and examined microscopically (Kova slide chamber; ICL Scientific) **Definition of positive result test 8:** $\geq$ 5 WBC hpf^{-1} **Definition of positive result test 9:** $\geq$ 10 WBC hpf^{-1}

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Wiggelinkhuizen, 1988[112] **Study design** Prospective cohort **Country** South Africa **Setting (teaching)** Secondary care (teaching)	**Patient spectrum** Children attending medical casualty and outpatient follow-up clinics were screened **Recurrent UTI:** NR **Urine sampling methods** Combination: clean-catch midstream ($n = 668$), bag ($n = 400$), catheter ($n = 44$), suprapubic aspiration ($n = 6$), other (ostomy samples) ($n = 19$) **Number of patients (number of girls):** 1137 (522) **Age: mean (range):** NR (0 to >12 years)	**Reference standard** Culture **Reference standard execution** Semi-quantitative culture using Bacteruritest (Mast Laboratories) filterstrip imprints on CLED agar **Definition of a positive test result** $>10^5$ cfu ml^{-1} of one predominant organism. Lower counts were considered significant if samples obtained by bladder catheterisation or SPA	**Tests 1–6:** Dipstick (Combur-9 test; Boehringer Mannheim) **Definition of positive result test 1:** LE positive **Definition of positive result test 2:** Nitrite positive **Definition of positive result test 3:** LE or nitrite positive **Definition of positive result test 4:** LE and nitrite positive **Definition of positive result test 5:** LE, nitrite or protein positive **Definition of positive result test 6:** LE, nitrite and protein positive **Tests 7–12:** Dipstick (Multistix 9; Ames Bayer-Miles) **Definition of positive result test 7:** LE positive **Definition of positive result test 8:** Nitrite positive **Definition of positive result test 9:** LE or nitrite positive **Definition of positive result test 10:** LE and nitrite positive **Definition of positive result test 11:** LE, nitrite or protein **Definition of positive result test 12:** LE, nitrite and protein positive **Note:** For the analysis for dipstick positive for both LE and nitrite the authors appear to have omitted test results that were positive for LE or positive for nitrite and negative for the other. The reviewers used the results for dipstick positive for either test to deduce these and have added these to the 'negative' cells of the 2×2 table of the data

continued

TABLE 40 *Included studies of tests for the diagnosis of UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Woodward, 1993[113] **Study design** Prospective cohort **Country** UK **Setting (teaching)** Secondary care (non-teaching)	**Patient spectrum** Patients in paediatric surgical department. Patients were selected using pre-existing criteria for urine testing (NS); most had acute abdominal pain **Recurrent UTI:** NR **Urine sampling methods** Combination: 86% of samples were taken midstream **Number of patients (number of girls):** 133 (71) **Age: mean (range):** 8.1 years (1 month to 15 years)	**Reference standard** Culture and microscopy **Reference standard execution** NS **Definition of a positive test result** > 20 WBC μl^{-1} and $> 10^8$ cfu l^{-1} (10^5 cfu ml^{-1})	**Test 1:** Dipstick: LE and nitrite positive (Multistix 10SG; Bayer) **Definition of positive result test 1:** more than a trace of LE, any colour change for nitrites **Test 2:** Dipstick: either test positive (Multistix 10SG) **Definition of positive result test 2:** more than a trace of LE detected, any colour change for nitrites

CNA, colistin-nalidixic acid; CLED, cystine lactose electrolyte-deficient; UA, urinalysis.

Appendix 6

Included studies: further investigation

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI*

Study details	Patient details	Reference standard	Index test
Alon, 1986[114] **Study design** Prospective cohort **Country** Israel **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** All children hospitalised or seen at an outpatient clinic, over approx. 11 months, because of confirmed symptomatic UTI, in whom radiological evaluation was indicated. Indications for radiological evaluation were: first documented UTI in boys; first documented UTI in girls aged <5 years; first infection presenting as severe clinical pyelonephritis in older girls; second infection in girls aged >5 years **Recurrent UTI:** NR **Number of patients (number of girls):** 81 (68) (33 outpatients, 48 inpatients) **Age: mean (range):** 4 years (2 weeks to 12 years)	**Reference standard** IVP: examination preceded by plain abdominal and pelvic radiographs. 60% urographin injected i.v. at 1 ml kg^{-1} body weight in children and 2–3 ml kg^{-1} body weight in small infants. Supine radiographs of the kidneys and bladder were obtained at 5 and 10 minutes; if necessary, prone radiographs were added. Additional oblique and postvoiding radiographs or tomography were used when indicated **Time between infection and reference standard:** 5–7 weeks **Definition of a positive test result** NR	**Test 1:** MCUG: bladder filled to capacity with 30% Urographin under fluoroscopic visualisation. If passive reflux was observed during filling a radiograph was obtained. The full bladder was radiographed routinely. After catheter removal the patient voided, and, if reflux was noted during voiding, a radiograph was taken, if not a postvoiding radiograph of the kidneys, ureters, bladder, and urethral areas was obtained **Time between infection and test 1:** 5–7 weeks **Definition of positive result test 1:** Reflux was graded 1–5 according to the international system[284] **Test 2:** Ultrasound: ultrasonography was performed first. Examination with a grey-scale static scanner and 3.5–5-MHz transducers, and a real-time sector scanner with a 5-MHz transducer. Longitudinal supine and prone scans, and transverse prone scans were performed to evaluate position, size and anatomy of the kidneys. For detection of renal scars the parenchymal width was measured along the length of each kidney and compared bilaterally. In addition, serial longitudinal scans were carried out with 0.5–1.0-cm intervals, with accentuation on the central echographic pattern, to detect double collecting systems **Time between infection and test 2:** <4 days **Definition of positive result test 2:** NR **Test 3:** Combination: VCUG and ultrasonography, as above **Time between infection and test 3:** As above **Definition of positive result test 3:** VCUG or ultrasound positive

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Alzen, 1994[115] **Study design** Prospective cohort **Country** Germany **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of reflux	**Patient spectrum** Mixed, some UTI **Further details** Consecutive children. Indications for imagining were: initial UTI (n = 14), recurrent UTI (n = 2), known reflux (n = 4), pathological ultrasound (n = 15), others (n = 17) **Recurrent UTI:** Combination **Number of patients (number of girls):** 52 (21) **Age: mean (range):** NR (<2 years)	**Reference standard** MCUG: performed immediately after ultrasound. Bladder filled with contrast agent and standard MCUG performed **Time between infection and reference standard:** NR **Definition of a positive test result** Reflux graded according to international recommendations	**Test 1:** Ultrasound: child catheterised and bladder emptied. Children lay on front. Bladder filled with air. Kidneys examined dorsally by standard ultrasound **Time between infection and test 1:** NR **Definition of positive result test 1:** NR
Andrich, 1992[116] **Study design** Retrospective cohort **Country** USA **Setting (teaching)** Secondary care (NR) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children referred for evaluation with a clinical diagnosis of pyelonephritis. None had either obstructive uropathy or neuropathic bladder **Recurrent UTI:** NR **Number of patients (number of girls):** 72 (50) **Age: mean (range):** 1.6 years (1 month to 5.4 years)	**Reference standard** ^{99m}Tc-DMSA, no further details **Time between infection and reference standard:** NR **Definition of a positive test result:** NR	**Test 1:** Ultrasound: renal ultrasound, no further details **Time between infection and test 1:** NR **Definition of positive result test 1:** NR **Test 2:** Cystography: no details **Time between infection and test 2:** NR **Definition of positive result test 2:** NR

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Bagni, 1997[117] **Study design** Prospective cohort **Country** Italy **Setting (teaching)** Secondary care (NR) **Aim of imaging** Detection of scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** Patients with a history of recent (n = 37) or previous (n = 11) UTI, 80% of patients aged <5 years **Recurrent UTI:** Combination **Number of patients (number of girls):** 48 (36) **Age: mean (range):** 3.2 years (0.1–17 years)	**Reference standard** DMSA, planar: imaging 2–3 hours after i.v. 20–74 MBq ^{99m}Tc-DMSA. Image acquisition using standard posterior, right posterior oblique left posterior oblique and anterior views **Time between infection and reference standard:** NR **Definition of a positive test result** Reduced uptake or well-defined scars	**Test 1:** DMSA, SPECT: data obtained over 360° as 120 projections **Time between infection and test 1:** NR **Definition of positive result test 1:** Reduced uptake or well-defined scars
Barnett, 1978[118] **Study design** Prospective cohort **Country** New Zealand **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children with Gram-negative UTI attending the paediatric genitourinary clinic and wards. Where more than one UTI was tested for in a patient the results from the first episode were used in the analysis **Recurrent UTI:** Combination **Number of patients (number of girls):** 69 (97 UTIs) (NR) **Age: mean (range):** NR (<1 month to >1 year)	**Reference standard** Combination: IVU and MCUG **Time between infection and reference standard:** NR **Definition of a positive test result** Detection of radiological abnormalities, no details provided	**Test 1:** Microscopy: antibody-coated bacteria tested for by immunofluorescence. Urine specimen centrifuged for 10 minutes, sediment washed with phosphate-buffered saline. 0.05 ml of undiluted FITC-conjugated rabbit anti-human IgA, IgG and IgM polyvalent serum added to 0.2 ml washed urine. Mixed and incubated at 27°C for 20 minutes. Sediment washed and examined under microscope. Blocking antibody and negative controls carried out **Time between infection and test 1:** NR **Definition of positive result test 1:** Any fluorescence observed significant if both controls were negative

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Baronciani, 1986[119] **Study design** Retrospective cohort **Country** Italy **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of reflux	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children admitted to a paediatric department with UTI **Recurrent UTI:** Initial UTI **Number of patients (number of girls):** 98 (71) **Age: mean (range):** (0–14 years)	**Reference standard** MCUG: no details reported **Time between infection and reference standard:** NR **Definition of a positive test result** Reporting by criteria of Dwoskin *et al.*[285]	**Test 1:** Ultrasound: real-time ultrasound with 2.5–3.5-MHZ probe, longitudinal and transverse scans with subject in prone position **Time between infection and test 1:** NR **Definition of positive result test 1:** classified as normal, moderate dilatation, hydronephrosis, severe hydronephrosis
Barry, 1998[120] **Study design** Retrospective cohort **Country** UK **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** In children following UTI (no details given) **Recurrent UTI:** NR **Number of patients (number of girls):** 300 (648 kidneys) (176) **Age: mean (range):** 3.89 years (18 days to 13.6 years)	**Reference standard** DMSA: scanning 3 hours post-injection, dose was fraction by body weight of 80 MBq (min. 18 MBq), posterior and left and right posterior oblique projections **Time between infection and reference standard:** >3 months **Definition of a positive test result** NR	**Test 1:** Ultrasound: using 3.5, 5 or 7.5-MHz microconvex transducers. Prone and supine scans unless lack of cooperation indicated other approaches **Time between infection and test 1:** 1–3 months **Definition of positive result test 1:** Scarring assessed by following criteria: major: (1) proximity of sinus echoes to cortical surface; intermediate: (2) loss of pyramids, (3) irregularity of outline; minor: (4) loss of definition of capsular echo, (5) calyceal dilatation. The major criterion plus at least one intermediate criterion were necessary for the diagnosis of scarring

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Benador, 1994[121] **Study design** Prospective cohort **Country** Switzerland **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children hospitalised with a clinical diagnosis of pyelonephritis **Recurrent UTI:** Combination **Number of patients (number of girls):** 111 (220 kidneys) (51) **Age: median (range):** 5.5 months (1 week to 16 years)	**Reference standard** ^{99m}Tc-DMSA, dose 75 μCi kg^{-1} (min. 400 μCi, max. 2 mCi). Scans 3–4 hours postinjection. Six views (one posterior, two posterior oblique, one anterior, two anterior oblique) **Time between infection and reference standard:** Mean 3 days **Definition of a positive test result** Abnormal defined as focal or diffuse decrease or absence of DMSA uptake	**Test:** Ultrasound: anterior, posterior, longitudinal and transverse views obtained of each patient **Time between infection and test:** Mean 3 days **Definition of positive test result:** Increase in renal size, loss of cortico-medullary differentiation, focal or generalised hyperechogenicity or hypoechogenicity, and parenchymal reduction were considered signs of pyelonephritis **Test 1:** For first or multiple UTI in patients of all ages **Test 2:** For first UTI in patients of all ages **Test 3:** For multiple UTI in patients of all ages **Test 4:** For first or multiple UTI in patients aged < 1 year **Test 5:** For first UTI in patients aged < 1 year **Test 6:** For multiple UTI in patients aged < 1 year **Test 7:** For first or multiple UTI in patients aged ≥ 1 year **Test 8:** For first UTI in patients aged ≥ 1 year **Test 9:** For multiple UTI in patients aged ≥ 1 year
Benigno, 1986[122] **Study design** Prospective cohort **Country** Italy **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Anatomical	**Patient spectrum** Confirmed UTI, further investigation **Further details** Patients admitted with UTI over a 4-year period **Recurrent UTI:** NR **Number of patients (number of girls):** 49 (34) **Age: mean (range):** NR (15 days to 10 years)	**Reference standard** IVU and MCUG: no details reported **Time between infection and reference standard:** Cystography 8 weeks after urine becomes sterile **Definition of a positive test result** NR	**Test 1:** ESR **Time between infection and test 1:** NR **Definition of positive result test 1:** 25 (no units reported) **Test 2:** CRP, semi-quantitative, latex agglutination test **Time between infection and test 2:** NR **Definition of positive result test 2:** Positive threshold 2+ **Test 3:** Leucocyte differential **Time between infection and test 3:** NR **Definition of positive result test 3:** Not clear **Test 4:** Body temperature **Time between infection and test 4:** NR **Definition of positive result test 4:** 38.5°C **Test 5:** Biochemical: renal concentrating capacity **Time between infection and test 5:** NR **Definition of positive result test 5:** 1025 (no units reported)

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Bergius, 1990[123] **Study design** Prospective cohort **Country** Finland **Setting (teaching)** Secondary care (NR) **Aim of imaging** Detection of reflux	**Patient spectrum** Mixed, some UTI **Further details** 124 consecutive infants and children referred for uroradiological work-up, usually because of relapsing febrile UTI. Main indications for urological work-up were: recurrent UTI (n = 106), postoperative follow-up (n = 10), enuresis (n = 5), other (n = 3) **Recurrent UTI:** NR **Number of patients (number of girls):** 124 (248 ureters) (59) **Age: mean (range):** NR (NR; 101 <5 years)	**Reference standard** MCUG: standard dynamic MCUG, immediately after ultrasound with the same catheter. Fluoroscopy was not used. To image the urethra and trigonum, one film was taken during voiding with the patient leaning forwards **Time between infection and reference standard:** NR **Definition of a positive test result** Reflux graded on international scale[284]	**Test:** Ultrasound: bladder emptied by catheter before examination. Both renal areas imaged with a 5-MHz transducer, special emphasis on thickness and structure of the renal parenchyma and on the shape of the pelvis and calyces. Bladder filled, according to size of patient, with Isopaque contrast medium and monitored during filling and voiding **Time between infection and test:** NR **Definition of positive test result:** The presence of air bubbles in the ureters was considered indicative of reflux and findings were graded according to the five-degree classification of Hofmann and Beyer[286] **Definition of positive result test 1:** Reflux grade ≥II **Definition of positive result test 2:** High-grade reflux: (grade ≥III)
Berrocal, 2001[124] **Study design** Prospective cohort **Country** Spain **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Diagnosis of reflux	**Patient spectrum** Mixed, some UTI **Further details** Consecutive patients referred for suspected reflux. Patients unable to void spontaneously (e.g. because of spinal cord or CNS lesions) or who had neurogenic bladder were excluded. Clinical diagnoses included: UTI (n = 88), APN (n = 120), known reflux (n = 64), urinary incontinence (n = 2), structural abnormalities (n = 33), other (n = 18) **Recurrent UTI:** NR **Number of patients (number of girls):** 247 (216 patients and 440 kidneys included) (116) **Age: mean (range):** 3 years (3–18 years)	**Reference standard** MCUG: performed immediately after ultrasound using the same catheter. The contrast medium Plenigraf (iodine concentration 16%) was infused. Intermittent fluoroscopy was performed, and the following abdominal radiographs were obtained: half and completely filled bladder, anteroposterior and oblique voiding, postvoiding, and voiding lateral in males **Time between infection and reference standard:** NR **Definition of a positive test result** Interpreted by one radiologist and later reinterpreted by consensus. Reflux graded by international scale[284]	**Test:** Ultrasound: preliminary ultrasound followed by cystosonography. Baseline ultrasound included transverse and longitudinal scanning of both kidneys and bladder, using 3.5 or 5-MHz sector array or 7.5-MHz linear transducer. Bladder filled, by infusion through catheter, to half volume with saline. 10 ml of SH U 508A enhancer (300 mg ml^{-1}) was then injected and further saline infused until the bladder was full. Each kidney and bladder were imaged sequentially at approximately 15-second intervals during filling. Scans were obtained before filling, during filling and during voiding **Time between infection and test:** NR **Definition of positive test result:** reflux was diagnosed at cystosonography when microbubbles appeared in a ureter or renal pelvis. Reflux grading: *grade 1:* echo contrast in only the ureter *grade 2:* echo contrast in the pelvicalyceal system with no dilatation *grade 3:* mild to moderate dilatation of the pelvicalyceal system *grade 4:* moderate to severe dilatation of the pelvicalyceal system *grade 5:* gross dilatation of the pelvicalyceal system with total or partial atrophy **Test 1:** Results by renal unit **Test 2:** Results by patient

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Biggi, 2001[125] **Study design** Prospective cohort **Country** Italy **Setting (teaching)** Secondary care (NR) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children referred following a documented UTI associated with alterations in the urinary sediment (leucocyturia, bacteriuria, haematuria). Only children with first symptomatic UTI, in whom the interval between onset of symptoms and diagnosis of UTI was <6 days and in whom a DMSA scan was performed no later than 15 days following presentation were included **Recurrent UTI:** Initial UTI **Number of patients (number of girls):** 101 (60) **Age: mean (range):** 18 months (1 month to 13.5 years)	**Reference standard** DMSA: performed after i.v. injection of ^{99m}technetium, schedule based on body surface area (max. adult dose 110 MBq, min. dose 20 MBq). After injection (2–3 hours) three views (one posterior and two posterior oblique) were obtained **Time between infection and reference standard:** <15 days **Definition of a positive test result** One or more areas of focal decreased cortical uptake, or diffuse areas of diminished cortical uptake of DMSA with no evidence of cortical loss. Involvement of each kidney graded as mild/moderate/severe	**Test 1:** CRP: no further details **Time between infection and test 1:** NR **Definition of positive result test 1:** >88 mg dl^{-1} **Test 2:** ESR: no further details **Time between infection and test 2:** NR **Definition of positive result test 2:** >68 mm h^{-1} **Test 3:** Microscopy: no further details: WBC count **Time between infection and test 3:** NR **Definition of positive result test 3:** >14,601 WBC mm^{-3} **Test 4:** Microscopy: no further details: granulocytes **Time between infection and test 4:** NR **Definition of positive result test 4:** >52% **Test 5:** Clinical features: maximum rectal temperature **Time between infection and test 5:** NR **Definition of positive result test 5:** ≥39.1°C **Test 6:** Ultrasound: performed on computerised sonographic units equipped with 3.5 and 5-MHz transducers, results for number of kidneys **Time between infection and test 6:** NR **Definition of positive result test 6:** Abnormal echogenicity or dilatation of collecting system
Bircan, 1995[126] **Study design** Prospective cohort **Country** Turkey **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** 18 patients had a previous UTI or an episode of "fever of unknown origin" **Recurrent UTI:** Combination **Number of patients (number of girls):** 63 (56) **Age: mean (range):** 5 years (3 months to 12 years)	**Reference standard** DMSA: performed 2–3 hours after i.v. injection of 2 MBq kg^{-1} ^{99m}Tc-DMSA; anterior, posterior, right lateral and left lateral images were obtained **Time between infection and reference standard:** <48 hours **Definition of a positive test result** Focal areas of diminished uptake in the renal parenchyma	**Test 1:** Ultrasound: abdominal ultrasound using 5-MHz linear probe **Time between infection and test 1:** <48 hours **Definition of positive result test 1:** Kidneys examined for presence of congenital anomalies, renal scarring and for changes related to acute infection (changes in renal parenchymal echogenicity) **Test 2:** IVU: sodium megluminediatrizoate (Urografin) used as contrast material **Time between infection and test 2:** <48 hours **Definition of positive result test 2:** Anatomical pathologies related to the urinary system were evaluated

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Boudailliez, 1998[127] **Study design** Prospective cohort **Country** France **Setting (teaching)** Secondary care (NR) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children with their first episode of UTI; temperature >38.5°C, CRP>20 mg l^{-1}, no urinary tract malformation and no reflux grade ≥3 as assessed by mode B sonography and cystography (to exclude previous lesions of renal parenchyma) **Recurrent UTI:** Initial UTI **Number of patients (number of girls):** 49 (32) **Age: mean (range):** 4.2 years (0.2–14 years)	**Reference standard** DMSA: 50 μCi kg^{-1}, min. dose 350 μCi **Time between infection and reference standard:** <5 days **Definition of a positive test result** NR	**Test 1:** Ultrasound: power Doppler renal sonography (5–7.5-MHz probe) **Time between infection and test 1:** NR **Definition of positive result test 1:** NR
Bower, 1985[128] **Study design** Prospective cohort **Country** Australia **Setting (teaching)** Secondary care (NR) **Aim of imaging** Detection of reflux	**Patient spectrum** Mixed, some UTI **Further details** Children referred to a nuclear medicine department for assessment of renal and ureteric function as part of the follow-up of reflux, or recurrent UTI **Recurrent UTI:** Recurrent UTI **Number of patients (number of girls):** 30 (27 children, 54 ureters included in analysis) (22) **Age: mean (range):** NR (4 months to 12 years)	**Reference standard** Direct radionuclide cystography: ^{99m}Tc-DTPA renal scan and a delayed voiding cystogram. Voiding for cooperative children was allowed in the upright sitting position viewed posteriorally. Bolus of ^{99m}Tc-sulfur colloid (37 MBq) was injected in the catheter at the start of bladder filling. Analogue and digital acquisition was in 15-second frames for 14 frames followed by 30-second analogue image when the bladder was full before catheter removal and voiding. 60 5-second voiding frames were collected and a 30-second postvoid analogue image was obtained **Time between infection and reference standard:** Day after indirect cystogram **Definition of a positive test result** Images scored for reflux, no attempt to grade reflux	**Test 1:** Indirect radionuclide cystography: performed when 80% of the intravenously administered ^{99m}Tc-DTPA from renal study was in the bladder and the child expressed a strong desire to void. The study was then identical to that of the direct cystogram **Time between infection and test 1:** NR **Definition of positive result test 1:** Indirect playback loops read independently by three observers unaware of patients' identity or other investigation results. A consensus score for each ureter as positive or negative for reflux was given

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Buyan, 1993[129] **Study design** Prospective cohort **Country** Turkey **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** None of the children had had previous UTI or "fever of unknown origin" **Recurrent UTI:** Initial UTI **Number of patients (number of girls):** 24 (20) **Age: mean (range):** 6 years (13 months to 12 years)	**Reference standard** DMSA: performed 2–3 hours following i.v. injection of 2 MBq kg^{-1} of ^{99m}Tc-DMSA; anterior, posterior, right lateral and left lateral images were obtained. 3D images also obtained using SPECT **Time between infection and reference standard:** Before treatment **Definition of a positive test result** Focal areas in the renal parenchyma showing no radioactivity	**Test 1:** Clinical features: flank pain, chills, nausea, vomiting, high fever (>38°C), tenderness of the costovertebral angle diagnosed as upper UTI. Those with dysuria, enuresis, pollakiuria, abdominal pain, haematuria, fever (≤38°C) diagnosed as lower UTI **Time between infection and test 1:** On admission **Definition of positive result test 1:** Upper UTI **Test 2:** WBC: no details reported **Time between infection and test 2:** On admission **Definition of positive result test 2:** >15,000 WBC cm^{-1} **Test 3:** ESR: no details reported **Time between infection and test 3:** On admission **Definition of positive result test 3:** >25 mm h^{-1} **Test 4:** CRP: single radial immunodiffusion, Behring, LC-Partigen **Time between infection and test 4:** On admission **Definition of positive result test 4:** >20 μg l^{-1} **Test 5:** ACB: prepared and detected as described by Thomas *et al.*[287] **Time between infection and test 5:** On admission **Definition of positive result test 5:** >2 ACB per 200 fields or in 5 minutes of scanning
Capa Kaya, 2001[130] **Study design** Prospective cohort **Country** Turkey **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children with symptoms of upper UTI and positive urine culture **Recurrent UTI:** Initial UTI **Number of patients (number of girls):** 100 (82) **Age: mean (range):** 5 years (0–12 years)	**Reference standard** DMSA: 0.03–0.05 μCi kg^{-1} ^{99m}Tc-DMSA administered intravenously; anterior, posterior and right and left posterior oblique views were obtained **Time between infection and reference standard:** 3 days **Definition of a positive test result** Presence of focal or diffuse decreased uptake, segmental cortical thinning and cortical irregularity for upper UTI	**Test 1:** NAG activity was measured with a kit (Boehringer Mannheim) using a spectrophotomeric method, NAG/creatinine ratios **Time between infection and test 1:** Performed at time of infection **Definition of positive result test 1:** 5 U l^{-1} for NAG and 7 U g^{-1} for NAG creatinine ratio for upper UTI

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Cavanagh, 1983[131] **Study design** Prospective cohort **Country** England **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of reflux	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children referred to X-ray department for first MCUG and IVU because of provisional or proven diagnosis of UTI. 41/62 had proved UTIs, the remainder were suspected UTI but had no laboratory confirmation. 11 had suffered one attack of symptoms and the remainder had multiple infections. Children aged <6 months were excluded. Children with an obvious anomaly of renal drainage on the IVU, e.g. ectopic ureterocele, congenital megaureter, were excluded. Referrals came from paediatric and urological clinics **Recurrent UTI:** Combination **Number of patients (number of girls):** 62 (48) **Age: mean (range):** 5 years (6 months to 13 years)	**Reference standard** MCUG: bladder catheterisation without sedation immediately before X-ray, bladder filling using contrast medium sufficient to induce voiding **Time between infection and reference standard:** not clear **Definition of a positive test result** Reflux graded as follows: grade 1: slight – incomplete filling of the upper urinary tract without dilatation grade 2: moderate – complete filling of the upper urinary tract with slight dilatation but no ballooning of calices grade 3: gross – complete filling of the upper urinary tract with marker dilatation and obvious ballooning of calices. Any reflux considered abnormal	**Test:** Early IVU films available for study of the renal parenchyma on the nephrogram. Contrast medium was sodium meglumine diatrizoate **Time between infection and test:** within 3 weeks of MCUG **Definition of positive result test 1:** Graded as normal or suspect: duplex, scarred moiety, dilated ureter, scarred kidney **Definition of positive result test 2:** Grade 3 reflux on reference standard considered positive, all others considered negative

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Chan, 1999[132] **Study design** Prospective cohort **Country** Hong Kong **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children with increased susceptibility to UTI due to spinal dysraphism and neurogenic bladder (n = 18), anorectal anomaly (n = 6). Interval between last UTI and current UTI varied from 2 months to 2 years. No patient had a history of APN. Ten children had documented previous UTI **Recurrent UTI:** Recurrent UTI **Number of patients (number of girls):** 24 (48 kidneys) (11) **Age: mean (range):** 5.3 years (1–13 years)	**Reference standard** DMSA, ^{99m}Tc-DMSA scans performed 2–3 hours after i.v. injection in dose range 38–120 MBq by body weight. Simultaneous planar anterior and posterior, right posterior oblique and left anterior oblique, left posterior oblique and right anterior oblique images obtained **Time between infection and reference standard:** 2 months to 2 years **Definition of a positive test result** Presence or absence of renal scarring (not defined)	**Test:** MRI: 1.5 T with spine coil, field of view 300–375 mm, matrix 256 × 256, slice thickness 4 mm **Time between infection and test:** 2 months to 2 years **Definition of positive test result:** Presence or absence of renal scarring (not defined) **Test 1:** Coronal, postgadolinium STIR sequence (TR/TE/TI, 2000/17/160) **Test 2:** Coronal, fat-saturated, spin-echo T1-W sequence (TR/TE, 550/15) **Test 3:** MRI: STIR or T1-W
Clarke, 1990[133] **Study design** Prospective cohort **Country** England **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children with known UTI **Recurrent UTI:** NR **Number of patients (number of girls):** 22 (NR) **Age: mean (range):** NR (4–12 years)	**Reference standard** IVU, no details **Time between infection and reference standard:** NR **Definition of a positive test result** No details	**Test 1:** DMSA: planar ^{99m}Tc-DMSA imaging **Time between infection and test 1:** NR **Definition of positive result test 1:** NR **Test 2:** DMSA: SPECT ^{99m}Tc-DMSA imaging **Time between infection and test 2:** NR **Definition of positive result test 2:** NR

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Dacher, 1996[134] **Study design** Prospective cohort **Country** France **Setting (teaching)** Secondary care (NR) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children referred because of upper UTI. Criteria for inclusion were: confirmed UTI, high fever (>38°C), abdominal or lumbar fossa pain, and presence of urinary nitrites and LE as determined by dipstick. Uncooperative children, children with obstructed urinary tracts or pyelonephrosis, and those who had undergone surgery were excluded **Recurrent UTI:** NR **Number of patients (number of girls):** 30 (24) **Age: mean (range):** 7.5 years (7 months to 15 years)	**Reference standard** Enhanced CT: 10-mm slices without interslice intervals were obtained immediately after infusion of ionic iodinated contrast medium (1 ml kg^{-1} body weight) **Time between infection and reference standard:** Within 24 hours of admission **Definition of a positive test result** Sharply bordered triangular areas of decreased attenuation in the renal parenchyma that involved both the medulla and the cortex or rounded masses of low attenuation that modified renal contours were considered indicative of APN	**Test 1:** Ultrasound: power Doppler sonography performed with a 5-MHz curved array with patients in the prone position. Axial and longitudinal scans were obtained for each renal pole **Time between infection and test 1:** within 24 hours of admission **Definition of positive result test 1:** Abnormality was defined by the presence of a triangular zone of decreased or absent flow in the parenchyma. Each kidney was divided into two poles by a vertical line perpendicular to the major axis
De Sadeleer, 1994[135] **Study design** Retrospective cohort **Country** Belgium **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of reflux and scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** Patients with UTI referred for imaging who underwent indirect radionuclide cystography during the acute phase of the UTI and MCUG 6 weeks later **Recurrent UTI:** NR **Number of patients (number of girls):** 40 (80 kidneys) (24) **Age: mean (range):** median 4.5 years (2 weeks to 11 years)	**Reference standard test 1** MCUG: performed after catheterisation. Bladder emptied and 18% iodinated contrast material run into bladder until bladder capacity reached. Some images obtained during this phase. Spontaneous micturition occurred when the bladder was full. Images obtained by intermittent fluoroscopy **Time between infection and reference standard:** 6 weeks for MCUG, acute or postacute phase for DMSA **Definition of a positive test result:** Severity of reflux graded according to the international classification[284] **Reference standard tests 2, 3** DMSA scintigraphy performed 2 hours after i.v. injection of tracer at dose of 0.75 MBq kg^{-1} (minimum dose 17 MBq); one posterior (supine position) and two oblique posterior views performed	**Test 1:** Indirect radionuclide cystography: performed after ^{99m}Tc-MAG3 renography, the tracer dose was scaled according to body surface area. In cooperative children above 3–4 years old voiding cystography was performed approximately 2 hour after i.v. injection of the tracer. A dynamic series of images using a 5-second frame rate was acquired using a gamma camera at least 30 seconds before the child was allowed to void. Uncooperative children only imaged if there was enough computer time and gamma camera time. Analogue images were reviewed one by one. **Time between infection and test 1:** Acute phase **Definition of positive result test 1:** Any increase in ureteral or renal activity **Test 2:** MCUG: as for reference standard 1 **Time between infection and test 2:** 6 weeks **Definition of positive result test 2:** Severity of reflux graded according to international classification[284] **Test 3:** As for test 1 **Time between infection and test 3:** Acute phase **Definition of positive result test 3:** Any increase in ureteral or renal activity

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Ditchfield, 1994[136] **Study design** Prospective cohort **Country** Australia **Setting (teaching)** Secondary care (NR) **Aim of imaging** Detection of scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** Consecutive patients aged <5 years with a first proven UTI **Recurrent UTI:** Initial UTI **Number of patients (number of girls):** 150 (300 kidneys) (82) **Age: mean (range):** NR (<5 years)	**Reference standard** DMSA: performed according to standard technique including high-resolution tomography. Either ^{99m}Tc-gluconate or ^{99m}TC-DMSA was administered. Images were obtained after 1 hour for gluconate and 3 hours for DMSA. One posterior view delayed image of the kidneys was acquired, followed by posterior tomographic acquisition of 32 steps each for 30 seconds **Time between infection and reference standard:** Performed within 15 days of start of treatment **Definition of a positive test result** Graded on scale of 0–3: grade 0: no defect grade 1: possible defect grade 2: probably defect grade 3: definite defect Scans of grades 2–3 considered positive. When more than one defect present, grade represented the most severe defect	**Test:** MCUG: no details **Time between infection and test:** Performed within 15 days of start of treatment **Definition of positive test result:** Classified according to international classification. Reflux grades 0–1 considered negative, 2–5 considered positive **Test 1:** Result per kidney **Test 2:** Result per patient
Drachman, 1984[137] **Study design** Prospective cohort **Country** Israel **Setting (teaching)** Secondary care (NR) **Aim of imaging** Detection of reflux	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children who underwent IVP and MCUG 4–6 weeks after UTI **Recurrent UTI:** Initial UTI **Number of patients (number of girls):** 191 (177) **Age: mean (range):** NR (6 months to 12 years)	**Reference standard** MCUG, NR **Time between infection and reference standard:** 4–6 weeks **Definition of a positive test result** Reflux, graded as follows: grade I: reflux limited to the ureter grade II: reflux reaching the pelvis and calyces without dilatation of the collecting system grade III: complete reflux with some distension of ureter, pelvis and calyces grade IV: reflux associated with massive dilatation of ureter, pelvis and calyces. All grades of reflux considered abnormal. Also abnormal if ureteropelvic junction stenosis, atrophic kidney or anatomy of the collecting system	**Test 1:** IVP: no details reported **Time between infection and test 1:** 4–6 weeks **Definition of positive result test 1:** NR

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Elison, 1992[138] **Study design** Prospective cohort **Country** Australia **Setting (teaching)** Secondary care (non-teaching) **Aim of imaging** Detection of scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** Patients referred by a paediatric nephrologist and urologist. Patients with bacteriological evidence of recent UTI were excluded. Patients had experienced their last document UTI at least 3 months previously **Recurrent UTI:** NR **Number of patients (number of girls):** 208 (415 kidneys) (139) **Age: mean (range):** 3.7 years (3 months to 12 years)	**Reference standard** IVU: performed with non-ionic contrast medium (Omnipaque 240) at a dose of 1.5–2 ml kg^{-1} (min. 10 ml, max. 40 ml). Each study comprised four plain films with no additional tomography of the kidneys **Time between infection and reference standard:** NR (min. 3 months) **Definition of a positive test result** Reflux graded according to internal criteria.[284] Renal scarring reported as occurring in the upper, middle and/or lower poles of each kidney. Criteria for scarring included: disruption of the cortical rim of uptake seen in the pinhole images, clearly defined defects in uptake on emission computed scans; significant variation in the left:right relative function was also considered. Evaluated by three nuclear medicine physicians, consensus of at least two required for classification, otherwise image discarded	**Test:** DMSA: children who were unable to cooperate or who were aged <18 months old were sedated. DMSA dose dependent on age (min. 40 MBq). Imaging performed 3 hours after injection of ^{99m}Tc-DMSA in the supine position. Normal planar images were acquired in the anterior and posterior projections for 5 minutes per image using a high-resolution collimator. SPECT was undertaken in 76% of patients **Time between infection and test:** NR (min. 3 months) **Definition of positive test result:** Renal scarring reported as occurring in the upper, middle and/or lower poles of each kidney, no further details **Test 1:** Results by number of patients **Test 2:** Results by number of kidneys
Evans, 1999[139] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (NR) **Aim of imaging** Detection of reflux	**Patient spectrum** Mixed, some UTI **Further details** Children known to be undergoing both renal ultrasound and MCUG on the same day were eligible for inclusion. Only children with a full bladder who voided during the course of the ultrasound examination were included. Indications for referral were: UTI (n = 51), antenatal hydronephrosis (n = 3), incontinence (n = 1), unknown (n = 2) **Recurrent UTI:** NR **Number of patients (number of girls):** 57 (113 kidneys) (48) **Age: mean (range):** 5 years (1 month to 16 years)	**Reference standard** MCUG: fluoroscopic voiding cystourethrogram, performed on the same day as the preceding ultrasound **Time between infection and reference standard:** No details **Definition of a positive test result** VUR graded on international scale[284]	**Test 1:** Ultrasound: measurements made on widest section of each renal pelvis on transverse mid-kidney images. Patients were imaged before voiding, either supine or prone, and after voiding in the same position **Time between infection and test 1:** No details **Definition of positive result test 1:** A difference of 1 mm or more on pre- and postvoiding images was considered a change in pelvic diameter, and evidence of reflux

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Everaert, 1998[140] **Study design** Retrospective cohort **Country** Belgium **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children referred to the clinic for a UTI, had received a kidney ultrasound and DMSA scan within 4 days after onset of treatment and could be administered a second DMSA scan at least 3 months later for control. Children were excluded if they were aged <3 months, had proven hydronephrosis, if DMSA lesions compatible with scars were seen on a previous DMSA scan or on the follow-up scan, if it was impossible to decide from scans whether acute lesions were present, or if overt renal failure was present **Recurrent UTI:** NR **Number of patients (number of girls):** 62 (43) **Age: mean (range):** 4 years (NR)	**Reference standard** DMSA: performed after hyperhydration of the patients. A salt and glucose solution was infused intravenously at 20 ml kg^{-1} over 30 minutes. Patients were injected with 185 mBq 1.73 m^{-2} of freshly prepared ^{99m}Tc-DMSA. Renal activity on both kidneys 24 hours after the tracer injection was investigated **Time between infection and reference standard:** Within 4 days of therapy **Definition of a positive test result** To exclude pre-existing scars the ultimate diagnosis of APN was made retrospectively by comparing the DMSA images during and after the acute disease	**Test 1:** Urinary α_1-MG: urinary α_1-MG detected by latex enhanced nephelometry. Concentration expressed as the urinary α_1-MG: creatinine ratio **Time between infection and test 1:** On admission **Definition of positive result test 1:** >10 mg g^{-1} **Test 2:** Clinical features: clinical symptoms **Time between infection and test 2:** On admission **Definition of positive result test 2:** Symptoms of APN positive, symptoms of cystitis or atypical symptoms negative

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Farnsworth, 1991[141] **Study design** Prospective cohort **Country** Australia **Setting (teaching)** Secondary care (NR) **Aim of imaging** Detection of scarring	**Patient spectrum** Mixed, some UTI **Further details** Consecutive patients undergoing urological assessment for: UTI (n = 86), family history of reflux (n = 18), mild urinary tract dilatation detected on antenatal ultrasound (n = 4), imperforate anus (n = 2), haematuria (n = 1), retention (n = 1), painful voiding (n = 1). The indications for performing the DMSA study were UTI associated with high (>38.5°C) and persistent (>2 days) fever and/or severe systemic upset, or grade 3–5 reflux, according to international classification. Only infants with primary reflux were included **Recurrent UTI:** NR **Number of patients (number of girls):** 113 (224 kidneys) (53) **Age: mean (range):** NR (<1 year)	**Reference standard** Excretory urography (IVP) **Reference standard execution** IVP after 4 hours prep of clear fluids. Non-ionic contrast medium (Omnipaque 240), 10 mL kg^{-1} in children <4 kg and 1.5–2 kg^{-1} in children >4 kg. Films taken at end of injection, 10 minutes in prone position and after micturition **Time between infection and reference standard:** Not clear **Definition of a positive test result** Decrease in parenchymal thickness as defined by a focal decrease in the distance from the renal outline to the renal calyces and a generalised decrease in renal size and/or abnormal calyces, particularly medial deviation of the upper pole calyx. Accessory signs such as renal tract dilatation and striation of the renal pelvis were not considered	**Test 1:** DMSA 3 hours after i.v. injection of 40 MBq ^{99m}Tc-DMSA. Posterior planar view **Time between infection and test 1:** <1 month to >3 months **Definition of positive result test 1:** Reduction in kidney function and/or decreased or absent uptake of tracer in the renal cortex causing distortion or indentation of the normal renal outline

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Foresman, 2001[142] **Study design** Retrospective cohort **Country** USA **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of reflux	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children hospitalised with a clinical diagnosis of APN, in whom renal and bladder ultrasound had been performed and whose charts were available for review. Children with known genitourinary pathology, neurological disease or concomitant pregnancy were excluded from the analysis **Recurrent UTI:** NR **Number of patients (number of girls):** 209 (123) **Age: mean (range):** 2.4 years (2.1 days to 18 years)	**Reference standard** MCUG including fluoroscopic control, gravity filling, and filling and voiding views to assess the urethra, bladder wall and evidence of reflux **Time between infection and reference standard:** NR **Definition of a positive test result** NR	**Test 1:** Ultrasound: Duplex ultrasound with 5 or 7.5-MHz probes. Sequential examination of kidneys and bladder before and after voiding if feasible **Time between infection and test 1:** NR **Definition of positive result test 1:** Renal size, presence of hydronephrosis and hydroureter, renal scarring, parenchymal character, calculi and bladder wall thickening assessed. Radiologist reimaged questionable areas and provided an official report
Fretzayas, 2000[143] **Study design** Prospective cohort **Country** Greece **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children with a first symptomatic confirmed UTI were included regardless of the presence of fever. Children were included if there was no previous history of urinary tract obstruction, other chronic inflammatory condition or other current infectious disease **Recurrent UTI:** Initial UTI **Number of patients (number of girls):** 83 (54) **Age: mean (range):** 3.8 years (25 days to 14 years)	**Reference standard** DMSA: dose of 5 MBq kg^{-1} ^{99m}Tc-DMSA (min. 10 MBq) administered i.v. At least 4 hours after injection images were obtained in anterior, posterior and oblique views. Pinhole views used to image areas of particular interest **Time between infection and reference standard:** <96 hours **Definition of a positive test result** APN diagnosed when scintiscan revealed focal or diffuse areas of diminished uptake with an intact or slightly bulging contour	**Test 1:** Body temperature **Time between infection and test 1:** On admission **Definition of positive result test 1:** ≥38°C **Test 2:** CRP: no details **Time between infection and test 2:** On admission Definition of positive result test 2: 20 mg dl^{-1} **Test 3:** ESR: no details **Time between infection and test 3:** Measured on admission. No details **Definition of positive result test 3:** 30 mm h^{-1} **Test 4:** Polymorphonuclear elastase-α_1-antitrypsin complex: measured in EDTA-plasma and in urine supernatant, both obtained by centrifugation at 2000 g for 10 minutes within 1 hour of collection. Measurement was performed with an ELISA according to the manufacturers instructions **Time between infection and test 4:** On admission **Definition of positive result test 4:** 95th percentile of reference range (figure not reported) **Test 5:** MCUG: obtained by standard radiographic technique **Time between infection and test 6:** median 17 days after treatment **Definition of positive result test 6:** reflux graded according to international recommendations

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Frutos, 2000[144] **Study design** Prospective cohort **Country** Spain **Setting (teaching)** Secondary care (NR) **Aim of imaging** Detection of reflux	**Patient spectrum** Mixed, some UTI **Further details** Children suspected of reflux. Children who did not receive both imaging modalities were excluded. 68 children had previously diagnosed reflux **Recurrent UTI:** NR **Number of patients (number of girls):** 169 (144 included in the analysis, 293 renal units) (78) **Age: mean (range):** 3 years 9 months (3 days to 18 years)	**Reference standard** MCUG: contrast media infused using catheter used for ultrasound, same volume of contrast agent was used. The complete urinary tract was imaged using a frontal projection. Images were taken of the full bladder, during micturation, after micturition and, in boys, lateral plates were taken during micturition **Time between infection and reference standard:** Not clear, performed during same diagnostic session as ultrasound **Definition of a positive test result** Graded according to international classification[284]	**Test 1:** Ultrasound: standard ultrasound followed by cystosonography. Bladder filled with Levograf (an echo-enhancing agent). Ultrasonographic images were obtained during bladder filling and micturition **Time between infection and test 1:** Not clear **Definition of positive result test 1:** On standard ultrasound kidneys were evaluated for position, size and morphology, and for changes in the parenchyma or dilatation of excretory paths. Special attention was paid to dilatation of the distal ureter and the ureterovesical junction. Reflux was diagnosed on cystosonography whenever bubbles of Levograf were found above the bladder, outside the ureter or in the renal pelvis
Gervaix, 2001[145] **Study design** Prospective cohort **Country** Switzerland **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children attending the emergency unit at a children's hospital with fever (rectal temperature >38°C), signs and symptoms suggestive of a UTI and/or a positive urine dipstick analysis (positive LE and/or nitrite) were consecutively enrolled. Children who received antibiotics in the previous week were excluded from the study. Children with a positive urine culture were included **Recurrent UTI:** NR **Number of patients (number of girls):** 54 (36) **Age: mean (range):** NR (1 week to 16 years)	**Reference standard** DMSA, no further details **Time between infection and reference standard:** 3–5 days **Definition of a positive test result** APN diagnosed if focal or diffuse decrease or absence of ^{99m}Tc-DMSA uptake was noted on at least two projections	**Test 1:** PCT: Lumitest PCT (Brahms Diagnostica, Berlin, Germany) and Brahms PCT-Q (Brahms Diagnostica). Measured quantitatively in EDTA-blood samples by an immunoluminometric assay. PCT values were also determined by a rapid semi-quantitative immunochromatographic test. Both performed according to manufacturer's instructions **Time between infection and test 1:** On admission **Definition of positive result test 1:** PCT-Q ≥0.5 ng ml^{-1} (cut-off determined by ROC analysis) **Test 2:** CRP: NyoCard CRP (Nycomed Pharma, Oslo, Norway) CRP measured in EDTA-blood samples by a rapid immunometric method following the manufacturer's instructions **Time between infection and test 2:** On admission **Definition of positive result test 2:** CRP≥ 40 mg dl^{-1}

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Girona, 1995[146] **Study design** Prospective cohort **Country** Spain **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children aged <2 years with symptomatic UTI. Patients with obstructive uropathy or secondary reflux were excluded **Recurrent UTI:** Initial UTI **Number of patients (number of girls):** 85 (170 kidneys) (46) **Age: mean (range):** NR (15 days to 2 years)	**Reference standard** ^{99m}Tc-DMSA i.v. administered at a dose calculated according to standard guidelines, min. dose 15 MBq, 3 hours after administration; posterior, left oblique posterior and right oblique posterior images were obtained **Time between infection and reference standard:** Not clear **Definition of a positive test result** APN diagnosed if differential renal function was <48–52%, non-symmetrical renal size, defined as focal or multifocal perfusion defects	**Test 1:** Ultrasound: renal ultrasound performed with 5-MHz transducers. Longitudinal and transverse images were obtained with the patient in prone and supine positions **Time between infection and test 1:** NR **Definition of positive result test 1:** Kidney size was compared with tables of age-standardised kidney **Test 2:** MCUG: no details **Time between infection and test 2:** NR **Definition of positive result test 2:** Graded from I to V according to international classification. Grade ≥II positive **Test 3:** CRP: no details **Time between infection and test 3:** no details **Definition of positive result test 3:** >2 mg dl^{-1}
Gordon, 1992[147] **Study design** Prospective cohort **Country** UK **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children referred 12–14 weeks after a UTI **Recurrent UTI:** NR **Number of patients (number of girls):** 59 (110 kidneys) (31) **Age: median (range):** 5.3 years (0.1–14 years)	**Reference standard** DMSA scintigraphy 6 hours after ^{99m}Tc-DMSA injection (dose scaled by body surface area to adult dose of 100 MBq). Posterior and two posterior oblique views acquired by gamma camera in 256 × 256 matrix **Time between infection and reference standard:** 12–14 weeks **Definition of a positive test result** A kidney was considered abnormal if differential function on ^{99m}Tc-DMSA was <43% and/or if a focal defect was seen	**Test 1:** Scintigraphy: ^{99m}Tc-MAG3 study carried out with child supine on gamma camera dynamic 20-minute acquisition in 10-second frames. Dose scaled on body surface area to adult dose of 80 or 112 MBq **Time between infection and test 1:** 12–14 weeks **Definition of positive result test 1:** NR

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Guermazi, 1993[148] **Study design** Retrospective cohort **Country** Belgium **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI	**Patient spectrum** Mixed, some UTI **Further details** Children who underwent DMSA, including those with a doubtful or negative urine culture. The locations of the infection before DMSA was made based on clinical and biological features. 60/166 children were classed as having a lower UTI and 27 as having an upper UTI; in the remaining 79 the diagnosis was 'non-specific', the urine culture was negative or doubtful **Recurrent UTI:** NR **Number of patients (number of girls):** 166 (92) **Age: mean (range):** 5 years (15 days to 17 years)	**Reference standard** DMSA: performed 2 hours after i.v. injection of ^{99m}Tc-DMSA at a dose of 0.74 MBq kg^{-1}. One posterior and two obliques posterior images were taken **Time between infection and reference standard:** Not clear **Definition of a positive test result** Images were classed as abnormal based on two scintigraphic features: acute lesions or chronic lesions (definitions provided)	**Test 1:** Ultrasound: 5-MHz convex **Time between infection and test 1:** NR **Definition of positive result test 1:** Suspicion of inflammation (any type): focal hypoechogenic lesion, size anomaly, irregularity in the contours or aberrant differentiation of the corticomedulla
Haberlik, 1997[149] **Study design** Prospective cohort **Country** Austria **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of reflux	**Patient spectrum** Mixed, some UTI **Further details** 102 children in whom radiological evaluation by MCUG was indicated. Indications for MCUG included: UTI (n = 37), follow-up of previous reflux (n = 21), enuresis (n = 13), UTI and enuresis (n = 3), dysuria (n = 2), haematuria (n = 1) **Recurrent UTI:** NR **Number of patients (number of girls):** 102 (77 included in analysis, 154 kidneys) (59) **Age: mean (range):** 7.3 years (7 months to 14 years)	**Reference standard** MCUG: performed immediately after second conventional ultrasound following emptying of bladder via catheter **Time between infection and reference standard:** NR **Definition of a positive test result** Reflux graded according to standard criteria[284]	**Test 1:** Ultrasound: colour Doppler imaging-mode cystography with 5 and 3.5-MHz linear and sector transducers used. Catheterisation performed using standard aseptic procedures. Residual urine removed from bladder, patient placed supine for rest of study. Bladder filled by drip infusion using room-temperature saline solution. Both distal ureters and urethrovesical junction were alternately scanned by sagittal and oblique sections. A second conventional scan of the kidneys at the end of filling was made for detection of possible pelvicalyceal dilatation or urine-filled pyelon **Time between infection and test 1:** NR **Definition of positive result test 1:** Reflux defined as visualisation of a blue-coloured jet from the ureterovesical junctions to the distal ureter during the course of bladder filling or of pelvicalyceal dilatation or urine-filled pyelon on conventional ultrasound

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Hajjar, 2002[150] **Study design** Prospective cohort **Country** France **Setting (teaching)** Secondary care (NR) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** Patients admitted to a paediatric nephrology unit, over an 18-month period, with clinical and biological suspicion of APN **Recurrent UTI:** NR **Number of patients (number of girls):** 49 (NR) **Age: median (range):** 3 years (3 months to 15 years)	**Reference standard** ^{99m}Tc-DMSA scan 6 hours postinjection (50 μCi kg^{-1} body weight) **Time between infection and reference standard:** <2 days **Definition of a positive test result** Evidence of images characteristic of APN	**Test 1:** Ultrasound: B-mode sonography with 7.5-MHz transducer used for baseline examination to measure renal size and identify uropathies, 5–10-MHz linear transducer to study renal structure. Doppler sonography to map the intrarenal vessels. Each kidney studied with the patient supine and prone, in the transverse and sagittal planes **Time between infection and test 1:** < 2 days **Definition of positive result test 1:** criteria for positive ultrasound: increased global renal volume in relation to diameter (ratio 1.4 significant); focal hyper- or hypoechogenicity, with changes in renal parenchymal echogenicity and triangular forms; diffuse hyperechogenicity, differential echogenicity between kidneys; abnormal renal vasculature on Doppler examination, evidence of triangular zones of hypovascularisation on more than two occasions
Hanbury, 1989[151] **Study design** Prospective cohort **Country** England **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of reflux and scarring	**Patient spectrum** Mixed, some UTI **Further details** Children investigated for suspected UTI who received ultrasound and plain X-ray of the kidneys, ureters and bladder as the initial investigation. Presenting symptoms included dysuria, frequency, abdominal pain, enuresis, daytime wetting, fevers, loin pain, haematuria, urgency, vaginal soreness, difficult voiding and balanitis. 80% of children had two or more symptoms; 39% had firm evidence of UTI (10^5 cfu ml^{-1} and >50 pus cells mm^{-3}) **Recurrent UTI:** NR **Number of patients (number of girls):** 332 (309 included) (173) **Age: mean (range):** 6 years (2–16 years)	**Reference standard** MCUG and IVU **Reference standard execution** No details reported. Only performed if child had abnormal ultrasound/X-ray or if child presented with a further UTI (parents followed up after 1–8 years to enquire about further symptoms of UTI) **Time between infection and reference standard:** NR **Definition of a positive test result** No details	**Test 1:** Combination: ultrasound and KUB X-ray **Time between infection and test 1:** Not clear **Definition of positive result test 1:** No details

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Hedman, 1978[152] **Study design** Prospective cohort **Country** Sweden **Setting (teaching)** Secondary care (NR) **Aim of imaging** Detection of reflux	**Patient spectrum** Confirmed UTI, further investigation **Further details** "In a few cases the investigation was performed as part of periodic control of earlier proven reflux." All children had recurrent UTI **Recurrent UTI:** Recurrent UTI **Number of patients (number of girls):** 51 (102 kidneys) (44) **Age: mean (range):** 8 years (2–15 years)	**Reference standard** MCUG: technique of Shopfner[288] **Time between infection and reference standard:** NR **Definition of a positive test result** NR	**Test 1:** Scintigraphy: 15 μCi ^{99m}Tc-DTPA kg^{-1} body weight injected i.v. after voiding. 2–5 hours postinjection, sequential images recorded at 5-second intervals for approx. 30 seconds, patient then allowed to void and images recorded during voiding **Time between infection and test 1:** NR **Definition of positive result test 1:** NR
Hellerstein, 1978[153] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** The group included children with their second or third UTI as well as some with a history of many UTIs. Several children were known to have reflux. A few of the children had ureteral reimplantations performed ≥ 1 years before these studies **Recurrent UTI:** Combination **Number of patients (number of girls):** 45 (49 studies) (42) **Age: mean (range):** NR (3–17 years)	**Reference standard** Bladder washout test: bladder filled sterile water containing neomycin and Elase. After 45 minutes the bladder was drained through the catheter. Quantitative cultures were done on final few millilitres of washout solution. Three consecutive urine samples were collected at 20-minute intervals and each of these samples was cultured quantitatively on two blood agar plates. Plates were incubated for 15–18 hours at 37°C and colonies on each plate counted **Time between infection and reference standard:** NR **Definition of a positive test result** Growth of ≥ 1000 cfu ml^{-1} in one of the three final urine specimens taken as upper UTI. Counts of 100–1000 cfu ml^{-1} considered indeterminate	**Test 1:** ACB: catheter urine samples obtained for culture, sensitivity studies and enumeration of ACB. Urinary sediments and saline controls were incubated with fluorescein-conjugated antihuman globulin of goat origin and rewashed twice in phosphate-buffered saline. Smears were prepared and examined microscopically for fluorescence. A minimum of 20 bacteria, identified by phase-contrast microscopy, were examined for fluorescence. Bacteria showing bright apple-green fluorescence were recorded as antibody coated **Time between infection and test 1:** On admission **Definition of positive result test 1:** <1% of bacteria in urinary sediment with antibody coating classed as negative

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Hellstrom, 1989[154] **Study design** Prospective cohort **Country** Sweden **Setting (teaching)** Secondary care (NR) **Aim of imaging** Detection of scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** All children with a first known episode of confirmed febrile UTI diagnosed at the children's hospital were enrolled **Recurrent UTI:** Initial UTI **Number of patients (number of girls):** 88 (84 included in the analysis) (65) **Age: mean (range):** median 10 months (2 months to 6 years)	**Reference standard** Urography: performed according to standardised procedure.[289] Appears that follow-up urography was also performed after several years (2.3–4.1 years) **Time between infection and reference standard:** Not clear **Definition of a positive test result** Renal damage (scarring) defined as reduction in parenchymal thickness with or without calyceal deformity	**Test 1:** MCUG: performed according to standardised procedure adhering to the recommendations of the International Reflux Study in Children.[284] Drip infusion of contrast medium by gravity from a standardised height. Intermittent fluoroscopy with an image intensified and 70-mm film for documentation used during bladder filling and voiding **Time between infection and test 1:** Not clear **Definition of positive result test 1:** Reflux graded according to international criteria[284]
Hitzel, 2000[177] **Study design** Prospective cohort **Country** France **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI and prediction of scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children with clinically defined APN (fever >38°C, abdominal pain and positive urinary culture). Infants who had high-grade reflux and obstruction were excluded **Recurrent UTI:** NR **Number of patients (number of girls):** 56 (111 kidneys) (NR) **Age: mean (range):** 5 years (NR)	**Reference standard** DMSA: no further details **Time between infection and reference standard:** Performed during acute phase and at 7 months **Definition of a positive test result** NR	**Test:** Ultrasound: B-mode and colour/power Doppler sonography performed by an experienced radiologist in both prone and supine positions with 5–7.5-MHz transducer **Time between infection and test:** NR **Definition of positive result test:** NR **Test 1:** Compared with acute-phase DMSA reference standard **Test 2:** Compared with follow-up DMSA reference standard at 7 months

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Hitzel, 2002[155] **Study design** Prospective cohort **Country** France **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI	**Patient spectrum** Imaging, other **Further details** To be included a child had to have clinical findings consistent with APN, be aged >6 months, and have undergone Doppler ultrasound and DMSA at the acute stage of pyelonephritis. APN was diagnosed if the patient had abdominal or lumbar fossa pain, fever >38°C, and positive urine culture results. Children were excluded if they had urinary tract obstruction, > grade III reflux, or breakthrough infection between inclusion and follow-up **Recurrent UTI:** NR **Number of patients (number of girls):** 57 (50) **Age: mean (range):** 5 years (6 months to 15.5 years)	**Reference standard** DMSA: scintigraphy by standard protocol, 4 hours after i.v. injection of ^{99m}Tc-DMSA. Planar posterior, left posterior and right posterior oblique views obtained **Time between infection and reference standard:** During acute phase **Definition of a positive test result** If the criteria for inflammation were met: slightly bulging or normal contour; single or multiple, local or diffuse areas of decreased activity in parenchyma, which are diffuse or, rarely, spheric, in at least two projections; mild to severe degree of photopenia or, rarely, complete absence of activity; no volume loss	**Test:** Ultrasound: sonography included grey-scale and Doppler ultrasound examination of both kidneys with a variable-frequency 5–7-MHz curved transducer. Axial and longitudinal scans were obtained. Performed by an experienced radiologist **Time between infection and test:** During acute phase **Definition of positive test result:** Presence of a triangular zone of decreased or absent flow in the parenchyma. Grey-scale abnormalities: thickening of pelvic or ureteral wall, renal sinus hyperechogenicity, mild dilatation of pelvis or ureter, increased renal size, triangular hyperechogenicity **Test 1:** Results by patient **Test 2:** Results by kidney
Ilyas, 2002[156] **Study design** Retrospective cohort **Country** USA **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children presenting with a febrile UTI. Patients also had to have had an initial DMSA renal scan. Children were excluded if they had had a renal transplant, obstructive uropathy, neurogenic bladder, renal calculi or recurrent chronic pyelonephritis. The children were divided in three age groups: <2 years (n = 85), 2–8 years (n = 91), >8 years (n = 46) **Recurrent UTI:** NR **Number of patients (number of girls):** 222 (175) **Age: median (range):** 4.6 years (2 months to 19 years)	**Reference standard** DMSA: performed by the SPECT method within 48 hours of admission. Weight-adjusted adult-equivalent dose of 37 MBq ^{99m}Tc-DMSA was injected i.v. and SPECT acquisition was performed for 20 minutes 2 hours after isotope administration. Coronal and 3D surface rendering images were reviewed **Time between infection and reference standard:** NR **Definition of a positive test result** Presence of any of the following: change in relative size of the functional renal mass, an area of either decreased or absent activity within the cortex, a cortical defect with central extension to the collecting system	**Test 1:** MCUG: no further details **Time between infection and test 1:** Within 6 weeks of UTI **Definition of positive result test 1:** Grade based on international classification[284] **Test 2:** Ultrasound: renal ultrasound using 5 and 7.5-MHz probes. **Time between infection and test 2:** Performed during admission **Definition of positive result test 2:** Presence of renal volume enlargement, hyper- or hypoechogenicity (focal or diffuse) and renal pelvic dilatation measured from anterior and posterior projection and related to body weight

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Jakobsson, 1992[157] **Study design** Prospective cohort **Country** Sweden **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI and detection of scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children admitted to hospital with clinically defined APN: fever ≥38.5°C, ESR >20 mm h^{-1} or CRP >20 mg l^{-1}, and a positive urine culture **Recurrent UTI:** NR **Number of patients (number of girls):** 72 (59) **Age: median (range):** 1 year (0.1 to 15 years)	**Reference standard** DMSA: children examined in supine position. ^{99m}Tc-DMSA given at dose of 0.5 MBq kg^{-1} (min. 10 MBq). At least 3 hours after injection single anterior and posterior images were taken. In 60 children the DMSA uptake was also determined by computer-designed method that compared results with population of normal kidneys from age-matched control group **Time between infection and reference standard:** < 5 days for test 1 (initial scan), 6–20 weeks later for tests 3 and 5 **Definition of a positive test result** Each kidney judged subjectively to be normal, borderline or with definite changes. For computerised results kidneys with a DMSA uptake below 2 SD of the control kidney were defined as abnormal	**Test 1:** Ultrasound: performed with 3.5 or 5-MHz sector scanner. Renal volume calculated and expressed as a percentage of normal kidney volume for body weight. Compared with initial DMSA scan **Time between infection and test 1:** <5 days **Definition of positive result test 1:** Changes in ultrasound considered present if renal volume exceeded 120% of normal kidney volume or if changes in parenchymal echogenicity and/or dilatation of pelvices were observed **Test 2:** IVU: performed according to standard procedures **Time between infection and test 3:** 6–20 weeks (median 8 weeks) **Definition of positive result test 3:** Changes considered present if parenchymal reduction, deformities of calyces, hydronephrosis, ureteral dilatation or malformations were observed. Renal size and parenchymal thickness evaluated according to Claesson criteria. A parenchymal thickness <2 SD of the normal considered a parenchymal reduction **Test 3:** MCUG: no further details **Time between infection and test 5:** 6–20 weeks (median 8 weeks) **Definition of positive result test 5:** Presence of reflux noted on MCUG and graded according to international criteria[284]

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Jantausch, 1994[158] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children admitted to a children's medical centre over a 1.5-year period with a febrile UTI **Recurrent UTI:** NR **Number of patients (number of girls):** 24 (NR) **Age: mean (range):** NR (2 weeks to 10 years)	**Reference standard** DMSA: all patients received a renal scan to localise the site of UTI. No further details reported **Time between infection and reference standard:** NR **Definition of a positive test result** Patients with a positive scan (no details) classified as having pyelonephritis, patients with a negative scan as having cystitis	**Test 1:** β_2M concentration: β_2M determined according to the manufacturer's procedure. Micro-particle Enzyme Immunoassay (Abbott Laboratories) on the Abbott IMX analyser **Time between infection and test 1:** On admission **Definition of positive result test 1:** ≥ 0.5 μg mg^{-1} of CR **Test 2:** NAG: 50 μl of urine incubated with 100 μl of 4-methylumbelliferyl β-D-*N*-acetylglucosaminide substrate at 37°C for 60 minutes. The reaction was stopped by the addition of 2.5 ml of 0.17 M glycinecarbonate buffer, pH 10.3, and read in a spectrofluorometer with excitation at 365 nm and emission at 450 nm. Fluorescence compared with that of standard solutions of 4-methylumbelliferone. Sample blanks were prepared for each specimen to compensate for non-specific fluorescence **Time between infection and test 2:** On admission **Definition of positive result test 2:** ≥ 40 μmol h^{-1} mg^{-1} of CR **Test 3:** Combination: no details **Time between infection and test 3:** No details **Definition of positive result test 3:** Two tests combined (not clear whether both positive or either positive)

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Jequier, 1998[160] **Study design** Prospective cohort **Country** Switzerland **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI and prediction of scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children with clinically suspected pyelonephritis: rectal temperature ≥ 38.5°C, positive culture; and abdominal or flank pain or, in younger children unable to complain of pain, irritability, vomiting, feeding problems and a CRP level >10 mg l^{-1} **Recurrent UTI:** NR **Number of patients (number of girls):** 290 (199) **Age: median (range):** 394 days (4 days to 15 years)	**Reference standard** DMSA: scintigraphy performed 3–4 hours after i.v. injection of ^{99m}Tc-DMSA (2.78 MBq kg^{-1} body weight to a maximum of 74 MBq). One posterior, two posterior oblique, one anterior and two anterior oblique images obtained. Global DMSA uptake of each kidney was measured and the two sides were compared **Time between infection and reference standard:** <3 days then 60–90 days if initial scan positive **Definition of a positive test result** Focal or diffuse decreased or absent uptake seen on two projections or more in a normal-sized or swollen kidney	***Comparison with initial DMSA scan*** **Test 1:** Ultrasound: grey-scale ultrasound, with scan head adapted to patient size and varying from 7 to 4 MHz **Time between infection and test 1:** <3 days **Definition of positive result test 1:** Focal swelling of the renal parenchyma, loss of corticomedullary differentiation, focal hyper- or hypoechogenicity, thickening of the mucosa of the renal pelvis **Test 2:** Ultrasound: Doppler ultrasound, with scan head adapted to patient size and varying from 7 to 4 MHz **Time between infection and test 2:** <3 days **Definition of positive result test 2:** Focal swelling of the renal parenchyma, loss of corticomedullary differentiation, focal hyper- or hypoechogenicity, thickening of the mucosa of the renal pelvis, increased or decreased blood flow ***Comparison with follow-up DMSA scan*** **Test 3:** As test 1 **Test 4:** As test 2
Jequier, 1985[159] **Study design** Prospective cohort **Country** Canada **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Anatomical and detection of reflux and scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** UTI diagnosis made according to the criteria of Forbes *et al.*[290] **Recurrent UTI:** Initial UTI **Number of patients (number of girls):** 240 (121) **Age: mean (range):** NR (2 days to 15 years)	**Reference standard** IVU and/or MCUG: no procedural details reported. Pertinent echographic findings such as obstructive lesions were confirmed immediately by IVU and/or MCUG. Suspected reflux or normal sonograms were followed by IVU and/or MCUG 3 weeks to 5 months later. All patients had IVU **Time between infection and reference standard:** <5 months after acute phase (usually 3–6 weeks) **Definition of a positive test result** NR (positive: abnormal MCUG or IVU)	**Test 1:** Ultrasound: ultrasound using various machines with probes varying from 3.5 to 7.5 MHz. No further details reported **Time between infection and test 1:** All patients examined during the acute phase of UTI **Definition of positive result test 1:** NR

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Johnson, 1985[161] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Identification of treatable urological problems	**Patient spectrum** Confirmed UTI, further investigation **Further details** Patients admitted for pyelonephritis were eligible for inclusion as long as they were not referral cases. Children were excluded if they had asymptomatic bacteriuria or myelodysplasia, were attending the urology clinic or had a previous cystogram and intravenous pyelogram **Recurrent UTI:** Combination **Number of patients (number of girls):** 75 (69 included) (NR) **Age: mean (range):** NR (>2 weeks to <13 years)	**Reference standard** Radiological evaluation: All children had a renal and pelvic ultrasound, IVP and MCUG. Boys had MCUG done under fluoroscopic direction: bladder filled with contrast material and spot film taken at time of voiding and postvoid. IVP was done with 50% sodium diatrizoate injection. Ultrasound performed with real-time sector scanner **Time between infection and reference standard:** 4–6 weeks following start of antibiotic therapy **Definition of a positive test result** Reflux graded I–V according to international classification (not referenced). Identification of a treatable medical problem – one requiring either medical or surgical intervention in addition to the standard 10-day course of antimicrobial therapy – considered positive. Medical problems identified were: reflux and ectopic ureterocele with associated upper pole hydronephrosis	**Test 1:** Body temperature: rectal/oral temperature recorded after onset of symptoms before antibiotic therapy was started **Time between infection and test 1:** On admission **Definition of positive result test 1:** >38°C rectally or >37°C orally **Test 2:** Age **Definition of positive result test 2:** <5 years **Test 3:** Fever, ESR, CRP, DDAVP-RCA: ESR measured by the Westergen method; serum CRP determined quantitatively by nephelometry; DDAVP renal concentrating ability determined by the method of Monnen *et al.*[291] DDAVP laced in anterior nares at dose of 20 μg in children aged >1 year and 10 μg in infants. Urine collected at 3 and 5 hours and osmolality determined by freezing point depression using a Fiske osmometer. Values compared with normal values for maximum renal concentrating ability **Time between infection and test 3:** On admission **Definition of positive result test 3:** ERP ≥ 25 mm h^{-1}; CRP≥ 1.0 μg dl^{-1}; Any two of the four positive: both samples >2 SD below mean **Test 4:** IVP: methods as reference standard **Time between infection and test 4:** 4–6 weeks **Definition of positive result test 4:** as reference standard **Test 5:** Ultrasound: methods as reference standard **Time between infection and test 5:** 4–6 weeks **Definition of positive result test 5:** as reference standard **Test 6:** MCUG: methods as reference standard **Time between infection and test 6:** 4–6 weeks **Definition of positive result test 6:** As reference standard

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Johnson, 1990[162] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of reflux	**Patient spectrum** Confirmed UTI, further investigation **Further details** Further details of inclusion criteria reported previously[292,293] **Recurrent UTI:** NR **Number of patients (number of girls):** 147 (NR) **Age: mean (range):** NR (3 months to 13 years)	**Reference standard** NR: presence of reflux. Children received renal ultrasonogram, excretory urogram and voiding cystogram, in latter part of study children only received excretory urogram if reflux was found. Assume that these tests were used to diagnose reflux, but this is not clearly reported **Time between infection and reference standard:** No details **Definition of a positive test result** Reflux grades II–IV considered positive	**Test:** NAG: assays of NAG were done by the spectrophotometric method of Lockwood and Bosmann.[294] Creatinine concentration determined by standard methods and NAG values standardised to creatinin **Time between infection and test:** On admission **Definition of positive test result:** Normal values for NAG: creatinine ratios taken from Horak *et al*.[295] Values >1 SD from the mean were classified as elevated **Test 1:** Children with cystitis (determined according to criteria of Jodal[296] **Test 2:** Children with pyelonephritis (determined according to criteria of Jodal[296]
Kenda, 1989[163] **Study design** Prospective cohort **Country** Yugoslavia **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** Hospitalised children with confirmed UTI. 73/101 children were presenting with first UTI, remaining 28/101 had recurrent UTI. 56 aged <1 year **Recurrent UTI:** Combination **Number of patients (number of girls):** 101 (67) **Age: mean (range):** NR (2 weeks to 6 years)	**Reference standard** Excretory urography: no further details **Time between infection and reference standard:** <3 months **Definition of a positive test result** NR	**Test 1:** Ultrasound: no details reported **Time between infection and test 1:** <3 months **Definition of positive result test 1:** NR

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Kenda, 2000[164] **Study design** Prospective cohort **Country** Slovenia **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of reflux	**Patient spectrum** Mixed, some UTI **Further details** The indications for cystography were UTI, follow-up of a previously detected reflux or screening of siblings of children with reflux. Children aged <1 year excluded **Recurrent UTI:** NR **Number of patients (number of girls):** 99 (198 kidneys) (78) **Age: mean (range):** 4.6 years (1–12 years)	**Reference standard** Direct radionuclide voiding cystography: performed with child in supine position. Catheter inserted and urine allowed to drain. Bladder filled with 20 MBq of ^{99m}Tc pertechnetate-labelled colloid. When the bladder was full an echo-enhancing agent (Levovist) was administered intravesically. Child was asked to void or allowed to void spontaneously. Images acquired **Time between infection and reference standard:** NR **Definition of a positive test result** Reflux graded as follows: grade 1: radiotracer reaching the ureter only grade 2: radiotracer reaching the pelvis grade 3: radiotracer reaching the pelvis, which seemed dilated	**Test 1:** Ultrasound voiding cystography: performed using real-time scanner with a 3.7 and 7-MHz transducer. Baseline ultrasound image obtained and kidneys evaluated through ventral and dorsal approach. When bladder filled to predicted volume, Levovist was administered through catheter. Bladder and proximal parts of the ureters were examined, further Levovist was administered and kidneys were scanned ventrally and dorsally in longitudinal and transverse sections while awaiting micturation. Child asked to void or voided spontaneously. Procedure continued until voiding complete **Time between infection and test 1:** Performed at same time as reference standard **Definition of positive result test 1:** Reflux identified when hyperechogenic microbubbles detected in ureter and/or renal pelvis. Same grading scale used as used for reference standard
Kessler, 1982[165] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (NR) **Aim of imaging** Detection of reflux	**Patient spectrum** Mixed, some UTI **Further details** Children referred for MCUG to evaluate known VUR or for work-up of UTI **Recurrent UTI:** NR **Number of patients (number of girls):** 32 (55 kidneys) (30) **Age: mean (range):** NR (1–10 years)	**Reference standard** MCUG: no details reported **Time between infection and reference standard:** No details **Definition of a positive test result** Reflux was graded as follows: grade I: lower ureteral filling grade IIA: ureteral and pelvocalyceal filling without other changes grade IIB: ureteral and pelvocalyceal filling with mild calyceal blunting, but without clubbing and without dilatation of the pelvis or tortuosity or the ureter grade III: ureteral and pelvocalyceal filling, calyceal clubbing, and minor to moderate pelvic dilation with slight tortuosity of the ureters grade IV: massive hydronephrosis and hydroureter[285] Grades II–IV were considered positive for reflux	**Test 1:** Ultrasound: ultrasound with 5-MHz transducer used to scan both kidneys. Representative sagittal images obtained with the subject prone. Patient catheterised and placed prone for the remainder of study, residual urine removed via catheter. Cysto-Conray (20%) used as the contrast agent. Kidneys scanned simultaneously with injection of contrast material. The end-point for filling was determined according to patient age or by the child's inability to retain further contrast material. Reflux was not evaluated during voiding **Time between infection and test 1:** Immediately before MCUG **Definition of positive result test 1:** Visualisation of moving microbubbles in the renal collecting system and/or dilatation of the collecting system during the course of bladder filling

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Krzemien, 2002[166] **Study design** Prospective cohort **Country** Poland **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children with UTI referred to a paediatric hospital. 22 newborns, seven aged >1 year. No other illnesses detected among the children tested **Recurrent UTI:** Initial UTI **Number of patients (number of girls):** 29 (58 kidneys) (18) **Age: mean (range):** 8.2 months (1–24 months)	**Reference standard** DMSA: no further details **Time between infection and reference standard:** Within 3 weeks **Definition of a positive test result** Disorders of uptake of the indicator associated with presence of inflammatory processes in the kidneys. Normal if no differences in the uptake of dye, borderline images classed as normal	**Test 1:** Ultrasound: power Doppler ultrasound **Time between infection and test 1:** Within 7 days of presentation **Definition of positive result test 1:** Hyperfusion in the kidneys
La Cava, 1990[200] **Study design** Prospective cohort **Country** Italy **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children affected by UTI according to clinical, bacteriological and instrumental data **Recurrent UTI:** Combination **Number of patients (number of girls):** 162 (321 kidneys) (88) **Age: median (range):** 3.5 years (20 days to 15 years)	**Reference standard** Contrast urography performed according to the standard technique of the radiological department **Time between infection and reference standard:** ≥4 weeks **Definition of a positive test result** Scarring was classified according to the International Reflux Study Committee guidelines[301]	**Test 1:** Scintigraphy: renal sequential scintigraphy with ^{123}I-hippuran, single-kidney ERPF calculated from ^{123}I-hippuran clearance **Time between infection and test 1:** ≥4 weeks **Definition of positive result test 1:** Abnormal ERPF 270 ml minute^{-1}

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Landau, 1994[168] **Study design** Retrospective cohort **Country** USA **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI	**Patient spectrum** Mixed, some UTI **Further details** Medical records of all infants aged <4 months who underwent a DMSA scan to rule out APN were reviewed. Infants were evaluated for fever of undetermined source or suspected sepsis. Patients excluded if no UA was available from admission or if the urine specimen was not SPA or catheter sample. Those with known immunodeficiency, indwelling urinary catheter or a neuropathic bladder were also excluded. Associated clinical findings (age/temperature/peripheral WBC count/additional source of infection) were recorded to classify the infants as high or low risk for serious infection **Recurrent UTI:** NR **Number of patients (number of girls):** 186 (128 included in analysis) (38) **Age: mean (range):** 8 weeks (<16 weeks)	**Reference standard** DMSA: renal cortical scans were done during the acute phase of the disease and obtained 2–3 hours after an i.v. injection of ^{99m}Tc-DMSA dose of 50 μCi kg^{-1} (min. 300 μCi). High-resolution magnified images of the kidneys in posterior and posterior–oblique projections were obtained **Time between infection and reference standard:** NR **Definition of a positive test result** The finding of at least one discrete or diffuse photopenic lesion in the renal parenchyma, without loss in the cortex volume in that area	**Test 1:** Microscopy: urine samples centrifuged and unstained sediment examined under the microscope for WBC using ×400 magnification **Time between infection and test 1:** NR **Definition of positive result test 1:** ≥5 WBC hpf^{-1} for APN **Test 2:** Clinical features: low-risk criteria for a serious bacterial infection **Time between infection and test 2:** NR **Definition of positive result test 2:** No focal bacterial infection on physical examination, previously healthy, blood WBC <15 × 10^9 l^{-1}, band forms <15 × 10^9 l^{-1}, UA <5 WBC hpf^{-1}, when diarrhoea present: <5 WBC hpf^{-1} in stool
Landau, 1994[167] **Study design** Retrospective cohort **Country** USA **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** Infants aged <16 weeks who underwent a DMSA scan during episodes of febrile UTI. Infants had to have a positive urine culture and available UA from admission. Exclusion criteria included a known obstructive uropathy, immunodeficiency or an indwelling urinary catheter **Recurrent UTI:** NR **Number of patients (number of girls):** 142 (NR) **Age: mean (range):** NR (<16 weeks)	**Reference standard** DMSA: no details **Time between infection and reference standard:** During acute phase **Definition of a positive test result** No details	**Test 1:** UA: WBCs **Time between infection and test 1:** On admission **Definition of positive result test 1:** ≥5 WBC hpf^{-1}

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Lavocat, 1997[169] **Study design** Prospective cohort **Country** France **Setting (teaching)** Secondary care (non-teaching) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** All children aged >15 days admitted to a paediatric unit with febrile symptomatic UTI were included. Presented with symptoms of upper UTI and positive urine culture. All patients with uropathy, with the exception of reflux, were excluded from the study. UTI prophylaxis was given until the time of MCUG. Nine children had a history of pyelonephritis, and 24 had upper urinary tract symptoms (upper abdominal or lumbar pain) **Recurrent UTI:** NR **Number of patients (number of girls):** 55 (110 kidneys) (32) **Age: mean (range):** 33.4 months (3 weeks to 15 years)	**Reference standard** DMSA: performed 6 hours after i.v. injection of 2 MBq kg^{-1} (min. 15 MBq) of ^{99m}Tc-DMSA. One posterior, one anterior and two posterior oblique images were obtained. The relative contribution of each kidney to renal function was determined by using the geometric average from anterior and posterior plane data. The isofixation curves were used to locate cortical scars **Time between infection and reference standard:** <1 week **Definition of a positive test result** For each kidney, uptake of <45%; single or multiple peripheral cortical defects; localised or diffuse hypoactivity in one or both kidneys; large defect located at one pole. Small kidney volume and/or deformation of the outlines was considered as evidence of previous parenchymal involvement in APN	**Test 1:** Ultrasound: carried out using a 5-MHz transducer for children aged >3 months and a 7.5-MHz transducer for children aged <3 months **Time between infection and test 1:** <48 hours, repeated within 10 days if required **Definition of positive result test 1:** Increase in parenchymal volume (confirmed by a decrease in volume on a second ultrasound examination 10 days later); alteration of parenchymal echogenicity (hypoechoic or hyperechoic foci). Isolated dilatation and hypotonicity of the renal pelvis not considered abnormal **Test 2:** CT scan: scans were obtained before and after i.v. injection of 2 ml kg^{-1} of 38% sodium- meglumine ioxitalamate (Telebrix 38 R) or an ioversol (Optiray 350) bolus of 1 mg kg^{-1}. A plain film of the urinary tract was taken approximately 20 minutes after iodine injection **Time between infection and test 2:** <1 week **Definition of positive result test 2:** Round, ill-defined and non-enhancing areas of low attenuation exhibiting a mass effect reflected 'acute lobular nephronia'. Wedge-shaped and sharply delimited enhanced areas of reduced parenchyma reflected focal or multifocal lesions of pyelonephritis **Test 3:** MCUG: no details **Time between infection and test 3:** No details **Definition of positive result test 3:** Graded according to international classification[284]

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Leonidas, 1985[170] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (NR) **Aim of imaging** Abnormal urinary tract	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children referred for excretory urography as part of the diagnostic investigation of UTI **Recurrent UTI:** NR **Number of patients (number of girls):** 71 (59) **Age: mean (range):** 5.8 (1 month to 28 years)	**Reference standard** IVU: i.v. injection of 2–3 ml sodium diatrizoate 50% kg^{-1} body weight; films exposed at 3, 5 and 10 minutes postinjection, with additional exposures as necessary. 59/71 (89%) of patients also had MCUG **Time between infection and reference standard:** No details **Definition of a positive test result** Comments on the various components of the urinary tract were recorded separately (length of kidney, renal parenchymal thickness, and degree of dilatation of the collecting system) and a final diagnosis was indicated	**Test 1:** Ultrasound: carried out using a 5 or 3.5-MHz transducer. Sonograms usually obtained with the patient supine and in the right and left decubitus positions as required. Kidneys scanned in sagittal, coronal and transverse planes **Time between infection and test 1:** No details **Definition of positive result test 1:** Comments on the various components of the urinary tract were recorded separately (length of kidney, renal parenchymal thickness and degree of dilatation of the collecting system) and a final diagnosis was indicated
LeQuesne, 1986[171] **Study design** Retrospective cohort **Country** Australia **Setting (teaching)** Secondary care (NR) **Aim of imaging** Detection of scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children who were investigated with both ultrasound and DMSA scan. 29/33 children had proven reflux at the time of examination **Recurrent UTI:** NR **Number of patients (number of girls):** 33 (66 kidneys) (NR) **Age: mean (range):** NR (5 months to 14 years)	**Reference standard** DMSA: no details reported **Time between infection and reference standard:** NR **Definition of a positive test result** NR	**Test 1:** Ultrasound: no details reported **Time between infection and test 1:** NR **Definition of positive result test 1:** Ultrasonic signs of possible reflux nephropathy included: focal cortical thinning, focal caliectasis, segmental or generalised scarring, changes in echogenicity of renal tissue, renal size below normal range for height, disparity in renal size >10%

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Lindsell, 1986[172] **Study design** Prospective cohort **Country** UK **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** Age distribution: <1 year (n = 11), 1–5 years (n = 48), >5 years (n = 41) **Recurrent UTI:** NR **Number of patients (number of girls):** 100 (71) **Age: mean (range):** NR (children, including under 5 years)	**Reference standard** IVU performed using Iopamidol (Niopam 300) (dose 2 ml kg^{-1}). The number of films varied; the minimum necessary to show renal outlines clearly, an opacified pelvicalyceal system and a reasonably full bladder. Performed immediately after ultrasound **Time between infection and reference standard:** NR **Definition of a positive test result** Abnormality defined by: structural abnormalities of the renal tract; evidence of renal scarring; changes, such as minor calyceal blunting and ureteric dilatation, suggestive of reflux	**Test 1:** Ultrasound: all examinations by one radiologist using 5-MHz probes. If possible the pelvis was scanned when the bladder was full **Time between infection and test 1:** NR **Definition of positive result test 1:** Kidneys assessed for congenital abnormalities and for evidence of renal scarring or dilatation of the distal ureters suggestive of reflux
Lonergan, 1998[173] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (NR) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children presenting with a fever and positive culture were considered for inclusion. Exclusion criteria: children aged <2 years, elevated serum creatinine, allergy to gadopentetate dimeglumine or to scintigraphic agent, presence of MR-incompatible device, contraindications to sedation (if sedation deemed necessary) **Recurrent UTI:** NR **Number of patients (number of girls):** 37 (70 kidneys) (NR) **Age: mean (range):** 5.2 years (2–16 years)	**Reference standard** DMSA: scintigraphy using ^{99m}Tc-DMSA (1.85 MBq kg^{-1}, min. 18.5 MBq) or ^{99m}Tc-glucoheptonate (7.4 MBq kg^{-1}, min. 92.5 MBq). Scanning approx. 3 hours postinjection, one posterior and one posterior oblique view of each kidney **Time between infection and reference standard:** NR **Definition of a positive test result** Positive or negative for pyelonephritis (not defined)	**Test:** MRI: 1.5 T, pelvic coil. Gadolinium-enhanced inversion recovery imaging (TR/TE/TI, 2000/16/160), slice thickness 3–8 mm, axial and/or coronal planes **Time between infection and test:** NR **Definition of positive test result:** Positive or negative for pyelonephritis (not defined) **Test 1:** By patient **Test 2:** By kidney

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
MacKenzie, 1994[174] **Study design** Prospective cohort **Country** UK **Setting (teaching)** Secondary care (NR) **Aim of imaging** Detection of scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** All children presenting to hospital over a 5-year period, with a first documented, symptomatic, bacteriologically proven *E. coli* UTI were entered into the study. Symptoms, duration and child's temperature at presentation were recorded **Recurrent UTI:** Initial UTI **Number of patients (number of girls):** 175 (112 analysed) (112) **Age: mean (range):** NR (1 month to 13 years)	**Reference standard** DMSA: posterior, right and left posterior oblique views were obtained 1.5–2 hours after injection of a weight-related dose of DMSA **Time between infection and reference standard:** <28 days **Definition of a positive test result** Showing photon-deficient areas, scarring (persistent loss of normal reniform outline), showing both photon-deficient areas and scarring, showing a significant difference in size, showing divided function outside the normal range (45–55%)	**Test 1:** Ultrasound: ultrasound examinations performed using a 3.5 or 5-MHz probe. Images of the kidneys were obtained with the patient in supine and prone positions, images of the bladder also obtained. **Time between infection and test 1:** <48 hours **Definition of positive result test 1:** Ultrasound examinations were reported as normal, showing scarring, showing dilatation or a suspected obstruction, or showing a difference in size. The presence of a duplex kidney was looked for. Swelling of the kidney, generalised or localised changes in echogenicity, prominence of the pyramids and loss of the cortico-medullary differentiation were also commented on
Mage, 1989[175] **Study design** Prospective cohort **Country** France **Setting (teaching)** Secondary care (NR) **Aim of imaging** Detection of reflux	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children presenting over a 7-year period. 77 children aged <2 years, 12 children aged <2 months **Recurrent UTI:** Initial UTI **Number of patients (number of girls):** 122 (85) **Age: mean (range):** NR (16 days to 11 years)	**Reference standard** MCUG: examinations during filling, with full bladder, during voiding and postvoiding. Always retrograde in girls, retrograde or suprapubic in boys **Time between infection and reference standard:** >3 weeks **Definition of a positive test result** Not clear	**Test 1:** Ultrasound: ultrasound examination with 5-MHz transducer. Kidneys, ureteral junctions and bladder were examined. The anterioposterior renal pelvis diameter was systematically measured in transverse sections **Time between infection and test 1:** Before MCUG **Definition of positive result test 1:** Not clear

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Mahant, 2002[176] **Study design** Retrospective cohort **Country** Canada **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of reflux	**Patient spectrum** Confirmed UTI, further investigation **Further details** The charts of all children aged <5 years admitted with UTI were reviewed. Children with known genitourinary abnormalities or with previous history of UTI were excluded **Recurrent UTI:** Initial UTI **Number of patients (number of girls):** 170 (162 included) (71) **Age: mean (range):** median 3 months (3 days to 4 years)	**Reference standard** MCUG using Hypaque 18% contrast material. Intermittent fluoroscopy during the filling stage and a spot image of the filled bladder obtained. Spot images obtained of the bladder and urethra during voiding without catheter, with girls in a supine position and boys left anterior oblique. A postvoid image of the bladder and renal fossae was also obtained **Time between infection and reference standard:** NR **Definition of a positive test result** Reflux graded using international scale and reported by staff radiologists[284]	**Test 1:** Ultrasound: ultrasound scans, with sector curved array and linear high-resolution transducers **Time between infection and test 1:** Median 2 (IQR 1–3) following start of treatment **Definition of positive result test 1:** Renal ultrasound considered suggestive of reflux if: dilatation of the pelvicalyces, dilatation of the ureters, dilatation of the collecting system reported (for one or both kidneys)
McLorie, 1989[178] **Study design** Prospective cohort **Country** Canada **Setting (teaching)** Secondary care (NR) **Aim of imaging** Detection of scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** Patients with documented primary reflux, presenting with UTI. Criteria for participation in the study were: progression in degree of reflux, previous documentation of renal scars by IVP or ^{99m}Tc-DMSA, recurrent UTI or contemplation of surgical correction of reflux. Patients with renal insufficiency, hydronephrosis, neurovesical dysfunction or outflow obstruction were excluded **Recurrent UTI:** NR **Number of patients (number of girls):** 32 (64 renal units) (26) **Age: mean (range):** NR (2–14 years)	**Reference standard** DMSA: ^{99m}Tc-DMSA injected i.v. at a dose not exceeding 5 μCi 70 kg^{-1} 1.73 m^{-2} body surface area. Scans obtained 3 hours after injection in the sagittal, coronal and transverse planes **Time between infection and reference standard:** NR **Definition of a positive test result** Diagnosis of focal scarring was based on identification of areas of reduced radioactivity in the parenchyma in at least two tomographic cuts in one axis	**Test 1:** IVP after i.v. injection of 50% diatrizoate meglumine and diatrizoate sodium, (injection volume 1 ml kg^{-1} body weight). A minimum of two radiographs taken at 5 and 15 minutes after injection were obtained **Time between infection and test 1:** NR **Definition of positive result test 1:** Criteria for diagnosis of renal scarring were diffuse or focal parenchymal thinning and adjacent calyceal clubbing or deformity

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Mentzel, 2002[179] **Study design** Prospective cohort **Country** Germany **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of reflux	**Patient spectrum** Mixed, some UTI **Further details** All patients were referred for the evaluation of reflux. The indications for investigation were: UTI (n = 67), follow-up of previously diagnosed reflux (n = 15), sonographically diagnosed dilatation of the urinary pelvicalyceal system or megaureter (n = 20), malformation syndromes with high probability of renal involvement (n = 10), enuresis (n = 6). Patients were excluded for: galactosemia, ongoing UTI, unsuccessful sonographic examination caused by restlessness, boys aged <1 year **Recurrent UTI:** NR **Number of patients (number of girls):** 118 (234 uretero-renal units) (90) **Age: median (range):** 4.5 years (3 weeks to 16 years)	**Reference standard** MCUG: saline solution and X-ray contrast medium (Peritrast 400; Kohler-Chemie, Germany) were drip infused into the bladder. Procedure monitored by fluoroscopy and spot film using one anterior–posterior spot film during filling and one in the Lauenstein position during voiding **Time between infection and reference standard:** NR **Definition of a positive test result** Reflux graded according to international scale[284] (positive: reflux of any grade; negative: no reflux)	**Test 1:** Ultrasound: ultrasound with 3–5-MHz curved array and 5–10-MHz linear transducers. Baseline sonograms were obtained in two perpendicular planes of the kidney, ureters and bladder, with the patient in the supine and prone positions. The patient was then catheterised and the bladder emptied and afterwards filled with saline solution. Ultrasonographic contrast medium (Levovist 300 mg ml^{-1} solution) was then added. Examination in the longitudinal and transverse sections of each flank in prone and supine positions was conducted before voiding. Patients were then returned to the supine position and asked to void (uncooperative, young children allowed to void spontaneously). The retrovesical parts of the ureters and the renal pelvis were scanned during voiding **Time between infection and test 1:** NR **Definition of positive result test 1:** Reflux graded according to international scale[284] (positive: reflux of any grade; negative: no reflux)
Merrick, 1980[180] **Study design** Retrospective cohort **Country** Scotland **Setting (teaching)** Secondary care (NR) **Aim of imaging** Detection of scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** All children referred for renal investigations were identified from files. Patients had to receive both DMSA and IVU within 3 months of each other, or IVU in the interval between two identical DMSA scans, or a DMSA scan in the interval between two identical IVUs. All children had bacteriologically proven UTI **Recurrent UTI:** NR **Number of patients (number of girls):** 79 children (155 kidneys) (NR) **Age: mean (range):** NR (appears to be 1 to >10 years)	**Reference standard**: Scintigraphy: performed 1–4 hours after administration of ^{99m}Tc-glucoheptonate at a dose of 7.4 MBq kg^{-1} or of ^{99m}Tc-DMSA at a dose of 3.7 MBq kg^{-1}. Analogue images without enhancement or any form of data processing were recorded simultaneously in the posterior, left posterior, oblique and right posterior oblique positions **Time between infection and reference standard:** Not clear **Definition of a positive test result** No details	**Test 1:** IVU: technique of IVU determined by the radiologist. Minimum of three films were taken: a plain film immediately before administration of contrast, a coned view of the renal areas at 5 minutes and a full-length film at 15 minutes. Additional views and tomograms were obtained as deemed necessary to obtain adequate visualisation of both the renal outlines, the calyces and the ureters **Time between infection and test 1:** Not clear **Definition of positive result test 1:** No details

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Misselwitz, 1971[181] **Study design** Retrospective cohort **Country** Germany **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of reflux	**Patient spectrum** Mixed, some UTI **Further details** Children who had received both renography and IVU. 37 children with APN, 66 with recurrent or chronic pyelonephritis without retention on the IVU and without reflux, 64 children with recurrent or chronic pyelonephritis with retention on IVU or reflux. 167 had confirmed pyelonephritis, 13 had retention without pyelonephritis **Recurrent UTI:** NR **Number of patients (number of girls):** 180 (NR) **Age: mean (range):** NR (6 months to 16 years)	**Reference standard** IVU: NR **Time between infection and reference standard:** NR **Definition of a positive test result** Positive for 'harnstauung'	**Test 1:** Renogram: performed 30 minutes after 10 ml Tee kg^{-1} body weight in lying position. 2.5 μC kg^{-1} body weight of ^{131}I-*o*-hippurat injected **Time between infection and test 1:** NR **Definition of positive result test 1:** Positive for 'harnstauung'. Qualitative assessment: subjective assessment of the secretion curve **Test 2:** Renogram: performed 30 minutes after 10 ml Tee kg^{-1} body weight in lying position. 2.5 μC kg^{-1} body weight of ^{131}I-*o*-hippurat injected **Time between infection and test 2:** NR **Definition of positive result test 2:** Positive for 'harnstauung'. Semi-quantitative assessment according to method of Zum Winkel[297]
Montplaisir, 1981[182] **Study design** Prospective cohort **Country** Canada **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** 53 children aged <2 years **Recurrent UTI:** NR **Number of patients (number of girls):** 282 (216) **Age: mean (range):** NR (0–16 years)	**Reference standard** Not clear: on the basis of clinical, radiological and cystoscopic investigations children were classified as having kidney infection (n = 94), bladder/urethra infection (n = 102), or asymptomatic bacteriuria (n = 86) **Time between infection and reference standard:** NR **Definition of a positive test result** Lower UTI or asymptomatic bacteria considered negative. Kidney infection considered positive	**Test 1:** ACB: direct immunofluorescence performed on urine sediment as previously described[298] and on stool and vaginal secretions smeared on glass slides, air-dried and subsequently fixed with acetone. Antisera used were fluorescein-conjugated anti-human-IgG, -IgA and -IgM and anti-IgG containing only G(ab^1). As a negative control for each sample giving a positive result the test was repeated in the same manner. Smears were examined with a fluorescence microscope at a magnification of x250 **Time between infection and test 1:** NR **Definition of positive result test 1:** >3 fluorescent bacteria in 200 microscopic fields

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Morin, 1999[183] **Study design** Prospective cohort **Country** France **Setting (teaching)** Secondary care (NR) **Aim of imaging** Localisation of UTI and detection of reflux	**Patient spectrum** Confirmed UTI, further investigation **Further details** Patients referred for a first episode of APN. Clinical criteria for diagnosing APN were: fever, CRP>20 mg l^{-1} and a positive urine culture. Children with features of dilated uropathy were excluded **Recurrent UTI:** Initial UTI **Number of patients (number of girls):** 70 (43) **Age: median (range):** 2 years (1 month to 17 years)	**Reference standard** DMSA: children examined in supine position. ^{99m}Tc-DMSA given at dose of 0.5 MBq kg^{-1} body weight. 6 hours after injection, posterior and posterior oblique images obtained **Time between infection and reference standard:** <5 days **Definition of a positive test result** Considered abnormal if one or more areas of decreased DMSA uptake were noted. Care was taken not to consider central defects located over the pelivcalyceal system as abnormal **Reference standard 2** MCUG: performed within 4 weeks of admission according to standard procedure **Time between infection and reference standard 2:** <4 weeks **Definition of positive result reference standard 2** Reflux graded according to international criteria[284]	***Compared with reference standard 1*** **Test 1:** Ultrasound: renal ultrasound performed using 3.5, 5.0, and 9.0-MHz transducers. Anterior, posterior, longitudinal and transverse views were obtained for each kidney **Time between infection and test 1:** On admission **Definition of positive result test 1:** Considered abnormal if one of the following features was found: parenchymal hyperechogenicity, focal lesion with hyper/hypoechogenicity, thickening of the renal pelvic wall, significant enlargement of both kidney length and width **Test 2:** MCUG: conducted as for reference standard 2 **Time between infection and test 2:** < 4 weeks **Definition of positive result test 2:** As reference standard 2 ***Compared with reference standard 2*** **Test 3:** Ultrasound: conducted as for test 1 **Time between infection and test 3:** As for test 1 **Definition of positive result test 3:** As for test 1

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Mucci, 1994[184] **Study design** Retrospective cohort **Country** UK **Setting (teaching)** Secondary care (non-teaching) **Aim of imaging** Detection of scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** All included children had undergone at least DMSA and ultrasound **Recurrent UTI:** Combination **Number of patients (number of girls):** 193 (141) **Age: mean (range):** 4.8 years (5 months to 17 years)	**Reference standard** DMSA: no details reported **Time between infection and reference standard:** NR **Definition of a positive test result** NR	**Test 1:** Ultrasound: ultrasound, no details given **Time between infection and test 1:** NR **Definition of positive result test 1:** NR
Muensterer, 2002[185] **Study design** Retrospective cohort **Country** USA **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of reflux	**Patient spectrum** Mixed, some UTI **Further details** Patients who underwent renal ultrasound over a 6-month period were retrospectively reviewed. Patients were included if they had had MCUG and ultrasound examinations within 1 week. Indications for the studies were as follows: UTI, dysuria, frequency (n = 101, 42 first UTI, 59 recurrent), lower genitourinary malformations, (n = 28), dilatation on prenatal ultrasound (n = 31), neurological dysfunction (n = 26), haematuria, (n = 7). Patients with previous urinary tract surgery, kidney malformations or solitary kidney were excluded **Recurrent UTI:** Combination **Number of patients (number of girls):** 193 (386 kidneys) (111) **Age: median (range):** 3.6 years (1 day to 18.3 years)	**Reference standard** MCUG: no further details **Time between infection and reference standard:** >2 weeks **Definition of a positive test result** Reflux graded according to international reflux study in children[284]	**Test:** Ultrasound: renal size on ultrasound examination by a standard protocol using curvilinear or linear probes of the highest frequency possible (7, 5, or 3 MHz for infants, children and adolescents, respectively). Length measurements performed on screen using an integrated electronic calliper **Time between infection and test:** >2 weeks ***Compared with any reflux on MCUG*** **Definition of positive result test 1:** Abnormal kidney size (defined as one outside +2 SD of normal for age) **Definition of positive result test 2:** Any dilatation[299] ***Compared with high-grade reflux on MCUG (grades 3–5)*** **Definition of positive result test 3:** Abnormal kidney size (defined as one outside of +2 SD of normal for age) **Definition of positive result test 4:** Any dilatation **Definition of positive result test 5:** Abnormal kidney size or any dilatation

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Oostenbrink, 2000[186] **Study design** Prospective cohort **Country** Netherlands **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of reflux	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children aged <5 years presenting to the paediatric outpatient or emergency department. Patients with neurological bladder dysfunction were excluded **Recurrent UTI:** Initial UTI **Number of patients (number of girls):** 140 (89) **Age: mean (range):** 1 year (<5 years)	**Reference standard** MCUG: no further details **Time between infection and reference standard:** NR **Definition of a positive test result** Presence of reflux. Grade I–IV according to international classification[284]	***Compared with what?*** **Test 1:** Ultrasound: no details **Time between infection and test 1:** NR **Definition of positive result test 1:** Presence of dilatation of urinary tract, graded subjectively by radiologist as 0 if no dilatation; 1 in presence of pyelectasis, 2 in the case of mild dilatation, 3 if severe dilatation was presence. Classed as positive in the case of dilatation grade ≥2 ***Compared with any grade reflux*** **Test 2:** combination: combined risk score calculated from following model: score = 6 × male gender + 7 × positive family history – 1 × age + 1 × CRP + 14 × ultrasound dilatation. Model produced by regression analysis of prespecified variables thought to be associated with reflux. Points assigned to age: <1 year = 0; 1–2 year = 1; 2–3 year = 2, etc., with max. of 5 points for children aged 5 years. Points assigned to CRP: 0–9 mg l^{-1} = 1; 10–19 mg l^{-1} = 2 points, etc., up to max. of 20 points for CRP>200 mg l^{-1} **Time between infection and test 2:** NR **Definition of positive result test 2:** ≥1 **Definition of positive result test 3:** ≥6 **Definition of positive result test 4:** ≥11 **Definition of positive result test 5:** ≥16 **Definition of positive result test 6:** >25 ***Compared with reflux grade ≥3*** **Definition of positive result test 7:** ≥11 **Definition of positive result test 8:** ≥16 **Definition of positive result test 9:** >25

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Piaggio, 2003[187] **Study design** Prospective cohort **Country** Italy **Setting (teaching)** Secondary care (NR) **Aim of imaging** Detection of reflux	**Patient spectrum** Mixed, some UTI **Further details** Children undergoing MCUG and ultrasound over a 1-year period. Indications for examinations were: clinical signs, including recurrent UTI, pyelonephritis and significant micturition disorders; ultrasound data of moderate to severe or worsening hydroureteronephrosis; urinary tract malformations with or without clinical signs; clinical signs (UTI, hydronephrosis) in transplanted kidneys **Recurrent UTI:** Combination **Number of patients (number of girls):** 158 (305 kidney–ureter units) (61) **Age: mean (range):** 3.9 years (0.1–12.7 years)	**Reference standard** MCUG **Reference standard execution** Performed after cystosonography with same catheter, no further details reported **Time between infection and reference standard:** NR **Definition of a positive test result** Reflux appears to be classified according to the international scale[284]	**Test 1:** Ultrasound: ultrasound with convex 2–4 and 4–7-MHz multiple-frequency transducers. Levovist contrast medium (2.5 g at 300 micro-particles/mg ml^{-1}) was used. Half the dose was administered after mild bladder distension, the remainder retained in case of further need. Saline solution was continued until spontaneous micturition in younger children, and until urgent need in older ones **Time between infection and test 1:** NR **Definition of positive result test 1:** NR
Pickworth, 1992[188] **Study design** Retrospective cohort **Country** England **Setting (teaching)** Secondary care (non-teaching) **Aim of imaging** Detection of scarring	**Patient spectrum** Mixed, some UTI **Further details** The notes, radiological investigation and radionuclide scans of all patient who received ^{99m}Tc-MAG3 scans over a 2-year period were reviewed. Reasons for referral included: UTI (n = 57), pre-/postsurgical assessment (n = 21), further assessment of antenatally diagnosed renal tract anomaly (n = 13), multiple congenital defects (n = 4), screening (n = 3), loin pain (n = 2) **Recurrent UTI:** NR **Number of patients (number of girls):** 100 (NR) **Age: mean (range):** 5.6 years (6 days to 17 years)	**Reference standard 1** DMSA: no details reported **Time between infection and reference standard:** NR **Definition of a positive test result:** NR **Reference standard 2** MAG3: ^{99m}Tc-MAG3 scans were performed following oral hydration based on an adult dose of 100 MBq scaled according to body surface area. Patients were studied supine on a gamma camera. Micturating studies were performed at the end of the 30-minute renography phase with the patient sitting on a modified commode. Two frames were acquired during micturition **Time between infection and reference standard 2:** NR **Definition of positive result reference standard 2** Kidneys were classified as showing focal scarring if there were discrete photon-deficient areas on the 2.5-minutes images with or without underlying dilatation of the collecting system. Global scarring defined as uniform loss of cortical thickness	***Compared with DMSA*** **Test 1:** MAG3: conducted as for reference standard 2 **Time between infection and test 1:** NR **Definition of positive result test 1:** as for reference standard 2 ***Compared with MAG-3*** **Test 2:** IVU: no details **Time between infection and test 2:** NR **Definition of positive result test 2:** No details

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Piepsz, 1992[189] **Study design** Retrospective cohort **Country** Belgium **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** Retrospectively selected on the basis of clinical suspicion of APN **Recurrent UTI:** NR **Number of patients (number of girls):** 30 (60 kidneys) (NR) **Age: mean (range):** 7.2 years (4 months to 18 years)	**Reference standard** DMSA: ^{99m}Tc-DMSA scintigraphy 2 hours after i.v. injection. Dose calculated as a fraction of the adult dose, by child's weight and body surface area (min. 18 MBq). Posterior and two oblique posterior views **Time between infection and reference standard:** within 48 hours **Definition of a positive test result** Routine written report used for study. Abnormal: small kidney with or without irregular kidney shape or cortical defects, single or multiple cortical defects, diffuse hypoactivity of one kidney (<45% of total activity)	**Test 1:** Scintigraphy: MAG3 renography after i.v. injection of a fraction of the adult dose determined by child's weight and body surface area (min. 17 MBq). Sixty 20-second frames were recorded and the three frames acquired during the second minute of the test were added **Time between infection and test 1:** Within 48 hours **Definition of positive result test 1:** Abnormal: small kidney with or without irregular kidney shape or cortical defects; single or multiple cortical defects; diffuse hypoactivity of one kidney (<45% of total activity)
Pylkkanen, 1978[190] **Study design** Prospective cohort **Country** Finland **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** Symptomatic (n = 114) and asymptomatic (n = 14) children **Recurrent UTI:** Initial UTI **Number of patients (number of girls):** 128 (NR) **Age: mean (range):** NR (0–14 years)	**Reference standard** Clinical: Jodal criteria[296] **Time between infection and reference standard:** On admission **Definition of a positive test result** High fever, increased ESR, abnormally high CRP level, decreased renal concentrating capacity. Patient classed as upper UTI if at least 3 criteria fulfilled	**Test 1:** ACB: performed according to method of Thomas *et al.*[287] Fluorescein-conjugated goat antiserum to human globulin was used **Time between infection and test 1:** On admission **Definition of positive result test 1:** ≥2 brightly fluorescent bacteria

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Radmayr, 2002[191] **Study design** Prospective cohort **Country** Austria **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of reflux	**Patient spectrum** Confirmed UTI, further investigation **Further details** Patients transferred to a radiology department for uroradiological investigation because of a recent UTI. Patients with renal duplications were excluded from the study. None of the children had acute UTI at the time of the investigation **Recurrent UTI:** NR **Number of patients (number of girls):** 104 (208 renal and ureter units) (81) **Age: mean (range):** 5.4 years (14 days to 19 years)	**Reference standard** MCUG: using intermittent digital fluoroscopy. Filling volume kept comparable to that used in ultrasound, prewarmed X-ray contrast medium injected directly into the bladder by the transurethral route **Time between infection and reference standard:** NR **Definition of a positive test result** International classification for reflux grade[284]	**Test 1:** Ultrasound: performed using a 3.5–7.5-MHz curved array transducer attached to a Doppler ultrasound unit. An initial standard ultrasound of the whole urinary tract was performed with the patient prone and supine. After transurethral catheterisation, the bladder was completely emptied and filled with saline, administered until the patient had the urge to void or until the operator felt slight back pressure. 15% of the filling volume was then replaced with galactose-based, microbubble containing echo-enhancer agent. The bladder, retrovesical space and kidneys were monitored during injection of agent. Both kidneys were scanned during voiding **Time between infection and test 1:** NR **Definition of positive result test 1:** Reflux was diagnosed when microbubbles appeared in the ureter or renal pelvis. The international classification of VUR was used for grading[284]
Redman, 1984[192] **Study design** Retrospective cohort **Country** USA **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of reflux	**Patient spectrum** Confirmed UTI, further investigation **Further details** Girls who received an IVP and MCUG as part of the evaluation for UTI. The evaluation was recommended primarily on the basis of a strong history of UTI or the UA and culture obtained by referring physicians previously. No studies were performed when the child was acutely infected **Recurrent UTI:** NR **Number of patients (number of girls):** 200 (200) **Age: mean (range):** NR (< 1 year to 14 years)	**Reference standard** MCUG: performed in a retrograde fashion using a no. 8 feeding tube. Contrast medium was instilled by gravity using image intensification to observe filling. Cystography during voiding was also done **Time between infection and reference standard:** Not acute **Definition of a positive test result** No details reported	**Test 1:** IVP: performed using 1 ml lb^{-1} body weight 60% diatrizoate. Radiographs were made immediately following injections, and supine and prone radiographs were obtained 10 minutes after injections **Time between infection and test 1:** Not acute **Definition of positive result test 1:** No details reported

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Rehling, 1989[193] **Study design** Prospective cohort **Country** Denmark **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of scarring	**Patient spectrum** Mixed, some UTI **Further details** Children with UTI and/or congenital hydronephrosis. 12 had UTI, six had hydronephrosis. 69 children presented with UTI and/or congenital hydronephrosis, but only 20 included in analysis **Recurrent UTI:** NR **Number of patients (number of girls):** 69 (20 included in analysis) (9) **Age: median (range):** 5 years (6 days to 13 years)	**Reference standard** IVU: standard IVU performed starting with control film of kidneys and bladder. Maximum 40 ml of Omnipaque 300 mg I ml^{-1} or Telebrix 380 mg I ml^{-1} was injected in children under and over 15 kg, respectively. On average seven films taken **Time between infection and reference standard:** NR, not during infection **Definition of a positive test result** Urinary tract evaluated as normal (0), moderately abnormal (1), severely abnormal (2) or impossible to evaluate. 0 considered negative, all other results positive	**Test 1:** Scintigraphy: performed with the patient supine. Data were stored from 0 to 21 minutes postinjection of 4 MBq kg^{-1} body weight (min. 50 MBq) of ^{99m}Tc-DTPA. Regions of interest of the kidneys and the left ventricle of the heart were defined and time–activity curves computed **Time between infection and test 1:** NR, not during infection **Definition of positive result test 1:** Urinary tract evaluated as normal (0), moderately abnormal (1), severely abnormal (2) or impossible to evaluate; (0) considered negative, all other results positive
Rickwood, 1992[194] **Study design** Prospective cohort **Country** England **Setting (teaching)** Secondary care (non-teaching) **Aim of imaging** Detection of scarring, reflux or anatomical abnormality	**Patient spectrum** Confirmed UTI, further investigation **Further details** Consecutive children presenting to one of three hospitals with a symptomatic, bacteriologically proven UTI. Outpatients (n = 153), emergency admissions (n = 47) **Recurrent UTI:** NR **Number of patients (number of girls):** 200 (59) **Age: mean (range):** NR (<10 years, included infants)	**Reference standard** Combination: all children received IVU, further investigations determined by the ultrasound findings. Cystography and static DMSA were performed when ultrasound and IVU gave normal results or showed abnormalities in renal size, outline or echxture. Cystography also performed when distal ureteric dilatation was detected and was followed by DMSA in the presence of reflux or by dynamic diuresis renography otherwise. Cases of pure pelvic hydronephrosis were examined by dynamic renography only. Static DMSA was always deferred until at least a month after the UTI had cleared **Time between infection and reference standard:** Static DMSA performed a minimum of 1 month postinfection, no further details reported **Definition of a positive test result** Combination of all these methods, no further details	**Test 1:** Ultrasound: no details **Time between infection and test 1:** NR **Definition of positive result test 1:** NR

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Rohden, 1995[195] **Study design** Cohort, not clear if prospective **Country** Germany **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of reflux	**Patient spectrum** Mixed, some UTI **Further details** Children after a UTI, children with suspicion for urinary tract malformations, enuresis diurnal and nocturnal, pathological ultrasound after birth, and children followed up after long-term reflux **Recurrent UTI:** NR **Number of patients (number of girls):** 26 (16) **Age: mean (range):** 3.5 years (3 days to 13 years)	**Reference standard** MCUG: none reported **Time between infection and reference standard:** Not clear **Definition of a positive test result** NR	**Test 1:** Ultrasound: contrast-enhanced ultrasound with Echovist. Standard ultrasound performed initially following micturition, children catheterised, 10–30 ml of saline infused, depending on bladder volume 5–30 ml of contrast solution was infused. Children imaged in dorsal position. Bladder filled until needed to micturate, extra contrast infused and imaged during micturition **Time between infection and test 1:** Not clear **Definition of positive result test 1:** NR: subjective assessment
Rossleigh, 1990[196] **Study design** Prospective cohort **Country** Australia **Setting (teaching)** Secondary care (NR) **Aim of imaging** Detection of scarring	**Patient spectrum** Mixed, some UTI **Further details** Children undergoing urological assessment. 49 presented with UTI, in 14 the assessment was carried out for other reasons **Recurrent UTI:** NR **Number of patients (number of girls):** 63 (NR) **Age: mean (range):** NR (< 1 year)	**Reference standard** IVU: no details **Time between infection and reference standard:** > 1 month **Definition of a positive test result** No details	**Test :** DMSA: performed 3 hours after injection of 40 MBq ^{99m}Tc-DMSA, standard posterior planar views were collected for 5 minutes. Posterior pinhole views were also performed. Some patients also underwent SPECT examination. The study was reconstructed in coronal, sagittal and transaxial planes with slices of 1 pixel width. Differential renal function was calculated from the posterior planar data **Time between infection and test:** > 1 month **Definition of positive test result:** Reduction in kidney function and/or decreased or absent uptake of tracer in the renal cortex causing distortion or indentation of the normal renal outline **Test 1:** UTI patients only **Test 2:** Reflux, no UTI patients

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Salih, 1994[197] **Study design** Prospective cohort **Country** Turkey **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of reflux	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children who were investigated by standard MCUG and were shown to have reflux in at least one kidney **Recurrent UTI:** NR **Number of patients (number of girls):** 21 (42 kidneys) (14) **Age: mean (range):** 6 (2–16 years)	**Reference standard** MCUG: no further details **Time between infection and reference standard** NR **Definition of a positive test result** Graded according to classification of Dwoskin[285] For 2 × 2 analysis any reflux classed as positive	**Test 1:** Colour-flow Doppler sonography: conventional ultrasound and colour-flow Doppler sonography performed using 3.75 and 5-MHz phased array transducers. Patient initially examined by conventional ultrasound. Renal dimensions, parenchymal thickness, scars and parenchymal echo patters were evaluated during sonography examinations while the bladder was empty. Patients were asked to drink water until they had a strong sensation of bladder fullness or to the point of reflex voiding in infants. Patients were examined in supine position. Both ureterovesical junctions and distal ureters were scanned by sagittal and oblique sections one after the other. Patients were asked to urinate and examination repeated to find out whether there was a back-flow into the ureters. Residual volume of the bladder also examined **Time between infection and test 1:** On same day as MCUG **Definition of positive result test 1:** Reflux of urine into the ureter depicted as blue colour jet. Collecting systems examined and compared with prior sonography findings to grade reflux as follows: I: low-grade reflux; II: reflux with lower ureteral filling only, kidney is normal; III: reflux with minor to moderate ureteral and pelvic dilatation; IV: reflux with massive hydronephrosis and hydroureter. For 2 × 2 analysis any reflux classed as positive

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Scherz, 1994[198] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of scarring	**Patient spectrum** Imaging, other **Further details** 51 children presenting with febrile UTI, 24 asymptomatic (presenting with non-febrile UTI or for sibling screening). All children had reflux, demonstrated by MCUG **Recurrent UTI:** NR **Number of patients (number of girls):** 75 (150 kidneys) (53) **Age: mean (range):** NR (3 weeks to 12 years)	**Reference standard** DMSA from a commercial kit, dose determined by body weight (min. 0.3 μCi, max. 3.0 μCi). Imaging 2–6 hours postinjection, posterior and right and left posterior images obtained **Time between infection and reference standard:** >3 months **Definition of a positive test result** DMSA abnormality defined as: reduction in renal function (<43% overall function) and/or decreased or absent uptake of tracer in the renal cortex causing distortion or indentation of the normal renal outline	**Test 1:** Ultrasound: ultrasound, 3-MHz transducers. 14 images per kidney, including longitudinal, transverse and coronal **Time between infection and test 1:** Not clear **Definition of positive result test 1:** Abnormal defined as: changes in parenchymal echogenicity and/or dilation of pelvis; scar, defined as cortical thickening with or without depression of margin; renal size discrepancy (>1 cm) **Test 1:** Symptomatic patients **Test 2:** Asymptomatic patients **Test 3:** All patients
Schneider, 1984[199] **Study design** Prospective cohort **Country** Germany **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of reflux	**Patient spectrum** Mixed, some UTI **Further details** Children presenting for examination of the urinary tract over a 7-month period. Indication for MCUG was: UTI (n = 88), follow-up after surgery or prior pathology (n = 15), malformation syndromes (n = 4), haematuria (n = 2), 'persistent dribbling' (n = 1) **Recurrent UTI:** NR **Number of patients (number of girls):** 110 (219 renal units) (75) **Age: mean (range):** NR (6 days to 14 years)	**Reference standard** MCUG: standard MCUG using fluoroscopy and a spot-film technique. No further details reported **Time between infection and reference standard:** NR **Definition of a positive test result** Reflux graded according to the classification of Heikel and Parkkulainen[300]	**Test 1:** Ultrasound: ultrasound performed with a real-time sector-scanner using a 5-MHz transducer. The bladder was catheterised and completely emptied, and a baseline scan of the kidneys in supine and prone positions measured in transverse and longitudinal sections performed. The bladder was filled with contrast medium Conray FL, and the ureterovesical junction investigated for reflux. Air contrast studies were also conducted: small amounts of air (2–20 cm^3) were injected into the full bladder and the ureter was surveyed for migration of air bubbles associated with reflux **Time between infection and test 1:** NR **Definition of positive result test 1:** Reflux graded according to the classification of Heikel and Parkkulainen.[300] Positive: any grade reflux vs any grade reflux by MCUG **Definition of positive result test 2:** Increased separation in the central renal echo complex vs grade ≥II reflux by MCUG

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Sfakianakis, 1989[201] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** Infants with clinical and bacteriological proof of first UTI **Recurrent UTI:** Initial UTI **Number of patients (number of girls):** 104 (48 ultrasound) (NR) **Age: mean (range):** NR (< 2 years)	**Reference standard** Scintigraphy: ^{99m}Tc-glucoheptonate triple phase (flow, 10 × 2 minutes early and delayed) **Time between infection and reference standard:** NR **Definition of a positive test result** NR	**Test 1:** Ultrasound: NR **Time between infection and test 1:** NR **Definition of positive result test 1:** NR
Siamplis, 1996[202] **Study design** Prospective cohort **Country** Greece **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of reflux	**Patient spectrum** Mixed, some UTI **Further details** First episode of UTI (n = 51), recurrent UTI (n = 19), follow-up after past recurrent UTI (n = 5), follow-up of a familial reflux (n = 6), other disorders of the urinary tract (e.g. malformations or stone) (n = 6), other (n = 3) **Recurrent UTI:** Combination **Number of patients (number of girls):** 90 (180 kidneys) (35) **Age: mean (range):** 2.8 years (2.5 days to 17 years)	**Reference standard** MCUG: standard MCUG with urography, under fluoroscopy including the voiding phase. 2–5 days after ultrasound **Time between infection and reference standard:** NR **Definition of a positive test result** NR	**Test 1:** Ultrasound: fluid-cystorenography. 3.5-MHz sector and 10-MHz linear transducers. Normal saline administered dropwise by catheter (40–200 ml, according to capacity). Sonographic study of the renal collecting system performed during filling **Time between infection and test 1:** NR **Definition of positive result test 1:** NR **Test 2:** Ultrasound: air-cystorenography, conducted 30 minutes after removal of fluid. Air administered by same catheter (70–180 ml according to capacity). Sonographic examination of the renal pelvicalyceal system via a dorsal approach, in sitting position or upright in the arms of parent **Time between infection and test 2:** NR **Definition of positive result test 2:** NR

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Smellie, 1995[203] **Study design** Prospective cohort **Country** England **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of renal scarring and reflux	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children aged <14 years who had at least one bacteriologically proven UTI. 42 primary/secondary referrals and 16 tertiary referrals from other hospitals **Recurrent UTI:** Combination **Number of patients (number of girls):** 58 (46) **Age: median (range):** 3 years (1 month to 13 years)	**Reference standard** Combination: MCUG, IVU and DMSA performed according to standard methods. IVU and MCUG each limited to four films at one of the two hospitals **Time between infection and reference standard:** <12 months **Definition of a positive test result** More than one investigation abnormal. Children in whom DMSA study was initially abnormal but later resolved after treatment were classed as normal for DMSA	**Test 1:** Ultrasound: renal tract ultrasonography **Time between infection and test 1:** <12 months **Definition of positive result test 1:** NR
Smolkin, 2002[204] **Study design** Prospective cohort **Country** Israel **Setting (teaching)** Secondary care (NR) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children admitted to the paediatric department with febrile UTI **Recurrent UTI:** NR **Number of patients (number of girls):** 64 (60 included in analysis) (44) **Age: mean (range):** 16.7 months (2 weeks to 3 years)	**Reference standard** DMSA, no further details **Time between infection and reference standard:** <7 days **Definition of a positive test result** Renal pathology defined as focal or multifocal perfusion defects, or as split renal uptake of <45%. If the first DMSA was abnormal a repeat scan was performed ≥6 months after the initial one. Diagnosis of APN was confirmed only in patients with totally or partially reversible lesions on scintigraphy	**Test 1:** PCT: clotted blood (2 ml) was centrifuged, serum separated and frozen at –70°C before analysis. All patients with high PCT on admission had second PCT determination 72 hours after treatment **Time between infection and test 1:** <3 days **Definition of positive result test 1:** ≥0.5 μg/l **Test 2:** CRP: clotted blood (2 ml) was centrifuged, serum separated and frozen at –70°C before analysis. Performed on admission and 72 hours after treatment. Determined by semi-quantitative immunometric test **Time between infection and test 2:** <3 days **Definition of positive result test 2:** ≥20 mg l^{-1}

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Sreenarasimhaiah, 1995[205] **Study design** Prospective cohort **Country** USA **Setting (teaching)** Secondary care (NR) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** Consecutive series of patients; all children hospitalised with the clinical diagnosis of APN and who required radiological evaluation, over a 9-month period. Indications for radiological investigation published previously[114,302] **Recurrent UTI:** NR **Number of patients (number of girls):** 50 (42) **Age: mean (range):** NR (2 months to 15 years)	**Reference standard** ^{99m}Tc-glucoheptonate renal scintigraphy **Reference standard execution** Performed by injecting tracer intravenously in dose proportional to body surface area, (min. 1.0 μCi, max. 7.0 μCi). Images recorded every 15 seconds for 1–6 minutes. After 2 hours, posterior, right and left posterior oblique images were taken **Time between infection and reference standard:** 48–96 hours **Definition of a positive test result** The criteria for the diagnosis of APN were renal scarring and anatomical and functional abnormalities of the urinary system, published elsewhere.[303–308]	**Test 1:** Ultrasound: standard techniques for renal ultrasound,[114] no further details reported **Time between infection and test 1:** 48–96 hours **Definition of positive result test 1:** published elsewhere.[114,302] Results by renal unit

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Stokland, 1998[209] **Study design** Prospective cohort **Country** Sweden **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Prediction and detection of scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** All children aged 0–6 years who were treated for culture-verified acute first symptomatic UTI over a 2-year period were included in the study. Children aged ≥1 year had to have a body temperature ≥38.5°C during the index UTI, children below this age were included irrespective of body temperature. Children with urinary tract obstruction were excluded. All children were treated immediately with appropriate antibiotics **Recurrent UTI:** Initial UTI **Number of patients (number of girls):** 157 (314 renal units) (72) **Age: median (range):** 0.4 years (5 days to 5 years)	**Reference standard** DMSA: performed approximately 4 hours after injection of 0.5 MBq kg^{-1} body weight ^{99m}Tc-DMSA (minimum 10 MBq), posterior view with 250,000 counts acquired on a gamma camera with a general purpose collimator **Time between infection and reference standard:** 1.1 (range 0.5–2.5 years) **Definition of a positive test result** Focal or generalised uptake defect with or without indentation of the renal contour considered abnormal. Split renal function was calculated based on background subtracted kidney uptake. Split renal function <45% considered abnormal irrespective of any uptake defects at visual examination. Each kidney classified as normal, equivocal or abnormal. Equivocal classed as normal	**Test 1:** DMSA: as for reference standard **Time between infection and test 1:** Median 13 days (range 1–66 days) **Definition of positive result test 1:** As for reference standard **Test 2:** MCUG: no details **Time between infection and test 3:** No details **Definition of positive result test 3:** Reflux graded according to international recommendations[284] **Test 3:** Urography: initial urography **Time between infection and test 4:** NR **Definition of positive result test 4:** Renal damage defined as reduction of parenchymal thickness with or without calyceal deformation. In the presence of caliceal deformation, parenchymal thickness below 2 SD was considered abnormal. In the absence of calyceal deformation parenchymal thickness below 2.5 SD was considered abnormal. The parenchymal damage was classified according to a three-grade scale like that used for DMSA. Equivocal classed as normal **Test 4:** Urography: follow-up urography **Time between infection and test 6:** Within mean 1 day (range 1 day to 1.2 years) of follow-up DMSA **Definition of positive result test 6:** As for test 4

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Stokland, 1996[207] **Study design** Prospective cohort **Country** Sweden **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Prediction of scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** All children aged 0–6 years who were treated for culture-verified acute first symptomatic UTI over a 2-year period were included in the study. Children aged ≥ 1 year had to have a body temperature ≥38.5°C during the index UTI, children below this age were included irrespective of body temperature. Children with urinary tract obstruction were excluded. All children were treated immediately with appropriate antibiotics. Children who were not followed up for 1 year or who did not receive a follow-up DMSA scan were excluded **Recurrent UTI:** Initial UTI **Number of patients (number of girls):** 157 (72) **Age: median (range):** 0.4 years (5 days to 5.8 years)	**Reference standard** DMSA: performed approximately 4 hours after injection of 0.5 MBq kg^{-1} body weight ^{99m}Tc-DMSA (minimum 10 MBq), posterior view with 250,000 counts acquired on a gamma camera with a general purpose collimator **Time between infection and reference standard:** 1.1 (range 0.5–2.5 years) **Definition of a positive test result** Focal or generalised uptake defect with or without indentation of the renal contour considered abnormal. Split renal function was calculated based on background subtracted kidney uptake. Split renal function below 45% considered abnormal irrespective of any uptake defects at visual examination. Each kidney classified as normal, equivocal or abnormal. Equivocal classed as normal	**Test 1:** CRP: highest values used for analyses **Time between infection and test 1:** Determined at the index UTI **Definition of positive result test 1:** >20 mg l^{-1} **Test 2:** Body temperature **Time between infection and test 2:** Determined at index UTI, highest values used for analyses **Definition of positive result test 2:** ≥ 38.5°C **Test 3:** MCUG: no details **Time between infection and test 3:** 18 days (range 1–123 days) **Definition of positive result test 3:** Reflux graded 1–5 according to international recommendations[284]

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Stokland, 1994[206] **Study design** Prospective cohort **Country** Sweden **Setting (teaching)** Secondary care (NR) **Aim of imaging** Detection of scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children recently examined with urography because of UTI **Recurrent UTI:** NR **Number of patients (number of girls):** 25 (240 kidney examinations) (NR) **Age: median (range):** 6.5 years (2–16 years)	**Reference standard** Urography: no further details **Time between infection and reference standard:** NR **Definition of a positive test result** Equivocal findings were excluded. Abnormal defined as calyceal deformation plus parenchymal reduction. Classified by three radiologists	**Test:** Ultrasound: 3–7.5-MHz sector, vector, linear or convex transducers. Kidneys classified as normal, probably normal, uncertain, probably abnormal or abnormal **Time between infection and test:** NR **Tests 1–4:** Focal renal scarring used as the diagnostic criteria **Definition of positive result test 1:** Positive: abnormal **Definition of positive result test 2:** Positive: abnormal or probably abnormal **Definition of positive result test 3:** Positive: abnormal or probably abnormal, or uncertain **Definition of positive result test 4:** Positive: abnormal or probably abnormal, or uncertain, or probably normal **Tests 5–8:** Focal renal scarring and/or reduced renal size used as the diagnostic criteria **Definition of positive result test 5:** Positive: abnormal **Definition of positive result test 6:** Positive: abnormal or probably abnormal **Definition of positive result test 7:** Positive: abnormal or probably abnormal, or uncertain **Definition of positive result test 8:** Positive: abnormal or probably abnormal, or uncertain, or probably normal

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Stokland, 1996[208] **Study design** Prospective cohort **Country** Sweden **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children aged <6 years presenting with their first recognised bacteriologically proven symptomatic UTI were included. In the age group 1–6 years a body temperature of ≥38.5°C was required, children aged <1 year included regardless of temperature. No patient had recurrent infection before DMSA was performed **Recurrent UTI:** Initial UTI **Number of patients (number of girls):** 186 (175 included in analysis) (78) **Age: median (range):** 0.9 years (10 days to 5 years)	**Reference standard** DMSA: performed 4 hours after i.v. injection of 0.5 MBq kg^{-1} of ^{99m}Tc-DMSA. Posterior view acquired using gamma camera **Time between infection and reference standard:** 1–66 days **Definition of a positive test result** Localised or generalised uptake defects with or without indentation in the renal contour were regarded as abnormal. Relative renal function calculated based on background subtracted kidney uptake. A split renal side distribution <45% considered abnormal irrespective of any uptake defects at visual evaluation. All defects classified as normal, equivocal or abnormal. Equivocal cases analysed as negative	**Test 1:** Urography: no details; results by kidneys **Time between infection and test 1:** NR **Definition of positive result test 1:** Renal damage defined as a reduction in parenchymal thickness with or without calyceal deformation. In the presence of calyceal deformation a parenchymal thickness below 2 SD was considered abnormal. In the absence of calyceal deformity a parenchymal thickness below 2.5 SD was considered abnormal. The parenchymal damage was classified according to a three-graded scale like that used for DMSA **Test 2:** MCUG: no details **Time between infection and test 3:** No details **Definition of positive result test 3:** Graded according to International recommendations[284] **Test 3:** CRP: no details **Time between infection and test 4:** On admission **Definition of positive result test 4:** >20 mg l^{-1}
Tan, 1988[210] **Study design** Prospective cohort **Country** Singapore **Setting (teaching)** Secondary care (NR) **Aim of imaging** Detection of reflux	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children referred by paediatrics department with confirmed (n = 66) or strongly suspected (n = 34) UTI **Recurrent UTI:** NR **Number of patients (number of girls):** 100 (55 MCUG) (67) **Age: mean (range):** 1.76 years (0–11 years)	**Reference standard** MCUG: by infusing dilute contrast into the bladder by catheter. Under fluoroscopic screening reflux looked for in both ureters before, during and after micturition **Time between infection and reference standard:** NR **Definition of a positive test result** Reflux classified on the Smellie scale, grades I–IV	**Test 1:** Ultrasound: first examination carried out. Real-time sector scanning with 3.5 or 5-MHz transducer. Supine oblique and prone scans obtained in both longitudinal and transverse planes. Younger children were sedated **Time between infection and test 1:** NR (first investigation carried out) **Definition of positive result test 1:** NR

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Traisman, 1986[211] **Study design** Retrospective cohort **Country** USA **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children who had undergone scintigraphy, over a 2-year period, for the evaluation of possible UTI **Recurrent UTI:** NR **Number of patients (number of girls):** 55 (39 included) (31) **Age: median (range):** 3 years 11 months (3 days to 19 years)	**Reference standard** Clinical and laboratory findings: children classified as APN, cystitis or no UTI on clinical grounds. **Time between infection and reference standard:** On admission **Definition of a positive test result** *Pyelonephritis*: temperature $\geq 38°C$, costovertebral angle tenderness, chills, urine culture $\geq 10^5$ cfu ml^{-1}, ESR >25 mm h^{-1} *Cystitis*: temperature $<38°C$, dysuria, frequency, urine culture $\geq 10^5$ cfu ml^{-1}, ESR <25 mm h^{-1} *No UTI*: temperature $\leq 38.5°C$, no costovertebral angle tenderness, no chills, no dysuria, no frequency, urine culture $<10^5$ cfu ml^{-1} Positive: clinical evidence of APN	**Test 1:** Scintigraphy: studies performed using a dual-isotope method. Angiographic and cortical images were derived using ^{99m}Tc-glucoheptonate and functional measures with ^{131}I-*o*-hippurate. Initial and early 5-minutes static images using ^{99m}Tc-glucoheptonate (100 Ci lb^{-1}). Delayed images at 1.5–2.5 hours. Posterior and posterior oblique views of each kidney recorded **Time between infection and test 1:** Usually <1 week **Definition of positive result test 1:** NR **Test 2:** Ultrasound: using a 3.5 or 5-MHz transducer **Time between infection and test 2:** Usually <1 week **Definition of positive result test 2:** NR **Test 3:** IVP: injection of 2 ml kg^{-1} Renographin 60. Imaging sequences: preliminary AP radiograph, AP radiograph at 1 minute, AP and both oblique radiographs of the abdomen at 10 minutes. Tomograms or delayed radiographs, as determined by the radiologist **Time between infection and test 3:** NR **Definition of positive result test 3:** NR **Test 4:** Cystography: no details reported **Time between infection and test 4:** NR **Definition of positive result test 4:** NR

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Trave, 1997[212] **Study design** Prospective cohort **Country** Spain **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of scarring and reflux	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children with a diagnosis of APN. Patients were studied by means of clinical and laboratory assessments in addition to the imaging methods discussed below **Recurrent UTI:** Initial UTI **Number of patients (number of girls):** 33 (19) **Age: mean (range):** 4 years (0.2–12.3 years)	**Reference standard** DMSA: performed 3–4 hours after administration of i.v. 25–74 MBq of ^{99m}Tc-DMSA. Images were taken in the anterior, posterior and oblique posteriors (left and right) planes **Time between infection and reference standard:** Mean 3.9 days after admission **Definition of a positive test result** Scans were considered abnormal when kidney function was <45% and/or there was visualisation of areas of decreased uptake **Reference standard 2** MCUG: no further details **Time between infection and test 4:** 3–4 weeks after infection **Definition of positive result test 4** NR	***Compared with DMSA for detection of scarring*** **Test 1:** Ultrasound: renal ultrasound, no details **Time between infection and test 1:** Mean 2.6 days following recruitment **Definition of positive result test 1:** No details ***Compared with MCUG for diagnosing reflux*** **Test 2:** Ultrasound: no details **Time between infection and test 2:** As above **Definition of positive result test 2:** No details **Test 3:** DMSA: as for reference standard **Time between infection and test 3:** As for reference standard **Definition of positive result test 3:** As for reference standard

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Valentini, 2001[213] **Study design** Prospective cohort **Country** Italy **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of reflux	**Patient spectrum** Mixed, some UTI **Further details** Consecutive patients admitted because of recurrent UTI, a history of reflux, or myelomeningocele spina bifida **Recurrent UTI:** Recurrent UTI **Number of patients (number of girls):** 74 (60 patients and 118 kidneys included in the analysis) (NR) **Age: mean (range):** 5 years (3 weeks to 16 years)	**Reference standard** MCUG: conventional MCUG was performed using a standardised technique. An ionic, water-soluble contrast agent (36% iodamine, Uromiro) was introduced, bladder volume was kept comparable to that used in ultrasound examinations. Examination of the voiding phase was attempted by removing the catheter, but was not always successful. Radiographs were taken during the filling and voiding phases **Time between infection and reference standard:** NR **Definition of a positive test result** Reflux was graded in accordance with the international system[284]	**Test 1:** Ultrasound: contrast-enhanced ultrasound performed using a 3.75-MHz convex-array transducer. The bladder was filled to its estimated capacity with saline, by catheter. The bladder, ureteral orifices and both kidneys were evaluated using conventional grey-scale sonography. Levovist was introduced through the catheter (300 mg ml^{-1}, to 8% of bladder volume), and the bladder and ureteral orifices were reevaluated by axial and oblique scans with the patient in the supine position. Both kidneys were re-examined in two orthogonal planes. The voiding phase was attempted with the catheter in place, but was not always achieved **Time between infection and test 1:** Immediately before MCUG **Test 2:** Ultrasound: Doppler sonography, using a 4-kHz pulse repetition frequency, with colour filters and colour gain adjusted to optimise imaging. Contrast-enhanced ultrasound performed as test 1 **Time between infection and test 2:** Immediately before MCUG **Definition of positive result tests 1 and 2:** The diagnostic criterion for reflux was the presence of microbubbles in the collecting system appearing as hyperechoic dots on grey-scale sonograms. Reflux was graded as follows: grade I: hyperechoic dots in the ureter above the ureteral orifice grade II: hyperechoic dots extending up to the renal pelvis without ureteral dilatation grade III: hyperechoic dots extending up to the renal pelvis and calices (non-dilated) with dilatation of the ureter grade IV: hyperechoic dots in mildly dilated ureter, pelvis and calyces grade V: hyperechoic dots in markedly dilated ureter, calyces and pelvis

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Verber, 1988[214] **Study design** Prospective cohort **Country** UK **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of reflux or renal scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children aged <5 years with symptomatic confirmed UTI **Recurrent UTI:** NR **Number of patients (number of girls):** 115 (80) **Age: mean (range):** 1.7 years (<5 years)	**Reference standard** MCUG or IVU: MCUG: performed after catheterisation. Hypaque fed into the bladder by gravity. Bladder screened intermittently during filling, catheter removed before continuous screening during micturition IVU: Performed after laxative the previous evening and restricted fluid for 5–8 hours pre-examination (dependent on age). Examinations comprised: a full-length control film, films of the renal area at 5–10 minutes after injection of 20–40 ml Hypaque or Niopam, full-length films before and after micturition **Time between infection and reference standard:** NR **Definition of a positive test result** MCUG: reflux recorded on a scale of 1–3 (grade 1: confined to the ureter; grade 2: reaching the renal calyces without distension; grade 3: with distension) IVU: renal scarring and renal size were recognised by the criteria of Hodson;[309] significant dilatation of the collecting system or the ureter on the postmicturition film and other features associated with reflux, such as dilatation of the renal pelvis, were recorded	***Compared with MCUG*** **Test 1:** Scintigraphy: DMSA scans performed 2–3 hours after i.v. injection of 2 MBq kg^{-1} ^{99m}Tc-DMSA (min. 20 MBq, max. 160 MBq). Images acquired in posterior and both posterior oblique projections, with the patient supine, using a gamma camera (n = 130 kidneys) **Time between infection and test 1:** NR **Definition of positive result test 1:** Defects reported if there was a clear interruption in the renal outline on any projection. Relative renal uptake outside the range of 45–55% was considered abnormal. Discrepancies in renal size were noted **Test 2:** IVU: as for reference standard **Time between infection and test 2:** NR **Definition of positive result test 2:** As for reference standard **Test 3:** Ultrasound: renal ultrasound in the anterior and posterior sagittal and transverse planes using a 5-MHz transducer and a static or real-time (coronal planes also included) scanner (n = 62 kidneys) **Time between infection and test 3:** NR **Definition of positive result test 3:** Transverse scans of the full bladder were used to visualise any ureteral dilatation. Renal length was measured and any focal cortical abnormality recorded. Separation of the renal sinus echoes by >0.5 cm was recorded as a dilated upper tract ***Compared with IVU*** **Test 4:** As for test 1 (n = 92 kidneys) **Time between infection and test 4:** NR **Definition of positive result test 4:** As for test 1

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Verboven, 1990[215] **Study design** Prospective cohort **Country** Belgium **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Localisation of UTI	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children admitted to a hospital with symptomatic UTI. Symptoms included fever, chills, anorexia, nausea, weight loss, dysuria, enuresis, abdominal pain and low back pain **Recurrent UTI:** NR **Number of patients (number of girls):** 24 (18) **Age: mean (range):** 4 years (3 weeks to 12 years)	**Reference standard** Clinical: patients classified according to clinical criteria of Pylkkanen:[310] fever, ESR, serum level of CRP and renal concentrating capacity **Time between infection and reference standard:** At presentation **Definition of a positive test result** Refer to Pylkkanen;[310] no further details	**Test 1:** DMSA: performed 2 hours after injection of dose of ^{99m}Tc-DMSA adjusted for the child's height and weight. One posterior and two posterior oblique images of 300 counts were obtained. When necessary SPECT was performed immediately after the planar imaging **Time between infection and test 1:** During acute infection **Definition of positive result test 1:** No details
Volti, 1991[216] **Study design** Prospective cohort **Country** Italy **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Abnormal urinary tract	**Patient spectrum** Confirmed UTI, further investigation **Further details** Patients with VUR on MCUG were excluded (n = 10) **Recurrent UTI:** NR **Number of patients (number of girls):** 56 (37) **Age: mean (range):** NR (2 months to 12 years)	**Reference standard** IVU: non-ionic contrast medium Iopamidol (dose 1.5–3 ml kg^{-1}). Supine radiographs of kidney and bladder 5–10 minutes after i.v. injection, 4–6 films **Time between infection and reference standard:** 7–10 days after treatment **Definition of a positive test result** NR	**Test 1:** Ultrasound: renal ultrasound using 5 and 3.5-MHz probes. Longitudinal, supine, prone and transverse scans performed. Kidneys evaluated for position, size, morphology and echogenicity. Bladder and degree of distension also observed. **Time between infection and test 1:** 7–10 days after treatment **Definition of positive result test 1:** NR

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Whitear, 1990[217] **Study design** Retrospective cohort **Country** UK **Setting (teaching)** Secondary care (teaching) **Aim of imaging** Detection of scarring	**Patient spectrum** Mixed, some UTI **Further details** Children who received both IVU and DMSA were included. These were a heterogeneous group. The largest diagnostic groups were UTI and reflux (42%), hypertension (8%) and nephritis (6%) **Recurrent UTI:** Other **Number of patients (number of girls):** 205 (388 kidneys) (97) **Age : Mean (range):** NR (3 days to 16 years)	**Reference standard** IVU: majority consisted of a control film, 5-minute renal area and 15-minute full-length film **Time between infection and reference standard:** No details **Definition of a positive test result:** NR	**Test 1:** Scintigraphy: ^{99m}Tc-DMSA scans on gamma camera, posterior and both posterior–oblique projections obtained 6 hours post-injection **Time between infection and test 1:** no details **Definition of positive result test 1:** NR

continued

TABLE 41 *Included studies of tests for the further investigation of confirmed UTI (cont'd)*

Study details	Patient details	Reference standard	Index test
Wujanto, 1987[218] **Study design** Prospective cohort **Country** UK **Setting (teaching)** Secondary care (non-teaching) **Aim of imaging** Detection of scarring	**Patient spectrum** Confirmed UTI, further investigation **Further details** Children referred for radionuclide assessment of renal function and scarring. All had previous IVU, 36 had radiographically demonstrated reflux, 30 had ureteric reimplantation to correct the reflux, and 16 were treated conservatively **Recurrent UTI:** Recurrent UTI **Number of patients (number of girls):** 46 (92 kidneys) (28) **Age: mean (range):** 5.6 years (2 months to 11 years)	**Reference standard 1** IVU: assessment of renal scarring: dose 1 MBq kg^{-1} body weight. After 2–3 hours analogue images were acquired in anterior, posterior and both posterior oblique projections. Relative renal function calculated. Performed previously, no details reported **Time between infection and reference standard:** NR **Definition of a positive test result 1** Judged according to radiologist's report and opinion of referring urologist, no further details. Equivocal classed as normal **Reference standard 2** DMSA: assessment of renal scarring, performed 2 days after hippuran renogram. Dose 1 MBq kg^{-1} body weight. After 2–3 hours analogue images were acquired in anterior, posterior and both posterior oblique projections. Relative renal function calculated **Time between infection and reference standard:** NR **Definition of a positive test result 2** Criteria used for reporting renal scarring were: reduction in kidney size, calyceal dilatation with thinning of cortex, decreased uptake of tracer in the cortex causing distortion or indentation of the normal renal outline. Equivocal classed as normal	***Compared with IVU*** **Test 1:** Renography: Assessment of renal function: 1123 hippuran at a dose of 0.2 MBq kg^{-1} body weight (min. 2.5 MBq). The scan was performed with the patient either sitting in front of or lying supine over a gamma camera. Computerised image acquisition every 20 seconds for at least 20 minutes. Relative renal function calculated **Time between infection and test 1:** NR **Definition of positive result test 1:** Criteria used for reporting renal scarring were: reduction in kidney size, calyceal dilatation with thinning of cortex, decreased uptake of tracer in the cortex causing distortion or indentation of the normal renal outline. Equivocal classed as normal **Test 2:** DMSA: as for reference standard 2 **Time between infection and test 2:** NR **Definition of positive result test 2:** As for reference standard 2 ***Compared with DMSA*** **Test 3:** As for test 1 **Time between infection and test 3:** NR **Definition of positive result test 3:** As for test 1

AP, anterior–posterior; ELISA, enzyme-linked immunosorbent assay; FITC, fluorescein isothiocyanate; IgA, IgG, IgM, immunoglobulin A, G, M; IMLA, ???; 3D, three-dimensional.

Appendix 7

Studies excluded from the review

TABLE 42 *Studies excluded from the review*

Study details	Does the study address diagnosis or further investigation of UTI?	Is it a diagnostic cohort study or an RCT?	Does the study include at least some children aged <5 years?	Minimum 20 participants included?	Data to construct 2 × 2 tables reported?	For studies of diagnosis, does the reference standard include culture?
Aathithan, 2001	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Abbott, 1972	**Other**				**No**	
Abbott, 1978	**Other**				**No**	
Abdou, 1977	**Other**				**No**	
Abdul Mujeeb, 1994	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	Yes	Culture
Abdurrahman, 1992	**Other**				**No**	
Abraham, 1970	**Other**				**No**	
Abraham, 1979	**Other**				**No**	
Abyholm, 1979	**Other**				**No**	
Addor, 1984	**Other**				**No**	
Aggarwal, 1989	**Other**				**No**	
Aggarwal, 1991	**Other**				**No**	
Akdilli, 1999	**Other**				**No**	
Akhundova, 1980	**Other**				**No**	
Akoua-Koffi, 1994	**Other**				**No**	
Aladjem, 1997	**Other**				**No**	
Alam, 1981	**Other**				**No**	
Albert, 1982	**Other**				**No**	
Alexander, 1972	**Other**				**No**	
Allen, 1974	**Other**				**No**	
Almeida, 1993	Further investigation	**Other**	Yes	≥20	**No**	
Almeida, 1994	**Other**				**No**	
Alon, 1988	Further investigation	**Other**	<18	≥20	**No**	
Alon, 1999	**Other**				**No**	
Al-Orifi, 2000	**Other**				**No**	
Altemaier, 1996	**Other**				**No**	
Altman, 1969	**Other**				**No**	
Altman, 1971	**Other**				**No**	
Al Umran, 1994	**Other**				**No**	
Alur, 2000	Further investigation	Diagnostic accuracy	Yes	≥20	**No**	
American Academy of Pediatrics, 1999	**Other**				**No**	
Amir, 1993	**Other**				**No**	
Anders, 1974	**Other**				**No**	
Anderson, 1995	**Other**				**No**	
Andersz, 1966	**Other**				**No**	
Andrich, 1992	**Other**				**No**	
Anonymous, 1968	**Other**				**No**	
Anonymous, 1979	**Other**				**No**	
Anonymous, 1984	**Other**				**No**	
Anonymous, 2000	**Other**				**No**	
Anonymous, 2002	**Other**				**No**	
Ansell, 2002	**Other**				**No**	
Anttila, 1970	**Other**				**No**	
Arap, 1986	**Other**				**No**	
Ariceta Iraola, 1991	**Other**				**No**	
Arrieta, 1994	**Other**				**No**	
Artibani, 1990	**Other**				**No**	
Arya, 2002	**Other**				**No**	

continued

TABLE 42 *Studies excluded from the review (cont'd)*

Study details	Does the study address diagnosis or further investigation of UTI?	Is it a diagnostic cohort study or an RCT?	Does the study include at least some children aged <5 years?	Minimum 20 participants included?	Data to construct 2 × 2 tables reported?	For studies of diagnosis, does the reference standard include culture?
Ascenti, 2000	Further investigation	**Other**	Yes	≥20	**No**	
Asscher, 1970	**Other**				**No**	
Aubert, 1983	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Augusidou-Savopoulou, 1993	**Other**				**No**	
Austin, 1999	**Other**				**No**	
Avni, 1997	**Other**				**No**	
Bacharach, 1982	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	**No**	Culture
Bachelard, 2001	**Other**				**No**	
Bachur, 2001	**Other**				**No**	
Bailey, 1995	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Bakakos, 2002	**Other**				**No**	
Balsamo, 1976	**Other**				**No**	
Balzar, 1991	**Other**				**No**	
Banzo, 1999	**Other**				**No**	
Baraff, 1992	**Other**				**No**	
Barbin, 1978	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Barkemeyer, 1993	**Other**				**No**	
Barta, 1969	**Other**				**No**	
Basso, 1981	**Other**				**No**	
Batinic, 1988	**Other**				**No**	
Batista, 1998	**Other**				**No**	
Beeram, 1991	**Other**				**No**	
Behrendt, 1985	**Other**				**No**	
Belli, 1996	Further investigation	**Other**	<18	≥20	**No**	
Benador, 1998	**Other**				**No**	
Ben-Ami, 1984	**Other**				**No**	
Ben-Ami, 1989	Further investigation	**Other**	Yes	≥20	**No**	
Bendall, 1994	**Other**				**No**	
Bengtsson, 1970	**Other**				**No**	
Benigno, 1990	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Benitz, 1998	**Other**				**No**	
Bensman, 1978	UTI diagnosis	**Other**	Yes	≥20	**No**	
Bensman, 1993	**Other**				**No**	
Bensman, 2002	**Other**				**No**	
Berg, 1971	**Other**				**No**	
Bergman, 1999	**Other**				**No**	
Bergstrom, 1972	**Other**				**No**	
Bergstrom, 1973	**Other**				**No**	
Berro, 2000	Further investigation	Diagnostic accuracy	**None <5**	≥20	Yes	
Bhatnagar, 2002	Further investigation	**Other**	Yes	≥20	**No**	
Biasini, 1974	UTI diagnosis	Diagnostic accuracy	Yes	≥20	**No**	Culture
Bixler-Forell, 1985	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Biggi, 2001	**Other**				**No**	
Bjerklund Johansen, 2002	**Other**				**No**	
Bjorgvinsson, 1991	Further investigation	**Other**	<12	≥20	**No**	
Blane, 1993	Further investigation	**Other**	**None <5**	≥20	**No**	
Bleeker, 2001	**Other**				**No**	
Blickman, 1984	**Other**				**No**	
Blickman, 1985	Further investigation	**Other**	Yes	≥20	**No**	
Blickman, 1991	**Other**				**No**	
Bliznakova, 1998	**Other**				**No**	
Block, 1986	**Other**				**No**	
Blondeau, 1995	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Bodaghi, 1978	**Other**				**No**	

continued

TABLE 42 *Studies excluded from the review (cont'd)*

Study details	Does the study address diagnosis or further investigation of UTI?	Is it a diagnostic cohort study or an RCT?	Does the study include at least some children aged <5 years?	Minimum 20 participants included?	Data to construct 2 × 2 tables reported?	For studies of diagnosis, does the reference standard include culture?
Bonadio, 1987	**Other**				**No**	
Bonadio, 1990	**Other**				**No**	
Bonadio, 1991	**Other**				**No**	
Bonadio, 1991	**Other**				**No**	
Bonadio, 1992	**Other**				**No**	
Bonadio, 1993	**Other**				**No**	
Bonadio, 1993	**Other**				**No**	
Borrelli, 1983	**Other**				**No**	
Bos, 1975	**Other**				**No**	
Bosio, 1998	**Other**				**No**	
Bosio, 2002	**Other**				**No**	
Boudailliez, 1989	Further investigation	Diagnostic accuracy	**None <5**	≥20	Yes	
Boudry, 1970	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Bouissou, 1988	**Other**				**No**	
Bouissou, 1994	Further investigation	**Other**	<18	≥20	**No**	
Braae, 1971	**Other**				**No**	
Bradley, 1971	**Other**				**No**	
Brendstrup, 1983	Further investigation	Diagnostic accuracy	**None <5**	≥20	Yes	
Breunung, 1969	**Other**				**No**	
Breunung, 1970	**Other**				**No**	
Breunung, 1971	UTI diagnosis	Diagnostic accuracy	<18	≥20	**No**	Culture
Breunung, 1973	**Other**				**No**	
Bridji, 1999	Further investigation	Diagnostic accuracy	<18	≥20	**No**	
Brindle, 1990	**Other**				**No**	
Brindle, 1994	**Other**				**No**	
Brock, 1977	Further investigation	Diagnostic accuracy	**None <5**	≥20	Yes	
Broderick, 1995	**Other**				**No**	
Broner, 1990	**Other**				**No**	
Brook, 1981	**Other**				**No**	
Brouhard, 1997	**Other**				**No**	
Bruna, 1997	**Other**				**No**	
Brundtland, 1973	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Bruns, 1969	**Other**				**No**	
Buchanan, 1971	**Other**				**No**	
Buchanec, 1974	**Other**				**No**	
Buchino, 1988	**Other**				**No**	
Bueschen, 1974	Further investigation	Diagnostic accuracy	**None <5**	≥20	Yes	
Buffatti, 1977	**Other**				**No**	
Buiuc, 1980	**Other**				**No**	
Burko, 1970	**Other**				**No**	
Busch, 1984	**Other**				**No**	
Busch, 1985	**Other**				**No**	
Busch, 1985	**Other**				**No**	
Buys, 1994	**Other**				**No**	
Cakar, 1998	Further investigation	Diagnostic accuracy	**None <5**	≥20	Yes	
Calado, 2002	**Other**				**No**	
Calver, 1988	**Other**				**No**	
Campos, 1996	**Other**				**No**	
Canarelli, 1979	Further investigation	Diagnostic accuracy	**None <5**	**<20**	**No**	
Cannon, 1986	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Capdevila Cogul, 2001	**Other**				**No**	
Cardiff–Oxford Bacteriuria Study Group, 1978	**Other**				**No**	
Castellanos, 1985	UTI diagnosis	**Other**	<18	**<20**	**No**	Culture
Cejkova, 1979	**Other**				**No**	
Chapman, 1988	**Other**				**No**	

continued

TABLE 42 *Studies excluded from the review (cont'd)*

Study details	Does the study address diagnosis or further investigation of UTI?	Is it a diagnostic cohort study or an RCT?	Does the study include at least some children aged <5 years?	Minimum 20 participants included?	Data to construct 2 × 2 tables reported?	For studies of diagnosis, does the reference standard include culture?
Chatys-Gorska, 1973	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Chatys-Gorska, 1974	**Other**				**No**	
Cheskis, 1972	**Other**				**No**	
Cheskis, 1973	**Other**				**No**	
Chiou, 2001	Further investigation	Diagnostic accuracy	Yes	≥20	**No**	
Chiou, 2001	Further investigation	Diagnostic accuracy	Yes	≥20	**No**	
Cho, 1998	**Other**				**No**	
Christen, 1974	**Other**				**No**	
Christian, 1998	**Other**				**No**	
Christophe, 1983	**Other**				**No**	
Chu, 2002	**Other**				**No**	
Chuang, 1989	**Other**				**No**	
Cielak-Puchalska, 2000	**Other**				**No**	
Cigna, 1992	**Other**				**No**	
Cohen, 1972	**Other**				**No**	
Conn, 1970	**Other**				**No**	
Conway, 1972	**Other**				**No**	
Cook, 1995	Further investigation	**Other**	**None <5**	≥20	**No**	
Cooper, 1993	Further investigation	Diagnostic accuracy	<18	≥20	**No**	
Corman, 1982	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Corso, 1989	Further investigation	Diagnostic accuracy	**None <5**	≥20	Yes	
Coulthard, 1999	**Other**				**No**	
Coulthard, 2001	**Other**				**No**	
Courteau, 1980	**Other**				**No**	
Craig, 1997	**Other**				**No**	
Craig, 1998	**Other**				**No**	
Craig, 1999	**Other**				**No**	
Craig, 2000	**Other**				**No**	
Cruickshank, 1967	**Other**				**No**	
Cusins, 1973	UTI diagnosis	**Other**	Yes	≥20	**No**	Culture
Cuzzolin, 2001	**Other**				**No**	
Dacher, 1993	**Other**				**No**	
Dajani, 1980	**Other**				**No**	
Daly, 1986	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	**No**	Culture
Darge, 1996	Further investigation	Diagnostic accuracy	<12	**<20**	Yes	
Darge, 1997	**Other**				**No**	
Darge, 1999	**Other**				**No**	
Darge, 2001	**Other**				**No**	
Darge, 2001	**Other**				**No**	
Darge, 2002	**Other**				**No**	
Darge, 2002	**Other**				**No**	
Daschner, 1976	**Other**				**No**	
Daschner, 1976	**Other**				**No**	
Daschner, 1977	Further investigation	Diagnostic accuracy	**None <5**	≥20	Yes	
Davey, 1997	Further investigation	Diagnostic accuracy	<12	≥20	**No**	
David, 1998	**Other**				**No**	
de Man, 1991	**Other**				**No**	
Deffrenne, 1979	**Other**				**No**	
Deflandre, 1987	Further investigation	**Other**	<18	≥20	**No**	
Denis, 1978	**Other**				**No**	
Dennis, 1979	Further investigation	Diagnostic accuracy	**None <5**	≥20	Yes	
Desnottes, 1978	**Other**				**No**	
Díaz Alvarez, 1998	**Other**				**No**	
Dick, 1996	**Other**				**No**	
Dikshit, 1993	Further investigation	Diagnostic accuracy	**Other**	≥20	Yes	
Dillon, 1984	**Other**				**No**	

continued

TABLE 42 *Studies excluded from the review (cont'd)*

Study details	Does the study address diagnosis or further investigation of UTI?	Is it a diagnostic cohort study or an RCT?	Does the study include at least some children aged <5 years?	Minimum 20 participants included?	Data to construct 2 × 2 tables reported?	For studies of diagnosis, does the reference standard include culture?
Dinkel, 1986	Further investigation	**Other**			**No**	
Ditchfield, 1993	**Other**				**No**	
Ditchfield, 1995	**Other**				**No**	
Ditchfield, 1998	Further investigation	**Other**	<18	≥20	**No**	
Dittrich, 1986	**Other**				**No**	
Djojohadipringgo, 1976	**Other**				**No**	
Dodge, 1969	**Other**				**No**	
Dodge, 1971	**Other**				**No**	
Dolezel, 2000	Further investigation	Diagnostic accuracy	**None <5**	≥20	Yes	
Domic, 1991	**Other**				**No**	
Dosa, 1972	**Other**				**No**	
Downs, 1999	UTI diagnosis	SR	**Other**	≥20	Yes	Culture
Dubnickova, 1970	**Other**				**No**	
Dudley, 1996	**Other**				**No**	
Durbin, 1993	**Other**				**No**	
Eckstein, 1966	**Other**				**No**	
Edwards, 1975	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Edwards, 1997	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	Yes	Culture + microscopy
Eggert, 1971	**Other**				**No**	
Eggli, 1992	Further investigation	Diagnostic accuracy	<18	**<20**	Yes	
Eichenwald, 1986	**Other**				**No**	
El-Hatw, 1999	**Other**				**No**	
Eliakim, 1997	UTI diagnosis	**Other**			**No**	
El-Ridi, 1986	**Other**				**No**	
Endsjo, 1967	**Other**				**No**	
Enerback, 1987	**Other**				**No**	
Erasmie, 1989	**Other**				**No**	
Ergenekon, 2000	**Other**				**No**	
Ericsson, 1971	**Other**				**No**	
Espinosa, 1991	**Other**				**No**	
Everaert, 1998	**Other**				**No**	
Eyrick, 1969	**Other**				**No**	
Falcao, 1999	**Other**				**No**	
Farhat, 2002	**Other**				**No**	
Farkas, 1969	**Other**				**No**	
Fass, 1973	**Other**				**No**	
Faunce, 1992	**Other**				**No**	
Fennell, 1976	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Fernbach, 1989	**Other**				**No**	
Ferrario, 1970	UTI diagnosis	**Other**	**None <5**		**No**	
Ferrera, 1997	**Other**				**No**	
Fettich, 1989	**Other**				**No**	
Fettich, 1992	**Other**				**No**	
Fischman, 1982	Further investigation	**Other**	**Other**		**No**	
Fletcher, 1975	**Other**				**No**	
Fletcher, 1980	**Other**				**No**	
Fliedner, 1986	**Other**				**No**	
Fliegel, 1983	**Other**				**No**	
Fowlis, 1994	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	Yes	Culture
Foxman, 2002	**Background**				**No**	
Franczak, 1968	**Other**				**No**	
Franz, 1999	**Background**				**No**	
Frauscher, 1999	**Other**				**No**	
Freitag, 1973	**Other**				**No**	
Fuchs, 1969	**Other**				**No**	

continued

TABLE 42 *Studies excluded from the review (cont'd)*

Study details	Does the study address diagnosis or further investigation of UTI?	Is it a diagnostic cohort study or an RCT?	Does the study include at least some children aged <5 years?	Minimum 20 participants included?	Data to construct 2 × 2 tables reported?	For studies of diagnosis, does the reference standard include culture?
Furness, 1999	**Other**				**No**	
Gacinovic, 1996	Further investigation	**Other**			**No**	
Ganapathy, 1997	**Other**				**No**	
Garcia, 1997	UTI diagnosis	**Case–control**	<18	≥20	Yes	Culture
García Cañete, 2001	**Other**				**No**	
Garcia, 2002	UTI diagnosis	**Other**	<5 only	≥20	**No**	Culture
Garcia Munoz, 1996	**Other**				**No**	
Gazal, 1989	**Other**				**No**	
Gbadegesin, 2002	**Other**				**No**	
Gelfand, 1999	**Other**				**No**	
Gelfand, 2000	**Background**				**No**	
Genster, 1972	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Gentelet, 2001	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	Yes	Culture
Giddens, 1998	**Other**				**No**	
Gil Salom, 1989	**Other**				**No**	
Gillenwater, 1975	**Other**				**No**	
Gillenwater, 1975	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Gillenwater, 1976	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Ginevri, 1992	**Other**				**No**	
Ginocchi, 1968	**Other**				**No**	
Girardet, 1970	Further investigation	Diagnostic accuracy	**None <5**	**<20**	**No**	
Girardet, 1970	**Other**				**No**	
Girardet, 1971	**Other**				**No**	
Girardet, 1980	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Glazier, 1997	**Other**				**No**	
Gleason, 1974	**Other**				**No**	
Gleeson, 1991	**Other**				**No**	
Glezerov, 1975	**Other**				**No**	
Godard, 1977	**Other**				**No**	
Goldman, 2000	**Other**				**No**	
Goldraich, 1989	**Other**				**No**	
Goldsmith, 1990	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Golebiowska, 1977	**Other**				**No**	
Goosens, 1985	UTI diagnosis	Diagnostic accuracy	<5 only	≥20	**No**	**Other**
Gordon, 1986	**Other**				**No**	
Gorelick, 1999	UTI diagnosis	SR	**Other**	≥20	Yes	Culture
Goszczyk, 2000	**Other**				**No**	
Graborn, 1968	**Other**				**No**	
Granados, 1998	**Other**				**No**	
Grechi, 1980	**Other**				**No**	
Grechi, 1980	**Other**				**No**	
Grechi, 1989	**Other**				**No**	
Grisaru-Soen, 2000	**Other**				**No**	
Grob, 1978	**Other**				**No**	
Groshar, 1989	**Other**				**No**	
Grunberg, 1991	**Other**				**No**	
Guareschi, 1976	**Other**				**No**	
Guidoni, 1995	**Other**				**No**	
Gupta, 1993	**Other**				**No**	
Gutierrez, 1974	**Other**				**No**	
Haahr, 1971	UTI diagnosis	**Other**	**Other**	≥20	**No**	Culture
Haahr, 1971	**Other**				**No**	
Hachey, 1992	**Other**				**No**	
Hallett, 1974	UTI diagnosis	Diagnostic accuracy	**Not clear**	≥20	**No**	Culture
Hamburger, 1986	**Other**				**No**	
Hamoudi, 1986	UTI diagnosis	Diagnostic accuracy	**Not clear**	≥20	Yes	Microscopy

continued

TABLE 42 *Studies excluded from the review (cont'd)*

Study details	Does the study address diagnosis or further investigation of UTI?	Is it a diagnostic cohort study or an RCT?	Does the study include at least some children aged <5 years?	Minimum 20 participants included?	Data to construct 2 × 2 tables reported?	For studies of diagnosis, does the reference standard include culture?
Hanbury, 1990	Further investigation	Diagnostic accuracy	**Other**	≥20	Yes	
Hansen, 1995	Further investigation	**Other**	<18	≥20	**No**	
Hansen, 1996	Further investigation	**Other**	<18	≥20	**No**	
Hansson, 1997	**Other**				**No**	
Hansson, 1998	**Other**				**No**	
Hansson, 1999	**Other**				**No**	
Haran, 1967	**Other**				**No**	
Haraoka, 1996	**Other**				**No**	
Hassan, 1998	UTI diagnosis	Diagnostic accuracy	**Other**		**No**	
Hawatmeh, 1980	**Other**				**No**	
Haycock, 1986	**Background**				**No**	
Haycock, 1991	**Other**				**No**	
Hayden, 1986	**Other**				**No**	
Haznedaroglu, 1996	**Other**				**No**	
Heldrich, 1992	Further investigation	Diagnostic accuracy	**Other**	≥20	Yes	
Heldrich, 2000	**Other**				**No**	
Hellerstein, 1981	**Other**				**No**	
Hellerstein, 1982	**Other**				**No**	
Hellerstein, 1984	**Other**				**No**	
Hellerstein, 1988	**Other**				**No**	
Hellerstein, 1992	UTI diagnosis	Diagnostic accuracy	<18	≥20	**No**	Culture
Helwig, 1978	**Other**				**No**	
Hernandez Aguado, 2001	**Other**				**No**	
Herr, 2001	**Other**				**No**	
Herrera Labarca, 1995	**Other**				**No**	
Herrera Labarca, 1997	**Other**				**No**	
Hertz, 1970	**Other**				**No**	
Hervas, 2001	**Other**				**No**	
Hesse, 1991	**Other**				**No**	
Hida, 1995	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	Yes	Culture
Hilderbrand, 1981	**Other**				**No**	
Hiraga, 1985	**Other**				**No**	
Hiraoka, 1994	UTI diagnosis	Diagnostic accuracy	<18	≥20	Yes	Microscopy
Hiraoka, 1994	**Other**				**No**	
Hiraoka, 1996	Further investigation	Diagnostic accuracy	<5 only	≥20	**No**	
Hiraoka, 1997	Further investigation	**Other**	<12	**<20**	**No**	
Hiraoka, 1999	**Other**				**No**	
Hjalmas, 1967	**Other**				**No**	
Hobday, 1966	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Hoberman, 1993	UTI diagnosis	Diagnostic accuracy	<5 only	≥20	**No**	
Hodson, 1966	**Other**				**No**	
Hoebeke, 1996	**Other**				**No**	
Hofmann, 1985	Further investigation	**Other**	<18	≥20	**No**	
Hogg, 1987	**Other**				**No**	
Hole, 1975	**Other**				**No**	
Holemans, 1994	**Other**				**No**	
Holland, 1969	**Other**				**No**	
Holland, 1995	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	Yes	Culture
Holloway, 1982	**Other**				**No**	
Holt, 1983	**Other**				**No**	
Holy, 1971	**Other**				**No**	
Honkinen, 1986	Further investigation	Diagnostic accuracy	**None <5**	≥20	Yes	
Honkinen, 1999	**Other**				**No**	
Houston, 1969	**Other**				**No**	
Houston, 1969	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	**No**	Culture
Howman-Giles, 1998	**Other**				**No**	

continued

TABLE 42 *Studies excluded from the review (cont'd)*

Study details	Does the study address diagnosis or further investigation of UTI?	Is it a diagnostic cohort study or an RCT?	Does the study include at least some children aged <5 years?	Minimum 20 participants included?	Data to construct 2 × 2 tables reported?	For studies of diagnosis, does the reference standard include culture?
Huang, 1992	Further investigation	**Other**	**Not clear**	≥20	**No**	
Huicho, 2002	UTI diagnosis	SR	**Other**	≥20	Yes	Culture
Huland, 1984	**Other**				**No**	
Hulbert, 1973	**Other**				**No**	
Hurlbut, 1991	UTI diagnosis	SR	**Other**	≥20	**No**	Culture
Huttunen, 1970	**Other**				**No**	
Iitaka, 1990	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Ingels, 1989	**Other**				**No**	
Isaacman, 2002	**Other**				**No**	
Itoh, 1991	Further investigation	Diagnostic accuracy	**Other**	≥20	**No**	
Itoh, 1995	Further investigation	Diagnostic accuracy	**Other**	≥20	Yes	
Jakobsson, 1991	**Other**				**No**	
Jakobsson, 1992	Further investigation	Diagnostic accuracy	<18	≥20	**No**	
Jakobsson, 1994	**Other**				**No**	
Jakobsson, 1997	**Other**				**No**	
Jakobsson, 2000	**Other**				**No**	
Jaya, 1996	**Other**				**No**	
Jequier, 1983	**Other**				**No**	
Jequier, 1983	**Other**				**No**	
Jerkins, 1988	**Other**				**No**	
Jewkes, 1990	**Other**				**No**	
Jimenez-Cruz, 1981	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Jodal, 1975	Further investigation	Diagnostic accuracy	**None <5**	≥20	**No**	
Jodal, 2000	Further investigation	Diagnostic accuracy	**None <5**	≥20	Yes	
Jodal, 2002	**Other**				**No**	
Johnson, 1986	Further investigation	Diagnostic accuracy	**None <5**	≥20	Yes	
Jojart, 1977	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Joseph, 1990	**Other**				**No**	
Jothilakshmi, 2001	**Other**				**No**	
Kal'tianis, 1988	**Other**				**No**	
Kaltyanis, 1979	**Other**				**No**	
Kang, 1989	**Other**				**No**	
Kangarloo, 1985	**Other**				**No**	
Kaniewska, 1966	**Other**				**No**	
Karakatsani, 1997	**Other**				**No**	
Kass, 1992	Further investigation	Diagnostic accuracy	<12	≥20	**No**	
Kass, 2000	Further investigation	**Other**	<18	≥20	**No**	
Kassim, 1989	**Other**				**No**	
Kaufman, 1971	**Other**				**No**	
Kavukcu, 1998	**Other**				**No**	
Kawata, 1981	Further investigation	**Other**		**<20**	**No**	
Kellogg, 1992	**Other**				**No**	
Kelly, 1995	UTI diagnosis	Diagnostic accuracy	<18	≥20	**No**	Culture
Kenda, 1983	**Other**				**No**	
Kenda, 1998	**Other**				**No**	
Kenney, 1991	**Other**				**No**	
Kernen, 1999	**Other**				**No**	
Khan, 1984	UTI diagnosis	**Other**	**Other**	≥20	**No**	Culture
Kholin, 1973	**Other**				**No**	
Kienitz, 1970	**Other**				**No**	
Kiliku, 1991	**Other**				**No**	
Kjaerulff, 1979	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	Yes	Culture
Klauber, 1984	**Other**				**No**	
Kobayasi, 1982	**Other**				**No**	
Koenig, 1988	**Other**				**No**	
Kohli, 1993	**Other**				**No**	

continued

TABLE 42 *Studies excluded from the review (cont'd)*

Study details	Does the study address diagnosis or further investigation of UTI?	Is it a diagnostic cohort study or an RCT?	Does the study include at least some children aged <5 years?	Minimum 20 participants included?	Data to construct 2 × 2 tables reported?	For studies of diagnosis, does the reference standard include culture?
Konda, 1984	**Other**				**No**	
Konda, 1989	**Other**				**No**	
Korpal-Szczyrska, 1989	Further investigation	Diagnostic accuracy	**None <5**	≥20	**No**	
Koskimies, 1995	UTI diagnosis	Diagnostic accuracy	<18	≥20	**No**	
Kostiala, 1980	UTI diagnosis	**Other**	<18	≥20	**No**	Culture
Kostro, 2002	**Other**				**No**	
Krepler, 1969	**Other**				**No**	
Krepler, 1977	**Other**				**No**	
Kroigaard, 1967	**Other**				**No**	
Kumar, 1996	**Other**				**No**	
Kunin, 1975	**Background**				**No**	
Kunin, 1975	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	Yes	Culture
Kunin, 1976	**Other**				**No**	
Kunin, 1976	**Other**				**No**	
Kurol, 1988	**Other**				**No**	
Kuzmanovska, 1995	**Other**				**No**	
Kuzmanovska, 1996	**Translate**				**No**	
Labbe, 1983	**Other**				**No**	
Lachner, 1984	UTI diagnosis	**Other**	<18	≥20	**No**	
Ladron De Guevara, 2001	**Other**				**No**	
Lafave, 1979	**Other**				**No**	
Laguna, 1998	**Other**				**No**	
Lagutina, 1980	**Other**				**No**	
Lahde, 1981	Further investigation	**Other**	**Other**		**No**	
Lamabadusuriya, 2000	**Other**				**No**	
Lanning, 1979	Further investigation	Diagnostic accuracy	**None <5**	≥20	Yes	
Larcombe, 2002	**Background**				**No**	
Latorre, 2001	**Other**				**No**	
Latorre, 2001	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	Yes	Culture
Lavocat, 1998	Further investigation	**Other**	<18		**No**	
Leanos-Miranda, 1996	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	Yes	Culture
Leape, 1974	UTI diagnosis	**Other**	**None <5**	≥20	**No**	Culture
Lechi, 1976	**Other**				**No**	
Lee, 1991	**Other**				**No**	
Lefcoe, 1970	**Other**				**No**	
Lejeune, 1969	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Leong, 1976	**Other**				**No**	
Leonidas, 1983	**Other**				**No**	
Leonidas, 1984	Further investigation	Diagnostic accuracy	<18	≥20	**No**	
Leonidas, 1984	Further investigation	Diagnostic accuracy	<18	≥20	**No**	
Leonidas, 1995	**Other**				**No**	
Leonidas, 1999	**Other**				**No**	
Levitt, 1977	**Other**				**No**	
Lewis, 1998	UTI diagnosis	**Other**	<5 only	**<20**	**No**	
Li, 2002	**Other**				**No**	
Liaw, 2000	**Other**				**No**	
Lidefelt, 1989	**Other**				**No**	
Lin, 1998	**Other**				**No**	
Lines, 1970	**Other**				**No**	
Linne, 1994	Further investigation	**Other**	<12	≥20	**No**	
Lip, 1992	**Other**				**No**	
Lipshultz, 1972	**Other**				**No**	
Lirenman, 1969	UTI diagnosis	**Other**	<5 only	≥20	**No**	
Littlewood, 1972	**Other**				**No**	
Livsey, 1994	**Other**				**No**	
Lloyd, 1993	**Other**				**No**	

continued

TABLE 42 *Studies excluded from the review (cont'd)*

Study details	Does the study address diagnosis or further investigation of UTI?	Is it a diagnostic cohort study or an RCT?	Does the study include at least some children aged <5 years?	Minimum 20 participants included?	Data to construct 2 × 2 tables reported?	For studies of diagnosis, does the reference standard include culture?
Lohr, 1991	**Other**				**No**	
Loirat, 1978	**Other**				**No**	
Lorentz, 1979	**Other**				**No**	
Loutfi, 1998	**Other**				**No**	
Loutfi, 1999	**Other**				**No**	
Lowe, 1985	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	Yes	Culture
Luders, 1966	**Other**				**No**	
Lue, 1982	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	Yes	
Lythgoe, 1992	Further investigation	Diagnostic accuracy	**None <5**	≥20	Yes	
MacGregor, 1966	**Other**				**No**	
MacKenzie, 1990	**Other**				**No**	
MacKenzie, 1990	**Other**				**No**	
MacKenzie, 1991	**Other**				**No**	
MacKenzie, 1992	**Other**				**No**	
Macpherson, 1986	**Other**				**No**	
Madon, 1973	**Other**				**No**	
Mafe, 1997	**Other**				**No**	
Mage, 1989	Further investigation	**Other**	<12	≥20	**No**	
Magill, 1986	**Other**				**No**	
Mahant, 2001	**Other**				**No**	
Maizels, 1979	**Other**				**No**	
Maizels, 1987	**Other**				**No**	
Majd, 1979	**Other**				**No**	
Majd, 1986	Further investigation	Diagnostic accuracy	<12	≥20	**No**	
Majd, 1992	**Background**				**No**	
Malaga, 1978	**Other**				**No**	
Malviya, 2000	**Background**				**No**	
Mantel, 1970	**Other**				**No**	
Margileth, 1976	**Other**				**No**	
Marild, 1982	**Other**				**No**	
Marild, 1989	**Other**				**No**	
Marosvari, 1975	**Other**				**No**	
Marr, 1975	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Marshall, 1990	Further investigation	**Other**	<12	≥20	**No**	
Martin, 1985	Further investigation	Diagnostic accuracy	<18	≥20	**No**	
Martin, 2001	**Other**				**No**	
Martin Aguado, 2000	**Other**				**No**	
Martin Caballero, 1983	**Other**				**No**	
Martin Puerto, 1999	**Other**				**No**	
Mason, 1984	**Other**				**No**	
Masters, 1966	**Other**				**No**	
Mastin, 1995	Further investigation	Diagnostic accuracy	**Other**	≥20	**No**	
Matajc, 1965	**Other**				**No**	
Matsaniotis, 1971	**Other**				**No**	
Mattsby-Baltzer, 1981	**Other**				**No**	
Mazzoleni, 1984	Further investigation	**Other**	<12	≥20	**No**	
McAfee, 1979	**Other**				**No**	
McAlister, 1974	**Other**				**No**	
McCarthy, 1982	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	Yes	Culture
McCauley, 1984	Further investigation	Diagnostic accuracy	<18	≥20	**No**	
McCormick, 1978	**Other**				**No**	
McDonald, 2000	**Other**				**No**	
McGillivray, 2002	UTI diagnosis	Diagnostic accuracy	<18	≥20	**No**	Culture
Meadows, 1967	**Other**				**No**	
Medhat, 1997	Further investigation	**Other**	**Other**		**No**	
Melis, 1992	**Other**				**No**	

continued

TABLE 42 *Studies excluded from the review (cont'd)*

Study details	Does the study address diagnosis or further investigation of UTI?	Is it a diagnostic cohort study or an RCT?	Does the study include at least some children aged <5 years?	Minimum 20 participants included?	Data to construct 2 × 2 tables reported?	For studies of diagnosis, does the reference standard include culture?
Mendygarina, 1983	**Other**				**No**	
Merguerian, 1997	**Other**				**No**	
Merguerian, 1999	**Other**				**No**	
Merrick, 1979	Further investigation	Diagnostic accuracy	**None <5**	≥20	Yes	
Merrick, 1995	Further investigation	**Other**			**No**	
Merrick, 1995	Further investigation	**Other**			**No**	
Middleton, 1980	**Other**				**No**	
Mitchell, 1990	**Other**				**No**	
Miyata, 1969	**Other**				**No**	
Mok, 1979	**Other**				**No**	
Molyneux, 1995	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Mongeau, 1971	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Montplaisir, 1976	**Other**				**No**	
Moosmann, 1977	**Other**				**No**	
Morey, 1999	**Background**				**No**	
Morin de Finfe, 1989	**Other**				**No**	
Morris, 1978	**Other**				**No**	
Motoiro, 1975	UTI diagnosis	Diagnostic accuracy	<18	≥20	**No**	Culture
Mouratidis, 1993	Further investigation	**Other**	<18	≥20	**No**	
Mrhac, 1988	**Other**				**No**	
Mucke, 1971	**Other**				**No**	
Muller Suur, 1992	Further investigation	Diagnostic accuracy	<18	≥20	**No**	
Murahovschi, 1988	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	Yes	Culture
Murphy, 1989	UTI diagnosis	Diagnostic accuracy	<18	≥20	**No**	Culture
Murphy, 1989	**Other**				**No**	
Mussarakis, 1994	**Other**				**No**	
Nakaarai, 1971	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	Yes	Culture
Nanayakkar, 1988	**Other**				**No**	
Nangia, 1998	**Other**				**No**	
Narbutowicz, 1975	**Other**				**No**	
Nauschuetz, 1993	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	Yes	Culture
Need, 2000	**Other**				**No**	
Nelson, 1990	**Other**				**No**	
Newman, 1967	**Other**				**No**	
Newman, 1997	**Other**				**No**	
Ng, 1971	**Other**				**No**	
N'Goran, 1989	**Other**				**No**	
Nicolet, 1983	Further investigation	Diagnostic accuracy	<18	≥20	**No**	
Nicolet, 1984	Further investigation	Diagnostic accuracy	<18	≥20	**No**	
Nicolet, 1984	**Other**				**No**	
Nitz, 1980	**Other**				**No**	
Nowak, 2000	**Other**				**No**	
Nunan, 1997	**Other**				**No**	
Nuutinen, 2001	**Other**				**No**	
Nwaorgu, 1992	**Other**				**No**	
Oak, 1999	**Other**				**No**	
Oehme, 1972	**Other**				**No**	
O'Hara, 1996	**Other**				**No**	
Okolo, 1988	**Other**				**No**	
Oldak-Skvirsky, 1994	**Other**				**No**	
Orellana, 2002	**Other**				**No**	
Ort, 1965	**Other**				**No**	
Ozturk, 1991	Further investigation	Diagnostic accuracy	**None <5**	≥20	Yes	
Padelt, 1967	**Other**				**No**	
Padhy, 1989	**Other**				**No**	
Pahl, 1992	**Other**				**No**	

continued

TABLE 42 *Studies excluded from the review (cont'd)*

Study details	Does the study address diagnosis or further investigation of UTI?	Is it a diagnostic cohort study or an RCT?	Does the study include at least some children aged <5 years?	Minimum 20 participants included?	Data to construct 2 × 2 tables reported?	For studies of diagnosis, does the reference standard include culture?
Pai, 1991	**Other**				**No**	
Palmer, 1996	**Other**				**No**	
Paltiel, 1992	**Other**				**No**	
Panaretto, 1999	**Other**				**No**	
Paniktratov, 1975	**Other**				**No**	
Panuel, 1984	Further investigation	**Other**	<18	≥20	**No**	
Panuel, 1984	Further investigation	Diagnostic accuracy	<18	≥20	**No**	
Panuel, 1992	**Other**				**No**	
Papadopoulou, 2002	**Other**				**No**	
Parkkulainen, 1971	**Other**				**No**	
Parsons, 1974	**Other**				**No**	
Patel, 1993	**Other**				**No**	
Pead, 1994	**Other**				**No**	
Pecile, 1995	Further investigation	Diagnostic accuracy	<18	≥20	**No**	
Peng, 1999	Further investigation	**Other**	<18	≥20	**No**	
Peng, 2001	Further investigation	**Other**	<18	≥20	**No**	
Penza, 1981	**Other**				**No**	
Perri, 1989	**Other**				**No**	
Perri, 1992	**Other**				**No**	
Pezzlo, 1988	**Other**				**No**	
Pfaller, 1987	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	Yes	Culture
Piepsz, 1990	Further investigation	Diagnostic accuracy	**None <5**		Yes	
Piepsz, 1999	**Other**				**No**	
Piepsz, 2002	**Other**				**No**	
Poli-Merol, 1998	Further investigation	Diagnostic accuracy	<18	≥20	**No**	
Pollet, 1980	Further investigation	**Other**	**Not clear**	≥20	**No**	
Pollet, 1981	Further investigation	**Other**	<21	≥20	**No**	
Polmear, 1999	**Other**				**No**	
Porter, 1978	**Other**				**No**	
Prassopoulos, 1995	**Other**				**No**	
Preston, 1994	**Other**				**No**	
Preuss, 1969	**Other**				**No**	
Principi, 1969	**Other**				**No**	
Pronicka, 1967	**Other**				**No**	
Proesmans, 1980	UTI diagnosis	Diagnostic accuracy	**None <5**	≥ 20	Yes	Culture
Proesmans, 1981	UTI diagnosis	Diagnostic accuracy	**Other**	≥ 20	Yes	Culture
Proesmans, 1992	UTI diagnosis	Diagnostic accuracy	**Other**	**<20**	**No**	Culture
Pryles, 1959	**Other**				**No**	
Pulatov, 1973	**Other**				**No**	
Pulliam, 2001	**Other**				**No**	
Putto, 1986	**Other**				**No**	
Pylkkanen, 1981	UTI diagnosis	Diagnostic accuracy	<18	≥20	**No**	Culture
Raes, 1997	**Other**				**No**	
Rahman, 1997	**Other**				**No**	
Ramzy, 1993	**Other**				**No**	
Randolph, 1970	**Other**				**No**	
Randolph, 1971	**Other**				**No**	
Randolph, 1974	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Randolph, 1979	UTI diagnosis	**Other**	<5 only	≥20	**No**	
Randolph, 1981	UTI diagnosis	**Other**	<5 only	≥20	**No**	
Raymond, 1998	**Other**				**No**	
Redman, 2001	**Background**				**No**	
Rees, 1996	**Other**				**No**	
Riccabona, 1991	Further investigation	Diagnostic accuracy	<5 only	≥20	**No**	
Riccabona, 2001	**Other**				**No**	
Riccabona, 2002	**Other**				**No**	

continued

TABLE 42 *Studies excluded from the review (cont'd)*

Study details	Does the study address diagnosis or further investigation of UTI?	Is it a diagnostic cohort study or an RCT?	Does the study include at least some children aged <5 years?	Minimum 20 participants included?	Data to construct 2 × 2 tables reported?	For studies of diagnosis, does the reference standard include culture?
Ring, 1989	**Other**				**No**	
Roberts, 2000	**Background**				**No**	
Robins, 1975	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Robson, 1996	**Other**				**No**	
Roch, 1980	**Other**				**No**	
Roderick, 1997	**Other**				**No**	
Roebuck, 1999	Further investigation	SR	**None <5**	≥20	Yes	
Roelants, 2001	**Other**				**No**	
Ronchetti, 1976	**Other**				**No**	
Rosenberg, 1990	**Other**				**No**	
Rosenberg, 1992	**Other**				**No**	
Rosenberg, 2001	**Background**				**No**	
Rosenberg, 2002	**Other**				**No**	
Rosenkranz, 1971	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	**No**	Culture
Rossleigh, 1990	**Other**				**No**	
Rossmueller, 2001	**Other**				**No**	
Roy, 1986	Further investigation	Diagnostic accuracy	**None <5**	≥20	Yes	
Rushton, 1992	**Other**				**No**	
Sabbag Chauvez, 1988	**Other**				**No**	
Sackey, 2000	**Other**				**No**	
Santos, 1980	UTI diagnosis	Diagnostic accuracy	<18	≥20	**No**	Culture
Saraga, 1996	Further investigation	Diagnostic accuracy	<12	≥20	**No**	
Saxton, 1995	**Other**				**No**	
Scheifele, 1978	**Other**				**No**	
Scherf, 1977	**Other**				**No**	
Schersten, 1967	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Schiff, 1993	Further investigation	Diagnostic accuracy	**None <5**	≥20	Yes	
Schlager, 2001	**Other**				**No**	
Schreiter, 1970	Further investigation	Diagnostic accuracy	<5 only	≥20	**No**	
Schreiter, 1971	**Other**				**No**	
Scully, 1990	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	Yes	Culture
Seigle, 1995	**Other**				**No**	
Sellin, 1982	**Other**				**No**	
Servadio, 1974	Further investigation	Diagnostic accuracy	**Other**	≥20	**No**	
Sfakianakis, 1992	**Other**				**No**	
Sfakianakis, 2000	Further investigation	Diagnostic accuracy	**Other**	≥20	Yes	
Shah, 1989	**Other**				**No**	
Shanon, 1992	Further investigation	Diagnostic accuracy	<18	≥20	**No**	
Shapiro, 1988	Further investigation	**Other**	<18	≥20	**No**	
Sharief, 2001	UTI diagnosis	Diagnostic accuracy	<18	≥20	**No**	Culture
Sharma, 1970	**Other**				**No**	
Shaw, 1997	UTI diagnosis	Diagnostic accuracy	<18	≥20	**No**	Culture
Sherwood, 1984	Further investigation	Diagnostic accuracy	**None <5**	≥20	Yes	
Shrestha, 1973	UTI diagnosis	Diagnostic accuracy	<18	≥20	**No**	Culture
Siafarikas, 1977	**Other**				**No**	
Siegel, 1975	**Other**				**No**	
Sigmund, 1991	**Other**				**No**	
Sikund, 1968	**Other**				**No**	
Silbert, 1992	UTI diagnosis	Case–control	<18	≥20	Yes	Culture
Silvestro, 1983	**Other**				**No**	
Simon, 1972	**Other**				**No**	
Sinaniotis, 1978	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Sitzmann, 1970	**Other**				**No**	
Skelton, 1977	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Slosky, 1977	**Other**				**No**	
Smellie, 1989	**Other**				**No**	

continued

TABLE 42 *Studies excluded from the review (cont'd)*

Study details	Does the study address diagnosis or further investigation of UTI?	Is it a diagnostic cohort study or an RCT?	Does the study include at least some children aged <5 years?	Minimum 20 participants included?	Data to construct 2 × 2 tables reported?	For studies of diagnosis, does the reference standard include culture?
Smellie, 1994	**Other**				**No**	
Smellie, 1995	**Other**				**No**	
Smith, 1973	**Other**				**No**	
Smith, 1998	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	Yes	Culture
Snyder, 1987	Follow-up	**Case–control**	**Not clear**	**<20**	Yes	
Sorantin, 1997	**Other**				**No**	
South Bedfordshire Practitioners' Group, 1990	**Other**				**No**	
South Bedfordshire Practitioners' Group, 1990	**Other**				**No**	
Sreenarasimhaiah, 1998	**Background**				**No**	
Stake, 1979	**Other**				**No**	
Stake, 1983	**Other**				**No**	
Stark, 1980	**Other**				**No**	
Steiner, 1988	**Other**				**No**	
Stepanov, 1976	**Other**				**No**	
Stokland, 1992	**Other**				**No**	
Strife, 1988	Further investigation	Diagnostic accuracy	<18	≥20	**No**	
Strife, 1996	**Other**				**No**	
Sty, 1987	**Other**				**No**	
Subat-Dezulovic, 1998	**Other**				**No**	
Subat-Dezulovic, 1998	Further investigation	**Cross-sectional**	<18	≥20	**No**	
Tabuki, 1981	**Other**				**No**	
Taffinder, 1984	**Other**				**No**	
Takano, 1983	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Takeda, 1994	**Other**				**No**	
Tamminen, 1978	**Other**				**No**	
Tarp, 2000	**Other**				**No**	
Tasker, 1993	Further investigation	Diagnostic accuracy	<12	≥20	**No**	
Taylor, 1986	**Other**				**No**	
Tereshchenko, 1987	**Other**				**No**	
Thabet, 2002	UTI diagnosis	Diagnostic accuracy	<18	≥20	Yes	Microscopy
Thayyil-Sudhan, 2000	UTI diagnosis	Diagnostic accuracy	<18	≥20	**No**	Culture
Thayyil-Sudhan, 2000	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Thelle, 1985	Further investigation	Diagnostic accuracy	<18	≥20	**No**	
Thornbury, 1965	**Other**				**No**	
Tobiansky, 1998	UTI diagnosis	RCT/CCT	<5 only	≥20	**No**	
Traisman, 1987	Further investigation	Diagnostic accuracy	<18	≥20	**No**	
Troell, 1984	**Other**				**No**	
Troger, 1999	**Other**				**No**	
Tsai, 1998	**Other**				**No**	
Tsukamoto, 1999	**Other**				**No**	
Tsukamoto, 1999	**Other**				**No**	
Tucci, 1985	**Other**				**No**	
Ugarte, 1986	**Other**				**No**	
Uhari, 1976	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	Yes	Culture
Utikalova, 1974	**Other**				**No**	
Vallee, 1999	**Other**				**No**	
Van de Vijver, 2001	**Other**				**No**	
van der Voort, 1997	**Other**				**No**	
van der Voort, 1997	**Other**				**No**	
Vanderfaeillie, 1998	**Other**				**No**	
Van Herreweghe, 1980	**Other**				**No**	
Varela Salgado, 1994	UTI diagnosis	Diagnostic accuracy	**Other**		**No**	

continued

TABLE 42 *Studies excluded from the review (cont'd)*

Study details	Does the study address diagnosis or further investigation of UTI?	Is it a diagnostic cohort study or an RCT?	Does the study include at least some children aged <5 years?	Minimum 20 participants included?	Data to construct 2 × 2 tables reported?	For studies of diagnosis, does the reference standard include culture?
Vargas Rosendo, 1984	Further investigation	Diagnostic accuracy	<18	**<20**	Yes	
Vazquez, 1984	**Other**				**No**	
Vegni, 1969	**Other**				**No**	
Vela Navarrete, 1969	**Other**				**No**	
Veleminsky, 1975	**Other**				**No**	
Venturoli, 1982	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Vernon, 1997	**Other**				**No**	
Verrier Jones, 1993	**Other**				**No**	
Vilska, 1980	**Other**				**No**	
Vlahakis, 1971	Further investigation	Diagnostic accuracy	**Other**		**No**	
Von Rohren, 1981	**Other**				**No**	
Wagle, 1989	UTI diagnosis	Diagnostic accuracy	**Not clear**	≥20	Yes	Culture
Wallin, 2001	Further investigation	**Other**	<5 only	≥20	**No**	
Walten, 1971	**Other**				**No**	
Wassner, 1992	**Other**				**No**	
Weber, 1966	**Other**				**No**	
Weingartner, 1969	**Other**				**No**	
Weitzel, 1980	**Other**				**No**	
Whitaker, 1969	**Other**				**No**	
White, 2001	**Background**				**No**	
Whyte, 1988	**Other**				**No**	
Wichmann, 1970	**Other**				**No**	
Wiebel, 1972	**Other**				**No**	
Wientzen, 1979	**Other**				**No**	
Wille, 1969	**Other**				**No**	
Wilson, 1993	**Other**				**No**	
Winnicki, 1975	**Other**				**No**	
Winquist, 1997	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	Yes	Culture
Wlodarczak, 1974	**Other**				**No**	
Wlodarczak, 1975	**Other**				**No**	
Wlodarczak, 1975	**Other**				**No**	
Wong, 1998	UTI diagnosis	Diagnostic accuracy	<5 only	≥20	**No**	Culture
Woodard, 1976	**Other**				**No**	
Wyszynska, 1967	**Other**				**No**	
Yen, 1994	Further investigation	Diagnostic accuracy	<18	≥20	**No**	
Yen, 1996	Further investigation	**Other**	<12	≥20	**No**	
Yen, 1998	Further investigation	Diagnostic accuracy	<18	≥20	**No**	
Yen, 1999	**Other**				**No**	
Yen, 1999	**Other**				**No**	
Yuen, 2001	UTI diagnosis	Diagnostic accuracy	<5 only	≥20	Yes	Microscopy
Yunes-Zarraga, 1997	**Other**				**No**	
Zacchello, 1966	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	Yes	Culture
Zainal, 1996	UTI diagnosis	Diagnostic accuracy	**None <5**	≥20	Yes	Culture
Zaki, 1996	**Other**				**No**	
Zaman, 1998	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	Yes	Culture
Zaman, 2001	UTI diagnosis	Diagnostic accuracy	**Other**	≥20	Yes	Culture
Zhilinskaia, 1973	**Other**				**No**	
Zilleruelo, 1995	Further investigation	Diagnostic accuracy	<12	≥20	**No**	
Zocchi, 1988	Further investigation	Diagnostic accuracy	**None <5**	≥20	Yes	
Zoch-Zwierz, 1979	**Other**				**No**	
Zoppardo, 1988	Further investigation	Diagnostic accuracy	<18	≥20	**No**	
Zwolinska, 1999	**Other**				**No**	

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Appendix 8

Downs analysis tables

TABLE 43 *Quality assessment of the Downs study*[10]

Study question		Comments
General		
1. Costs and effects examined	✓	
2. Alternatives compared	✓	
3. The viewpoint(s)/perspective of the analysis is clearly stated (e.g. NHS, society)	×	Can be assumed to be US third party payer
Selection of alternatives		
4. All relevant alternatives are compared (including do-nothing if applicable)	×	A range of additional strategies could, in principle, have been assessed, including combination and sequential strategies
5. The alternatives being compared are clearly described (who did what, to whom, where and how often)	✓	
6. The rationale for choosing the alternative programmes or interventions compared is stated	✓	
Form of evaluation		
7. The choice of form of economic evaluation is justified in relation to the questions addressed	×	There was no clear explanation of how the results of the analysis could be used for decision-making
8. If a cost-minimisation design is chosen, have equivalent outcomes been adequately demonstrated?	NA	
Effectiveness data		
9. The source(s) of effectiveness estimates used are stated (e.g. single study, selection of studies, systematic review, expert opinion)	✓	
10. Effectiveness data from RCT or review of RCTs	✓	
11. Potential biases identified (especially if data not from RCTs)	✓	
12. Details of the method of synthesis or meta-analysis of estimates are given (if based on an overview of a number of effectiveness studies)	×	A number of systematic reviews were undertaken some of which culminated in pooling, but the methods were not detailed
Costs		
13. All the important and relevant resource use included	✓	Assuming a payer perpective
14. All the important and relevant resource use measured accurately (with methodology)	×	Estimates of cost from the literature
15. Appropriate unit costs estimated (with methodology)	✓	
16. Unit costs reported separately from resource-use data	×	Resource-use data not presented
17. Productivity costs treated separately from other costs	NA	
18. The year and country to which unit costs apply are stated, with appropriate adjustments for inflation and/or currency conversion	×	Country but not year
Benefit measurement and valuation		
19. The primary outcome measure(s) for the economic evaluation are clearly stated (cases detected, life-years, QALYs, etc.)	✓	
20. Methods to value health states and other benefits are stated (e.g. time trade-off)	NA	Outcomes presented in natural units
21. Details of the individuals from whom valuations were obtained are given (patients, members of the public, healthcare professionals, etc.)	NA	

continued

TABLE 43 *Quality assessment of the Downs study[10] (cont'd)*

Study question		Comments
Decision modelling		
22. Details of any decision model used are given (e.g. decision tree, Markov model)	✓	
23. The choice of model used and the key input parameters on which it is based are adequately detailed and justified	✓	
24. All model outputs described adequately.	✓	
Discounting		
25. Discount rate used for both costs and benefits	×	No discounting appears to have been undertaken for health benefits
26. Do discount rates accord with NHS guidance?	NA	3% for costs and 0% for health benefits. Not the same as NHS guidance
Allowance for uncertainty		
Stochastic analysis of patient-level data	×	No patient-level data
27. Details of statistical tests and confidence intervals are given for stochastic data	NA	
28. Uncertainty around cost-effectiveness expressed (e.g. confidence interval around incremental cost-effectiveness ratio, cost-effectiveness acceptability curves)	NA	
29. Sensitivity analysis used to assess uncertainty in non-stochastic variables (e.g. unit costs, discount rates) and analytical decisions (e.g. methods to handle missing data)	NA	
Probabilistic analysis of decision models	×	One- and two-way sensitivity analyses performed on key variables
30. Are all appropriate input parameters included with uncertainty?	×	
31. Is second order uncertainty (uncertainty in means) included rather than first order (uncertainty between patients)?	NA	
32. Are the probability distributions adequately detailed and appropriate?	NA	
33. Sensitivity analysis used to assess variability (e.g. unit costs, discount rates) and analytical decisions (e.g. methods to handle missing data)	×	
Deterministic analysis	✓	
34. The approach to sensitivity analysis is given (e.g. univariate, threshold analysis)	✓	One and two way, including threshold analysis. Mostly diagrammatically
35. The choice of variables for sensitivity analysis is justified	✓	
36. The ranges over which the variables are varied are stated	✓	
Presentation of results		
37. Incremental analysis is reported using appropriate decision rules	✓	
38. Major outcomes are presented in a disaggregated as well as aggregated form	✓	
39. Applicable to the NHS setting	×	US based and not relevant in UK setting

Appendix 9

Additional economics tables

TABLE 44 *Long-term costs and QALYs lost (girls) taken from the long-term model*

	Distribution	Girl <1 year		Girl 1–2 years		Girl 2–3 years		Girl >3 years	
		Mean	SE	Mean	SE	Mean	SE	Mean	SE
Cost long-term pathway 1	Gamma	£1022.735	£53.480	£980.980	£36.492	£963.149	£28.198	£956.166	£24.107
Cost long-term pathway 2	Gamma	£988.162	£640.574	£616.785	£496.336	£426.143	£421.172	£220.438	£335.570
Cost long-term pathway 3	Gamma	£117.774	£17.704	£103.305	£11.295	£97.539	£8.902	£92.547	£8.765
Cost long-term pathway 4	Gamma	£221.768	£140.056	£138.623	£107.033	£109.429	£105.696	£56.700	£84.120
Cost long-term pathway 5	Gamma	£153.299	£95.847	£50.532	£36.845	£109.429	£105.696	£28.489	£37.434
Cost long-term pathway 6	Gamma	£153.299	£95.847	£50.532	£36.845	£109.429	£105.696	£28.489	£37.434
Cost long-term pathway 7	Gamma	£0	£0	£0	£0	£0	£0	£0	£0
Cost long-term pathway 8	Gamma	£0	£0	£0	£0	£0	£0	£0	£0
QALYs lost long-term pathway 1	Gamma	0.171	0.102	0.094	0.071	0.061	0.055	0.049	0.048
QALYs lost long-term pathway 2	Gamma	0.736	0.500	0.649	0.523	0.443	0.422	0.237	0.347
QALYs lost long-term pathway 3	Gamma	0.047	0.031	0.025	0.019	0.016	0.015	0.008	0.014
QALYs lost long-term pathway 4	Gamma	0.235	0.168	0.133	0.115	0.114	0.112	0.061	0.089
QALYs lost long-term pathway 5	Gamma	0.094	0.066	0.051	0.044	0.114	0.112	0.012	0.011
QALYs lost long-term pathway 6	Gamma	0.094	0.066	0.051	0.044	0.114	0.112	0.012	0.011
QALYs lost long-term pathway 7	Gamma	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
QALYs lost long-term pathway 8	Gamma	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

TABLE 45 *Long-term costs and QALYs lost (boys) taken from the long-term model*

	Distribution	Boy <1 year		Boy 1–2 years		Boy 2–3 years		Boy >3 year	
		Mean	SE	Mean	SE	Mean	SE	Mean	SE
Cost long-term pathway 1	Gamma	£967.934	£27.802	£957.931	£26.883	£950.585	£27.723	£944.887	£27.407
Cost long-term pathway 2	Gamma	£476.160	£419.396	£380.752	£397.239	£262.298	£349.554	£164.145	£300.980
Cost long-term pathway 3	Gamma	£98.413	£8.421	£95.576	£8.204	£92.843	£6.974	£91.582	£7.963
Cost long-term pathway 4	Gamma	£118.069	£100.803	£92.372	£94.729	£59.281	£77.327	£43.805	£83.276
Cost long-term pathway 5	Gamma	£76.802	£68.023	£65.642	£65.170	£41.502	£53.913	£30.133	£55.432
Cost long-term pathway 6	Gamma	£76.802	£68.023	£65.642	£65.170	£41.502	£53.913	£30.133	£55.432
Cost long-term pathway 7	Gamma	£0	£0	£0	£0	£0	£0	£0	£0
Cost long-term pathway 8	Gamma	£0	£0	£0	£0	£0	£0	£0	£0
QALYs lost long-term pathway 1	Gamma	0.061	0.048	0.044	0.045	0.032	0.047	0.023	0.047
QALYs lost long-term pathway 2	Gamma	0.426	0.384	0.349	0.347	0.239	0.318	0.145	0.252
QALYs lost long-term pathway 3	Gamma	0.015	0.013	0.011	0.012	0.008	0.010	0.006	0.011
QALYs lost long-term pathway 4	Gamma	0.106	0.095	0.084	0.090	0.047	0.062	0.040	0.077
QALYs lost long-term pathway 5	Gamma	0.040	0.036	0.034	0.034	0.018	0.024	0.016	0.029
QALYs lost long-term pathway 6	Gamma	0.040	0.036	0.034	0.034	0.018	0.024	0.016	0.029
QALYs lost long-term pathway 7	Gamma	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
QALYs lost long-term pathway 8	Gamma	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

TABLE 46 *The optimal strategy (and probability ranked first) for each subgroup of girls as a function of the threshold willingness to pay for an additional QALY, including glucose tests*

Threshold value (£)	Girl over 3	
	Optimal	Prob. ranked 1st
0	2	0.67
1,000	2	0.757
2,000	2	0.816
3,000	2	0.854
4,000	2	0.885
5,000	2	0.902
6,000	2	0.909
7,000	2	0.91
8,000	2	0.897
9,000	2	0.873
10,000	2	0.862
11,000	2	0.846
12,000	2	0.829
13,000	2	0.805
14,000	2	0.787
15,000	2	0.77
16,000	2	0.758
17,000	2	0.745
18,000	2	0.728
19,000	2	0.714
20,000	2	0.702
21,000	2	0.691
22,000	2	0.683
23,000	2	0.662
24,000	2	0.652
25,000	29	0.306
26,000	29	0.312
27,000	29	0.32
28,000	29	0.324
29,000	29	0.335
30,000	29	0.348
31,000	29	0.351
32,000	29	0.357
33,000	29	0.362
34,000	29	0.369
35,000	29	0.373
36,000	29	0.379
37,000	29	0.382
38,000	29	0.389
39,000	29	0.393
40,000	29	0.398
41,000	29	0.401
42,000	29	0.405
43,000	29	0.408
44,000	29	0.41
45,000	29	0.417
46,000	29	0.423
47,000	29	0.425
48,000	29	0.431
49,000	29	0.434
50,000	29	0.439

Details of the strategies are given in *Table 37* of the main text.

TABLE 47 *The optimal strategy (and probability ranked first) for each subgroup of boys as a function of the threshold willingness to pay for an additional QALY, including glucose tests*

Threshold value	Boy over 3	
	Optimal	Prob. ranked 1st
0	2	0.685
1,000	2	0.754
2,000	2	0.807
3,000	2	0.839
4,000	2	0.876
5,000	2	0.906
6,000	2	0.917
7,000	2	0.918
8,000	2	0.915
9,000	2	0.909
10,000	2	0.906
11,000	2	0.898
12,000	2	0.884
13,000	2	0.861
14,000	2	0.849
15,000	2	0.835
16,000	2	0.815
17,000	2	0.802
18,000	2	0.786
19,000	2	0.776
20,000	2	0.76
21,000	2	0.751
22,000	2	0.74
23,000	2	0.727
24,000	2	0.72
25,000	2	0.71
26,000	2	0.7
27,000	2	0.691
28,000	2	0.682
29,000	2	0.673
30,000	2	0.668
31,000	2	0.66
32,000	2	0.654
33,000	2	0.649
34,000	2	0.64
35,000	2	0.63
36,000	2	0.623
37,000	2	0.616
38,000	2	0.606
39,000	2	0.595
40,000	2	0.586
41,000	29	0.269
42,000	29	0.274
43,000	29	0.28
44,000	29	0.282
45,000	29	0.286
46,000	29	0.293
47,000	29	0.297
48,000	29	0.299
49,000	29	0.3
50,000	29	0.302

Details of the strategies are given in *Table 37* of the main text.

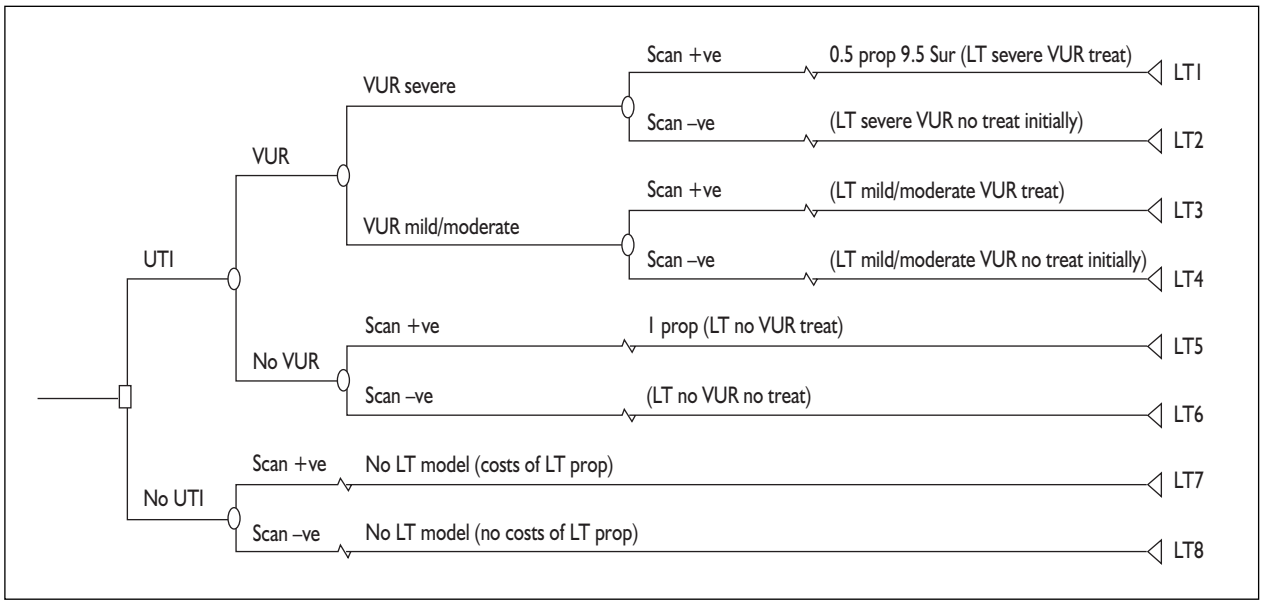

FIGURE 34 *Diagnostic tree for no diagnostic tests (treat all and image all). LT, long-term; prop, prophylaxis; Sur, surgery.*

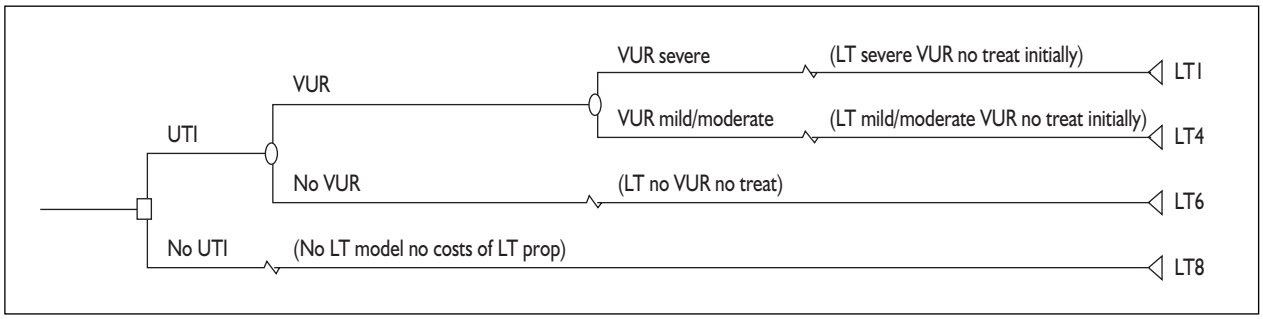

FIGURE 35 *Diagnostic tree for no diagnostic tests (treat all)*

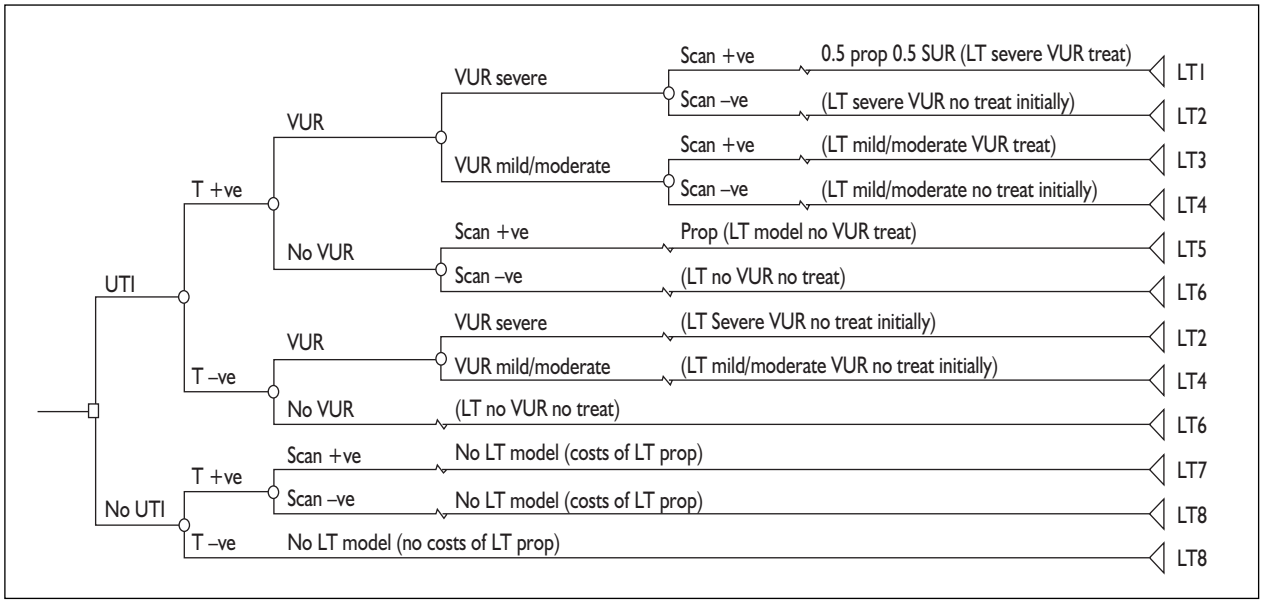

FIGURE 36 *Diagnostic tree for single diagnostic test*

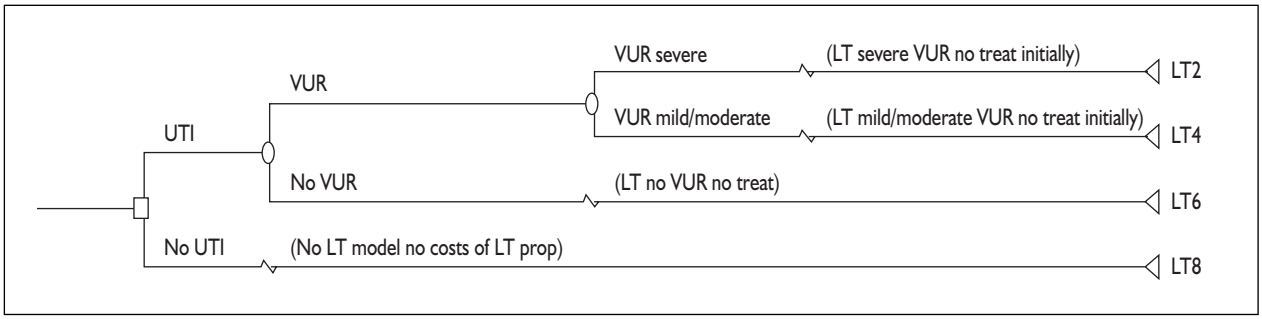

FIGURE 37 *Diagnostic tree for no diagnostic tests (treat no one)*

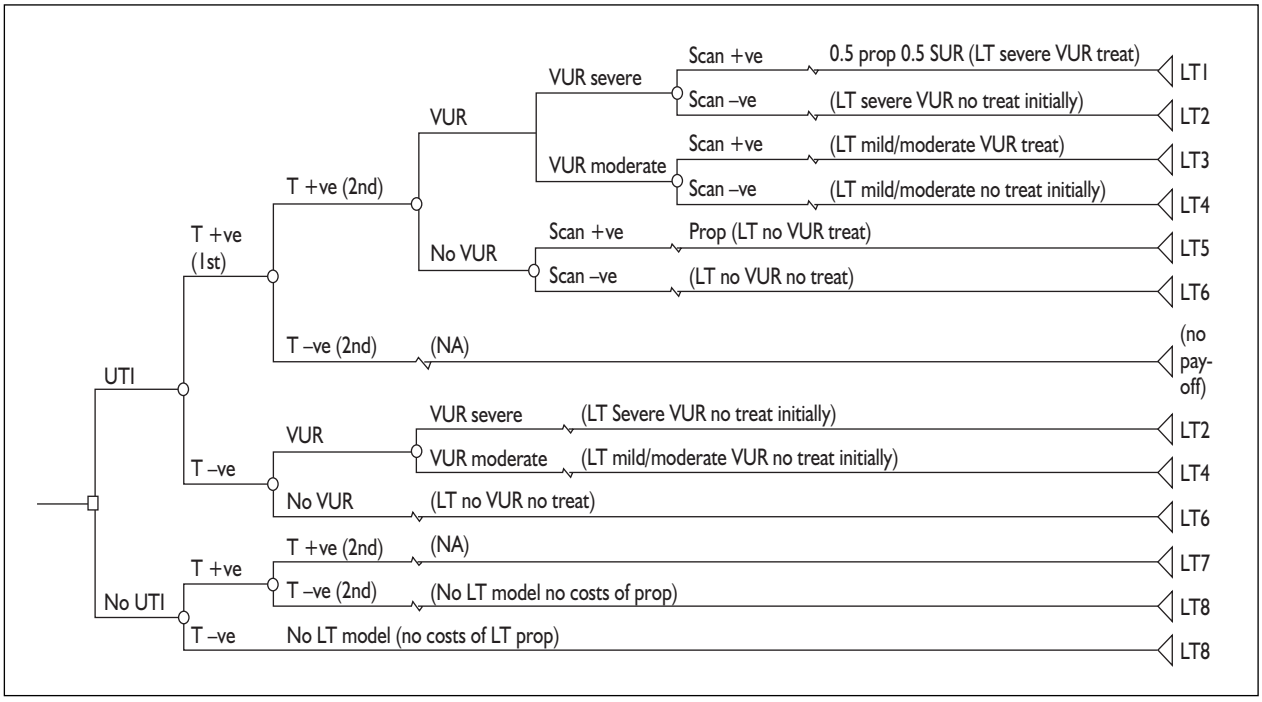

FIGURE 38 *Diagnostic tree for multiple diagnostic tests (confirmatory culture)*

Appendix 10

Full results of the cost-effectiveness and Monte Carlo simulation for all strategies

TABLE 48 *Simulation results (girl, < 1 year) excluding glucose*

	Threshold value											
	£0			£20,000			£30,000			£40,000		
Strategy no.	**Exp. NMB**	**Prob. ranked 1st**	**Rank**	**Exp. NMB**	**Prob. ranked 1st**	**Rank**	**Exp. NMB**	**Prob. ranked 1st**	**Rank**	**Exp. NMB**	**Prob. ranked 1st**	**Rank**
1	–63.34	0.323	2	–800.74	0	39	–1169.43	0	58	–1538.13	0	64
2	**–61.58**	**0.677**	**1**	–785.03	0.139	33	–1146.75	0.083	50	–1508.47	0.059	53
3	–282.74	0	43	–867.25	0	52	–1159.51	0.001	53	–1451.77	0.004	51
4	–476.92	0	72	–937.39	0	64	–1167.63	0	57	–1397.86	0	46
5	–475.96	0	71	–884.48	0	56	–1088.74	0	39	–1293.00	0	26
6	–71.17	0	6	–801.48	0	40	–1166.64	0	56	–1531.79	0	59
7	–67.78	0	4	–794.14	0	35	–1157.32	0	52	–1520.51	0	56
9	–68.89	0	5	–796.51	0	36	–1160.32	0	54	–1524.13	0	57
10	–67.25	0	3	–792.95	0	34	–1155.80	0	51	–1518.64	0	55
11	–242.22	0	40	–968.86	0	70	–1332.18	0	70	–1695.51	0	70
12	–241.40	0	39	–967.10	0	69	–1329.95	0	69	–1692.80	0	69
13	–257.96	0	42	–984.31	0	72	–1347.49	0	72	–1710.66	0	72
14	–256.44	0	41	–981.02	0	71	–1343.32	0	71	–1705.61	0	71
15	–72.88	0	7	–799.43	0	37	–1162.70	0	55	–1525.98	0	58
16	–228.67	0	38	–952.11	0	68	–1313.83	0	68	–1675.55	0	68
17	–99.75	0	8	–759.70	0	28	–1089.68	0	40	–1419.66	0	49
18	–129.46	0	14	–746.24	0.004	25	–1054.62	0.007	30	–1363.01	0.009	37
20	–106.47	0	9	–736.45	0.056	22	–1051.44	0.042	28	–1366.43	0.024	39
21	–131.82	0	15	–740.92	0.028	24	–1045.47	0.029	26	–1350.02	0.037	34
22	–124.69	0	13	–721.70	0	19	–1020.20	0	21	–1318.71	0	29
23	–182.53	0	35	–701.30	0	16	–960.69	0	15	–1220.08	0	14
25	–139.33	0	20	–682.25	0	9	–953.71	0	14	–1225.16	0	16
26	–187.38	0	37	–692.38	0	12	–944.87	0.001	11	–1197.37	0.001	11
27	–124.21	0	12	–694.83	0	14	–980.15	0	18	–1265.46	0	21
28	–181.77	0	34	–659.54	0.013	7	–898.42	0.011	6	–1137.31	0.013	6
30	–138.66	0	18	–645.06	0.254	3	–898.25	0.187	5	–1151.45	0.135	8
31	–186.58	0	36	–647.97	0.084	4	–878.67	0.097	2	–1109.37	0.086	2
32	–301.50	0	46	–921.16	0	61	–1230.99	0	62	–1540.82	0	65
33	–294.07	0	44	–903.29	0	58	–1207.90	0	60	–1512.51	0	54
34	–300.91	0	45	–917.31	0	60	–1225.51	0	61	–1533.70	0	60
35	–341.57	0	58	–938.50	0	66	–1236.97	0	65	–1535.43	0	62
36	–120.06	0	11	–738.92	0.025	23	–1048.35	0.024	27	–1357.78	0.024	35
37	–323.31	0	51	–907.82	0	59	–1200.08	0	59	–1492.33	0	52
38	–352.55	0	62	–876.74	0	54	–1138.84	0	48	–1400.93	0	48
39	–339.75	0	56	–844.87	0	47	–1097.44	0	41	–1350.00	0	33
40	–338.43	0	54	–856.74	0	49	–1115.89	0	45	–1375.04	0	41

continued

TABLE 48 *Simulation results (girl, < 1 year) excluding glucose (cont'd)*

Strategy no.	Threshold value											
	£0			£20,000			£30,000			£40,000		
	Exp. NMB	Prob. ranked 1st	Rank	Exp. NMB	Prob. ranked 1st	Rank	Exp. NMB	Prob. ranked 1st	Rank	Exp. NMB	Prob. ranked 1st	Rank
41	–414.38	0	70	–897.21	0	57	–1138.63	0	47	–1380.04	0	42
42	–161.05	0	25	–683.61	0.001	10	–944.88	0	12	–1206.16	0	12
43	–321.07	0	50	–781.54	0	32	–1011.77	0	20	–1242.01	0	17
44	–351.81	0	61	–836.01	0	45	–1078.12	0	37	–1320.22	0	30
45	–338.94	0	55	–800.50	0	38	–1031.27	0	22	–1262.05	0	20
46	–337.67	0	53	–814.83	0	42	–1053.40	0	29	–1291.98	0	25
47	–413.50	0	69	–848.58	0	48	–1066.13	0	33	–1283.67	0	24
48	–160.31	0	24	–642.58	0.184	2	–883.72	0.182	3	–1124.86	0.15	3
49	–320.11	0	49	–728.63	0.02	20	–932.89	0.106	9	–1137.15	0.22	5
50	–117.12	0	10	–777.07	0	31	–1107.05	0	43	–1437.03	0	50
51	–140.33	0	21	–757.10	0	27	–1065.49	0	32	–1373.88	0	40
53	–132.25	0	16	–762.23	0	29	–1077.23	0	36	–1392.22	0	44
54	–144.14	0	23	–753.24	0.001	26	–1057.79	0.001	31	–1362.34	0.002	36
55	–139.05	0	19	–736.06	0	21	–1034.56	0	24	–1333.07	0	31
56	–174.48	0	29	–693.26	0	13	–952.65	0	13	–1212.03	0	13
58	–162.53	0	27	–705.45	0	17	–976.91	0	17	–1248.36	0	18
59	–180.35	0	33	–685.34	0	11	–937.84	0	10	–1190.34	0.001	10
60	–138.56	0	17	–709.19	0	18	–994.51	0	19	–1279.82	0	23
61	–173.72	0	28	–651.49	0.021	5	–890.38	0.021	4	–1129.26	0.019	4
63	–161.86	0	26	–668.26	0	8	–921.45	0	8	–1174.65	0	9
64	–179.54	0	32	**–640.94**	**0.169**	**1**	**–871.63**	**0.207**	**1**	**–1102.33**	**0.214**	**1**
65	–312.86	0	47	–932.52	0	63	–1242.35	0	66	–1552.18	0	66
66	–317.65	0	48	–926.87	0	62	–1231.48	0	63	–1536.09	0	63
67	–329.56	0	52	–945.95	0	67	–1254.15	0	67	–1562.35	0	67
68	–341.48	0	57	–938.41	0	65	–1236.87	0	64	–1535.34	0	61
69	–143.46	0	22	–762.32	0	30	–1071.75	0	35	–1381.18	0	43
70	–346.14	0	60	–870.34	0	53	–1132.44	0	46	–1394.53	0	45
71	–353.85	0	64	–858.98	0	50	–1111.54	0	44	–1364.10	0	38
72	–363.74	0	66	–882.04	0	55	–1141.20	0	49	–1400.35	0	47
73	–381.15	0	68	–863.98	0	51	–1105.40	0	42	–1346.81	0	32
74	–177.03	0	31	–699.58	0	15	–960.85	0	16	–1222.13	0	15
75	–345.40	0	59	–829.61	0	44	–1071.72	0	34	–1313.82	0	27
76	–353.05	0	63	–814.60	0	41	–1045.38	0	25	–1276.16	0	22
77	–362.98	0	65	–840.13	0	46	–1078.71	0	38	–1317.29	0	28
78	–380.26	0	67	–815.35	0	43	–1032.90	0	23	–1250.44	0	19
79	–176.28	0	30	–658.56	0.001	6	–899.70	0.001	7	–1140.84	0.002	7

TABLE 49 *Simulation results (girl, 1–2 years)*

	Threshold value											
	£0			£20,000			£30,000			£40,000		
Strategy no.	**Exp. NMB**	**Prob. ranked 1st**	**Rank**	**Exp. NMB**	**Prob. ranked 1st**	**Rank**	**Exp. NMB**	**Prob. ranked 1st**	**Rank**	**Exp. NMB**	**Prob. ranked 1st**	**Rank**
1	–38.35	0.318	2	–518.50	0	36	–758.58	0	42	–998.66	0	57
2	**–36.63**	**0.682**	**1**	–502.87	0.26	26	–735.99	0.151	33	–969.11	0.099	46
3	–260.65	0	43	–629.18	0	45	–813.45	0	52	–997.72	0	56
4	–457.59	0	71	–739.38	0	72	–880.28	0	63	–1021.18	0	58
5	–457.77	0	72	–702.19	0	70	–824.40	0	55	–946.60	0	41
6	–46.21	0	6	–519.31	0	37	–755.86	0	39	–992.41	0	55
7	–42.83	0	4	–511.99	0	31	–746.58	0	36	–981.16	0	49
9	–43.92	0	5	–514.30	0	33	–749.50	0	37	–984.69	0	50
10	–42.27	0	3	–510.74	0	30	–744.98	0	35	–979.21	0	47
11	–217.27	0	40	–686.73	0	64	–921.46	0	70	–1156.19	0	70
12	–216.45	0	39	–684.95	0	63	–919.20	0	69	–1153.45	0	69
13	–233.04	0	42	–702.23	0	71	–936.82	0	72	–1171.42	0	72
14	–231.51	0	41	–698.92	0	69	–932.62	0	71	–1166.32	0	71
15	–47.86	0	7	–517.14	0	35	–751.78	0	38	–986.42	0	52
16	–203.71	0	38	–669.94	0	58	–903.06	0	68	–1136.18	0	68
17	–76.05	0	8	–499.74	0	25	–711.59	0	30	–923.43	0	36
18	–106.51	0	14	–498.59	0.007	24	–694.64	0.008	25	–890.68	0.006	28
20	–83.49	0	9	–484.90	0.049	19	–685.61	0.027	21	–886.31	0.024	26
21	–109.45	0	16	–495.79	0.011	22	–688.97	0.027	24	–882.14	0.033	23
22	–102.25	0	12	–482.05	0	18	–671.94	0	20	–861.84	0	20
23	–161.51	0	34	–485.23	0	20	–647.09	0	16	–808.95	0	16
25	–118.29	0	20	–458.73	0	9	–628.95	0.001	10	–799.18	0.001	13
26	–167.49	0	36	–481.03	0	15	–637.80	0	12	–794.58	0	12
27	–102.34	0	13	–463.21	0	10	–643.65	0.001	14	–824.09	0	18
28	–161.66	0	35	–455.94	0.007	8	–603.08	0.008	7	–750.22	0.007	7
30	–118.41	0	21	**–432.52**	**0.296**	**1**	–589.57	0.254	3	–746.62	0.21	5
31	–167.64	0	37	–449.79	0.052	5	–590.86	0.072	4	–731.93	0.076	2
32	–278.23	0	46	–672.56	0	60	–869.73	0	61	–1066.89	0	62
33	–271.40	0	44	–658.07	0	52	–851.41	0	58	–1044.75	0	60
34	–278.01	0	45	–670.27	0	59	–866.40	0	60	–1062.52	0	61
35	–319.71	0	58	–697.63	0	67	–886.59	0	66	–1075.54	0	65
36	–97.58	0	11	–490.57	0.029	21	–687.06	0.033	23	–883.56	0.035	24
37	–300.89	0	49	–669.42	0	57	–853.69	0	59	–1037.95	0	59
38	–330.92	0	61	–658.44	0	53	–822.21	0	54	–985.97	0	51
39	–319.30	0	56	–633.27	0	47	–790.26	0	47	–947.25	0	42
40	–317.49	0	53	–641.67	0	49	–803.76	0	49	–965.85	0	45

continued

TABLE 49 *Simulation results (girl, 1–2 years) (cont'd)*

Strategy no.	Threshold value											
	£0			£20,000			£30,000			£40,000		
	Exp. NMB	Prob. ranked 1st	Rank	Exp. NMB	Prob. ranked 1st	Rank	Exp. NMB	Prob. ranked 1st	Rank	Exp. NMB	Prob. ranked 1st	Rank
41	–395.39	0	69	–693.87	0	65	–843.11	0	57	–992.35	0	54
42	–140.99	0	24	–466.04	0	11	–628.56	0	9	–791.08	0	11
43	–301.41	0	50	–583.20	0	39	–724.10	0	31	–864.99	0	21
44	–331.06	0	62	–629.81	0	46	–779.18	0	45	–928.55	0	38
45	–319.45	0	57	–602.10	0	40	–743.43	0	34	–884.75	0	25
46	–317.63	0	54	–612.48	0	41	–759.90	0	43	–907.32	0	33
47	–395.55	0	70	–659.80	0	55	–791.92	0	48	–924.05	0	37
48	–141.13	0	25	–436.92	0.178	2	–584.81	0.216	2	–732.71	0.212	3
49	–301.59	0	51	–546.00	0.004	38	–668.21	0.028	19	–790.42	0.094	10
50	–93.34	0	10	–517.03	0	34	–728.87	0	32	–940.72	0	40
51	–117.28	0	19	–509.37	0	28	–705.42	0	27	–901.46	0	31
53	–109.15	0	15	–510.56	0	29	–711.26	0	29	–911.97	0	34
54	–121.43	0	23	–507.77	0	27	–700.95	0	26	–894.12	0.001	29
55	–116.54	0	17	–496.33	0	23	–686.23	0	22	–876.13	0	22
56	–153.44	0	28	–477.16	0	13	–639.02	0	13	–800.88	0	14
58	–141.30	0	26	–481.74	0	17	–651.97	0	17	–822.19	0	17
59	–159.88	0	32	–473.42	0	12	–630.19	0	11	–786.97	0	9
60	–116.63	0	18	–477.50	0	14	–657.94	0	18	–838.38	0	19
61	–153.58	0	29	–447.86	0.015	4	–595.00	0.029	5	–742.15	0.031	4
63	–141.43	0	27	–455.53	0	7	–612.58	0	8	–769.64	0	8
64	–160.03	0	33	–442.18	0.091	3	**–583.25**	**0.144**	**1**	**–724.32**	**0.17**	**1**
65	–289.72	0	47	–684.05	0	62	–881.22	0	64	–1078.39	0	66
66	–294.75	0	48	–681.42	0	61	–874.76	0	62	–1068.09	0	63
67	–306.33	0	52	–698.58	0	68	–894.71	0	67	–1090.84	0	67
68	–318.72	0	55	–696.64	0	66	–885.60	0	65	–1074.55	0	64
69	–120.84	0	22	–513.83	0	32	–710.32	0	28	–906.82	0	32
70	–324.93	0	59	–652.46	0	51	–816.22	0	53	–979.99	0	48
71	–333.10	0	63	–647.08	0	50	–804.07	0	50	–961.05	0	44
72	–342.41	0	65	–666.59	0	56	–828.68	0	56	–990.77	0	53
73	–360.67	0	67	–659.15	0	54	–808.39	0	51	–957.63	0	43
74	–156.64	0	30	–481.68	0	16	–644.21	0	15	–806.73	0	15
75	–325.08	0	60	–623.82	0	43	–773.19	0	44	–922.57	0	35
76	–333.25	0	64	–615.91	0	42	–757.23	0	41	–898.56	0	30
77	–342.55	0	66	–637.39	0	48	–784.81	0	46	–932.23	0	39
78	–360.83	0	68	–625.08	0	44	–757.20	0	40	–889.32	0	27
79	–156.78	0	31	–452.57	0.001	6	–600.46	0.001	6	–748.36	0.001	6

TABLE 50 *Simulation results (girl, 2–3 years)*

	Threshold value											
	£0			£20,000			£30,000			£40,000		
Strategy no.	**Exp. NMB**	**Prob. ranked 1st**	**Rank**	**Exp. NMB**	**Prob. ranked 1st**	**Rank**	**Exp. NMB**	**Prob. ranked 1st**	**Rank**	**Exp. NMB**	**Prob. ranked 1st**	**Rank**
1	–45.47	0.288	2	–688.82	0.001	31	–1010.50	0	38	–1332.17	0	46
2	**–43.53**	**0.712**	**1**	–672.76	0.315	15	–987.37	0.208	31	–1301.99	0.156	35
3	–268.42	0	43	–816.70	0	41	–1090.84	0.006	48	–1364.98	0.013	53
4	–466.53	0	71	–944.97	0	72	–1184.18	0	71	–1423.40	0	61
5	–467.21	0	72	–915.05	0	71	–1138.97	0	59	–1362.89	0	52
6	–53.25	0	6	–689.45	0	32	–1007.55	0	37	–1325.65	0	43
7	–49.84	0	4	–682.07	0	24	–998.18	0	34	–1314.30	0	39
9	–50.88	0	5	–684.27	0	28	–1000.97	0	35	–1317.67	0	40
10	–49.24	0	3	–680.74	0	21	–996.48	0	33	–1312.23	0	38
11	–224.27	0	40	–856.77	0	57	–1173.03	0	69	–1489.28	0	70
12	–223.42	0	39	–854.93	0	55	–1170.69	0	68	–1486.44	0	69
13	–239.99	0	42	–872.18	0	66	–1188.27	0	72	–1504.36	0	72
14	–238.43	0	41	–868.79	0	64	–1183.97	0	70	–1499.16	0	71
15	–54.85	0	7	–687.17	0	30	–1003.33	0	36	–1319.49	0	41
16	–210.65	0	38	–839.88	0	48	–1154.49	0	64	–1469.11	0	68
17	–83.93	0	8	–679.49	0	20	–977.27	0	26	–1275.05	0	31
18	–114.31	0	14	–682.72	0.016	26	–966.93	0.019	24	–1251.13	0.018	25
20	–91.84	0	9	–668.15	0.105	12	–956.31	0.068	20	–1244.47	0.055	22
21	–117.77	0	15	–681.24	0.058	22	–962.97	0.078	22	–1244.70	0.09	23
22	–111.07	0	12	–671.19	0	14	–951.26	0	19	–1231.32	0	20
23	–170.38	0	33	–684.09	0	27	–940.95	0	16	–1197.81	0.001	15
25	–128.13	0	20	–655.25	0	5	–918.82	0.002	9	–1182.38	0.002	11
26	–177.35	0	36	–682.27	0.002	25	–934.73	0.001	14	–1187.19	0	12
27	–111.41	0	13	–656.04	0	6	–928.35	0	12	–1200.66	0	16
28	–170.91	0	35	–660.64	0.009	10	–905.50	0.012	7	–1150.37	0.011	7
30	–128.60	0	21	**–634.15**	**0.213**	**1**	–886.92	0.191	2	–1139.69	0.166	4
31	–177.92	0	37	–657.16	0.038	7	–896.78	0.053	4	–1136.40	0.062	3
32	–286.57	0	46	–856.72	0	56	–1141.79	0	60	–1426.86	0	62
33	–279.83	0	44	–843.27	0	51	–1124.98	0	56	–1406.70	0	58
34	–286.26	0	45	–854.54	0	54	–1138.68	0	58	–1422.82	0	60
35	–328.15	0	56	–884.14	0	69	–1162.14	0	66	–1440.13	0	66
36	–105.65	0	11	–674.74	0.067	16	–959.29	0.069	21	–1243.83	0.059	21
37	–310.16	0	49	–858.44	0	59	–1132.59	0	57	–1406.73	0	59
38	–340.75	0	61	–857.15	0	58	–1115.34	0	54	–1373.54	0	55
39	–329.37	0	57	–834.36	0	46	–1086.85	0	46	–1339.35	0	48
40	–327.22	0	53	–840.45	0	49	–1097.06	0	49	–1353.68	0	50

continued

TABLE 50 *Simulation results (girl, 2–3 years) (cont'd)*

Strategy no.	Threshold value											
	£0			£20,000			£30,000			£40,000		
	Exp. NMB	Prob. ranked 1st	Rank	Exp. NMB	Prob. ranked 1st	Rank	Exp. NMB	Prob. ranked 1st	Rank	Exp. NMB	Prob. ranked 1st	Rank
41	–405.54	0	69	–897.27	0	70	–1143.14	0	61	–1389.00	0	57
42	–150.35	0	24	–664.88	0	11	–922.14	0.003	10	–1179.41	0.004	9
43	–311.86	0	50	–790.29	0	39	–1029.50	0	39	–1268.72	0	29
44	–341.27	0	62	–834.13	0	45	–1080.56	0	45	–1326.99	0	44
45	–329.93	0	58	–809.29	0	40	–1048.97	0	40	–1288.66	0	32
46	–327.75	0	54	–816.80	0	42	–1061.33	0	41	–1305.86	0	37
47	–406.16	0	70	–869.75	0	65	–1101.54	0	51	–1333.33	0	47
48	–150.87	0	25	–641.46	0.114	2	**–886.76**	**0.14**	**1**	–1132.05	0.144	2
49	–312.53	0	51	–760.37	0.001	38	–984.29	0.015	30	–1208.21	0.051	18
50	–101.48	0	10	–697.04	0	36	–994.83	0	32	–1292.61	0	33
51	–125.85	0	18	–694.26	0	34	–978.46	0	27	–1262.67	0	27
53	–117.99	0	16	–694.31	0	35	–982.46	0	28	–1270.62	0	30
54	–130.30	0	23	–693.76	0.001	33	–975.50	0.005	25	–1257.23	0.008	26
55	–125.61	0	17	–685.74	0	29	–965.81	0	23	–1245.87	0	24
56	–163.38	0	28	–677.09	0	18	–933.95	0	13	–1190.81	0	13
58	–151.59	0	26	–678.72	0	19	–942.28	0	17	–1205.84	0	17
59	–170.31	0	32	–675.23	0	17	–927.69	0	11	–1180.15	0	10
60	–125.96	0	19	–670.58	0	13	–942.90	0	18	–1215.21	0	19
61	–163.91	0	29	–653.64	0.005	4	–898.51	0.008	5	–1143.37	0.011	5
63	–152.07	0	27	–657.61	0	8	–910.38	0	8	–1163.16	0	8
64	–170.87	0	34	–650.11	0.055	3	–889.73	0.121	3	**–1129.36**	**0.148**	**1**
65	–298.38	0	47	–868.52	0	63	–1153.59	0	63	–1438.67	0	64
66	–303.67	0	48	–867.10	0	62	–1148.82	0	62	–1430.54	0	63
67	–315.30	0	52	–883.58	0	67	–1167.72	0	67	–1451.85	0	67
68	–328.05	0	55	–884.04	0	68	–1162.04	0	65	–1440.03	0	65
69	–129.54	0	22	–698.63	0	37	–983.17	0	29	–1267.72	0	28
70	–334.97	0	59	–851.36	0	53	–1109.56	0	53	–1367.76	0	54
71	–343.61	0	63	–848.60	0	52	–1101.10	0	50	–1353.59	0	49
72	–352.97	0	65	–866.20	0	61	–1122.81	0	55	–1379.43	0	56
73	–371.87	0	67	–863.60	0	60	–1109.46	0	52	–1355.33	0	51
74	–166.77	0	30	–681.30	0	23	–938.56	0	15	–1195.83	0	14
75	–335.48	0	60	–828.35	0	44	–1074.78	0	44	–1321.21	0	42
76	–344.17	0	64	–823.54	0	43	–1063.22	0	42	–1302.90	0	36
77	–353.50	0	66	–842.55	0	50	–1087.08	0	47	–1331.61	0	45
78	–372.49	0	68	–836.08	0	47	–1067.87	0	43	–1299.66	0	34
79	–167.29	0	31	–657.88	0	9	–903.18	0.001	6	–1148.47	0.001	6

TABLE 51 *Simulation results (girl, >3 years)*

	Threshold value											
	£0			£20,000			£30,000			£40,000		
Strategy no.	**Exp. NMB**	**Prob. ranked 1st**	**Rank**	**Exp. NMB**	**Prob. ranked 1st**	**Rank**	**Exp. NMB**	**Prob. ranked 1st**	**Rank**	**Exp. NMB**	**Prob. ranked 1st**	**Rank**
1	–27.46	0.335	2	–219.67	0.001	6	–315.78	0	23	–411.89	0	36
2	**–25.71**	**0.665**	**1**	**–203.99**	**0.722**	**1**	–293.13	0.599	2	–382.27	0.52	14
3	–252.71	0	43	–389.54	0	42	–457.95	0	40	–526.36	0	42
4	–452.29	0	71	–551.25	0	72	–600.73	0	72	–650.21	0	72
5	–453.62	0	72	–536.53	0	71	–577.99	0	71	–619.45	0	71
6	–35.29	0	6	–220.43	0	7	–312.99	0	18	–405.56	0	33
7	–31.92	0	4	–213.13	0	3	–303.74	0	7	–394.35	0	25
9	–33.06	0	5	–215.56	0	4	–306.81	0	11	–398.06	0	28
10	–31.36	0	3	–211.88	0	2	–302.13	0	5	–392.39	0	23
11	–206.36	0	40	–387.87	0	41	–478.62	0	45	–569.37	0	60
12	–205.53	0	39	–386.06	0	40	–476.32	0	44	–566.59	0	56
13	–222.08	0	42	–403.26	0	45	–493.85	0	54	–584.44	0	66
14	–220.57	0	41	–399.98	0	44	–489.68	0	52	–579.39	0	64
15	–37.00	0	7	–218.37	0	5	–309.06	0	12	–399.74	0	30
16	–192.79	0	38	–371.07	0	38	–460.21	0	41	–549.35	0	50
17	–66.77	0	8	–230.90	0	10	–312.96	0	17	–395.03	0	27
18	–97.71	0	14	–246.09	0	16	–320.28	0	25	–394.47	0	26
20	–74.51	0	9	–228.26	0.008	9	–305.13	0.014	8	–382.01	0.019	13
21	–101.03	0	16	–246.76	0	18	–319.63	0.001	24	–392.50	0.001	24
22	–94.41	0	12	–239.33	0	14	–311.79	0	15	–384.25	0	17
23	–154.60	0	33	–273.00	0	36	–332.20	0	36	–391.41	0	22
25	–110.95	0	20	–238.41	0	13	–302.14	0	6	–365.87	0	7
26	–161.28	0	36	–275.22	0	37	–332.20	0	35	–389.17	0	21
27	–95.08	0	13	–231.87	0	11	–300.26	0.001	4	–368.65	0	10
28	–155.65	0	35	–261.33	0.006	31	–314.18	0.009	21	–367.02	0.007	8
30	–111.88	0	21	–228.17	0.145	8	**–286.32**	**0.167**	**1**	**–344.47**	**0.16**	**1**
31	–162.39	0	37	–262.87	0.012	32	–313.11	0.022	19	–363.35	0.038	5
32	–269.69	0	46	–419.34	0	50	–494.17	0	55	–568.99	0	59
33	–263.04	0	44	–408.80	0	46	–481.68	0	47	–554.56	0	51
34	–269.66	0	45	–417.94	0	48	–492.09	0	53	–566.23	0	55
35	–310.58	0	53	–451.92	0	65	–522.59	0	67	–593.26	0	67
36	–88.66	0	11	–237.71	0.001	12	–312.23	0.002	16	–386.75	0.011	18
37	–293.05	0	49	–429.87	0	55	–498.29	0	59	–566.70	0	57
38	–324.48	0	61	–445.08	0	62	–505.38	0	62	–565.67	0	54
39	–313.20	0	57	–427.21	0	51	–484.21	0	49	–541.22	0	46
40	–311.45	0	55	–429.76	0	54	–488.92	0	51	–548.08	0	48

continued

TABLE 51 *Simulation results (girl, >3 years) (cont'd)*

Strategy no.	Threshold value											
	£0			£20,000			£30,000			£40,000		
	Exp. NMB	Prob. ranked 1st	Rank	Exp. NMB	Prob. ranked 1st	Rank	Exp. NMB	Prob. ranked 1st	Rank	Exp. NMB	Prob. ranked 1st	Rank
41	–387.93	0	69	–494.53	0	70	–547.84	0	70	–601.14	0	70
42	–133.81	0	25	–253.36	0	21	–313.13	0	20	–372.90	0	11
43	–296.21	0	50	–395.17	0	43	–444.65	0	39	–494.12	0	39
44	–325.51	0	62	–433.78	0	58	–487.92	0	50	–542.06	0	47
45	–314.31	0	58	–414.87	0	47	–465.15	0	42	–515.43	0	40
46	–312.50	0	56	–418.13	0	49	–470.94	0	43	–523.75	0	41
47	–389.15	0	70	–481.02	0	69	–526.95	0	69	–572.89	0	61
48	–134.85	0	27	–241.88	0.067	15	–295.40	0.113	3	–348.92	0.127	2
49	–297.54	0	51	–380.45	0	39	–421.91	0.009	38	–463.36	0.021	38
50	–84.11	0	10	–248.24	0	19	–330.30	0	31	–412.37	0	37
51	–108.77	0	18	–257.16	0	26	–331.35	0	33	–405.54	0	32
53	–99.99	0	15	–253.73	0	23	–330.61	0	32	–407.48	0	34
54	–113.08	0	23	–258.81	0	28	–331.68	0	34	–404.55	0	31
55	–108.73	0	17	–253.65	0	22	–326.11	0	29	–398.57	0	29
56	–147.04	0	28	–265.44	0	33	–324.64	0	26	–383.85	0	16
58	–133.77	0	24	–261.22	0	30	–324.95	0	28	–388.68	0	19
59	–153.77	0	32	–267.72	0	34	–324.70	0	27	–381.67	0	12
60	–109.41	0	19	–246.19	0	17	–314.58	0	22	–382.98	0	15
61	–148.09	0	29	–253.77	0.005	24	–306.62	0.005	10	–359.46	0.01	4
63	–134.69	0	26	–250.99	0	20	–309.13	0	13	–367.28	0	9
64	–154.89	0	34	–255.37	0.033	25	–305.61	0.058	9	–355.85	0.086	3
65	–281.17	0	47	–430.82	0	56	–505.64	0	63	–580.47	0	65
66	–286.48	0	48	–432.25	0	57	–505.13	0	61	–578.01	0	63
67	–298.19	0	52	–446.47	0	63	–520.61	0	66	–594.76	0	69
68	–310.78	0	54	–452.12	0	66	–522.79	0	68	–593.46	0	68
69	–111.99	0	22	–261.03	0	29	–335.55	0	37	–410.08	0	35
70	–318.44	0	59	–439.04	0	59	–499.33	0	60	–559.63	0	53
71	–327.13	0	63	–441.14	0	60	–498.14	0	58	–555.15	0	52
72	–336.59	0	65	–454.90	0	67	–514.06	0	64	–573.22	0	62
73	–355.32	0	67	–461.93	0	68	–515.23	0	65	–568.53	0	58
74	–149.70	0	30	–269.24	0	35	–329.01	0	30	–388.78	0	20
75	–319.47	0	60	–427.74	0	52	–481.88	0	48	–536.02	0	44
76	–328.24	0	64	–428.80	0	53	–479.08	0	46	–529.36	0	43
77	–337.64	0	66	–443.27	0	61	–496.08	0	57	–548.89	0	49
78	–356.54	0	68	–448.41	0	64	–494.35	0	56	–540.28	0	45
79	–150.73	0	31	–257.76	0	27	–311.28	0	14	–364.80	0	6

TABLE 52 *Simulation results (boy, < 1 year)*

	Threshold value											
	£0			£20,000			£30,000			£40,000		
Strategy no.	**Exp. NMB**	**Prob. ranked 1st**	**Rank**	**Exp. NMB**	**Prob. ranked 1st**	**Rank**	**Exp. NMB**	**Prob. ranked 1st**	**Rank**	**Exp. NMB**	**Prob. ranked 1st**	**Rank**
1	–40.80	0.317	2	–407.38	0	27	–590.68	0	38	–773.97	0	43
2	**–38.95**	**0.683**	**1**	–391.49	0.398	12	–567.75	0.252	27	–744.02	0.169	33
3	–263.82	0	43	–543.76	0	42	–683.73	0	48	–823.70	0	53
4	–461.30	0	71	–672.52	0	72	–778.12	0	72	–883.73	0	62
5	–461.74	0	72	–644.16	0	71	–735.37	0	62	–826.58	0	54
6	–48.59	0	6	–408.05	0	30	–587.77	0	37	–767.50	0	42
7	–45.18	0	4	–400.66	0	18	–578.40	0	32	–756.14	0	36
9	–46.21	0	5	–402.83	0	22	–581.14	0	35	–759.45	0	37
10	–44.65	0	3	–399.46	0	16	–576.87	0	31	–754.27	0	35
11	–219.61	0	40	–575.35	0	54	–753.22	0	67	–931.09	0	70
12	–218.81	0	39	–573.62	0	52	–751.03	0	65	–928.43	0	69
13	–235.40	0	42	–590.91	0	62	–768.66	0	71	–946.42	0	72
14	–233.86	0	41	–587.57	0	60	–764.43	0	70	–941.28	0	71
15	–50.23	0	7	–405.83	0	24	–583.63	0	36	–761.43	0	39
16	–206.06	0	38	–558.59	0	45	–734.86	0	61	–911.13	0	68
17	–79.25	0	8	–401.89	0	20	–563.21	0	25	–724.54	0	30
18	–109.86	0	14	–407.92	0.003	29	–556.96	0.003	24	–705.99	0.009	25
20	–87.26	0	9	–392.72	0.049	13	–545.45	0.053	20	–698.18	0.043	22
21	–112.81	0	15	–406.72	0.006	26	–553.68	0.016	23	–700.63	0.023	24
22	–106.04	0	12	–393.74	0	14	–537.59	0	19	–681.44	0	20
23	–165.58	0	34	–409.31	0	32	–531.18	0	17	–653.05	0	16
25	–123.17	0	20	–380.18	0	6	–508.68	0	9	–637.19	0.001	11
26	–171.54	0	36	–407.88	0	28	–526.05	0	14	–644.22	0	12
27	–106.26	0	13	–379.33	0	4	–515.86	0	11	–652.39	0	15
28	–165.92	0	35	–386.91	0.011	10	–497.40	0.014	7	–607.89	0.012	7
30	–123.47	0	21	**–360.17**	**0.274**	**1**	**–478.52**	**0.258**	**1**	–596.87	0.239	4
31	–171.90	0	37	–384.13	0.032	8	–490.24	0.06	5	–596.35	0.07	3
32	–282.10	0	46	–581.80	0	57	–731.65	0	59	–881.50	0	61
33	–274.95	0	44	–568.96	0	51	–715.97	0	56	–862.97	0	58
34	–281.44	0	45	–579.79	0	56	–728.96	0	58	–878.13	0	60
35	–321.94	0	54	–609.13	0	68	–752.72	0	66	–896.32	0	65
36	–101.01	0	11	–399.97	0.02	17	–549.44	0.032	21	–698.92	0.03	23
37	–305.17	0	49	–585.10	0	59	–725.07	0	57	–865.04	0	59
38	–335.97	0	61	–582.64	0	58	–705.98	0	54	–829.31	0	55
39	–323.72	0	57	–560.15	0	46	–678.36	0	46	–796.58	0	48
40	–321.71	0	53	–565.83	0	49	–687.89	0	49	–809.94	0	49

continued

TABLE 52 *Simulation results (boy, < 1 year) (cont'd)*

Strategy no.	Threshold value											
	£0			£20,000			£30,000			£40,000		
	Exp. NMB	Prob. ranked 1st	Rank	Exp. NMB	Prob. ranked 1st	Rank	Exp. NMB	Prob. ranked 1st	Rank	Exp. NMB	Prob. ranked 1st	Rank
41	–397.39	0	69	–621.48	0	70	–733.53	0	60	–845.58	0	57
42	–145.21	0	24	–390.46	0	11	–513.08	0	10	–635.70	0	9
43	–306.22	0	50	–517.44	0	39	–623.04	0	39	–728.65	0	31
44	–336.30	0	62	–560.77	0	47	–673.00	0	45	–785.23	0	45
45	–324.08	0	58	–536.40	0	40	–642.55	0	40	–748.71	0	34
46	–322.05	0	55	–543.48	0	41	–654.19	0	41	–764.90	0	41
47	–397.79	0	70	–595.45	0	66	–694.28	0	51	–793.11	0	47
48	–145.55	0	25	–368.31	0.145	2	–479.69	0.177	2	–591.08	0.193	2
49	–306.66	0	51	–489.08	0	38	–580.29	0.015	33	–671.50	0.053	19
50	–96.78	0	10	–419.42	0	36	–580.74	0	34	–742.07	0	32
51	–121.23	0	19	–419.30	0.001	35	–568.33	0.001	28	–717.36	0.001	27
53	–113.47	0	16	–418.93	0	33	–571.66	0	29	–724.39	0	29
54	–125.25	0	23	–419.16	0	34	–566.11	0	26	–713.07	0	26
55	–120.55	0	17	–408.25	0	31	–552.10	0	22	–695.95	0	21
56	–158.26	0	28	–402.00	0	21	–523.87	0	13	–645.74	0	13
58	–146.66	0	26	–403.67	0	23	–532.18	0	18	–660.69	0	17
59	–164.51	0	32	–400.85	0	19	–519.01	0	12	–637.18	0	10
60	–120.77	0	18	–393.84	0	15	–530.37	0	16	–666.91	0	18
61	–158.61	0	29	–379.59	0.009	5	–490.08	0.015	4	–600.57	0.019	5
63	–146.96	0	27	–383.66	0	7	–502.01	0	8	–620.37	0	8
64	–164.87	0	33	–377.09	0.052	3	–483.20	0.102	3	**–589.31**	**0.136**	**1**
65	–293.81	0	47	–593.51	0	65	–743.36	0	64	–893.21	0	64
66	–298.73	0	48	–592.74	0	64	–739.74	0	63	–886.75	0	63
67	–310.23	0	52	–608.57	0	67	–757.74	0	69	–906.91	0	67
68	–322.77	0	56	–609.96	0	69	–753.55	0	68	–897.14	0	66
69	–124.70	0	22	–423.66	0	37	–573.14	0	30	–722.61	0	28
70	–329.97	0	59	–576.64	0	55	–699.97	0	52	–823.31	0	52
71	–337.98	0	63	–574.41	0	53	–692.63	0	50	–810.84	0	50
72	–347.17	0	65	–591.29	0	63	–713.35	0	55	–835.40	0	56
73	–365.70	0	67	–589.79	0	61	–701.84	0	53	–813.89	0	51
74	–161.34	0	30	–406.59	0	25	–529.21	0	15	–651.84	0	14
75	–330.30	0	60	–554.76	0	44	–667.00	0	44	–779.23	0	44
76	–338.34	0	64	–550.66	0	43	–656.81	0	42	–762.97	0	40
77	–347.51	0	66	–568.94	0	50	–679.65	0	47	–790.36	0	46
78	–366.10	0	68	–563.76	0	48	–662.59	0	43	–761.42	0	38
79	–161.69	0	31	–384.45	0	9	–495.83	0.002	6	–607.21	0.002	6

TABLE 53 *Simulation results (boy, 1–2 years)*

	Threshold value											
	£0			£20,000			£30,000			£40,000		
Strategy no.	**Exp. NMB**	**Prob. ranked 1st**	**Rank**	**Exp. NMB**	**Prob. ranked 1st**	**Rank**	**Exp. NMB**	**Prob. ranked 1st**	**Rank**	**Exp. NMB**	**Prob. ranked 1st**	**Rank**
1	–36.38	0.3	2	–354.17	0	12	–513.07	0	36	–671.97	0	38
2	**–34.39**	**0.7**	**1**	–338.01	0.532	2	–489.82	0.349	22	–641.63	0.26	30
3	–260.43	0	43	–504.25	0	40	–626.16	0	43	–748.07	0	48
4	–458.82	0	71	–647.52	0	72	–741.88	0	72	–836.23	0	70
5	–459.65	0	72	–625.53	0	71	–708.47	0	71	–791.40	0	58
6	–44.14	0	6	–354.77	0	14	–510.09	0	34	–665.40	0	37
7	–40.68	0	4	–347.29	0	6	–500.59	0	28	–653.89	0	34
9	–41.82	0	5	–349.70	0	8	–503.64	0	29	–657.58	0	35
10	–40.13	0	3	–346.05	0	5	–499.00	0	27	–651.96	0	32
11	–215.10	0	40	–521.96	0	45	–675.39	0	62	–828.82	0	69
12	–214.30	0	39	–520.24	0	44	–673.21	0	61	–826.18	0	68
13	–230.86	0	42	–537.44	0	53	–690.73	0	66	–844.02	0	72
14	–229.30	0	41	–534.07	0	50	–686.45	0	65	–838.84	0	71
15	–45.72	0	7	–352.44	0	10	–505.80	0	30	–659.17	0	36
16	–201.52	0	38	–505.14	0	41	–656.95	0	53	–808.76	0	63
17	–75.41	0	8	–355.73	0	17	–495.89	0	25	–636.05	0	26
18	–106.69	0	14	–366.13	0.001	25	–495.85	0.004	24	–625.57	0.004	24
20	–83.37	0	9	–349.73	0.05	9	–482.92	0.054	16	–616.10	0.057	20
21	–109.56	0	16	–365.45	0.006	24	–493.40	0.013	23	–621.35	0.016	22
22	–102.69	0	12	–355.09	0	15	–481.29	0	15	–607.49	0	19
23	–163.49	0	34	–379.40	0	36	–487.36	0	20	–595.32	0	16
25	–119.64	0	20	–347.55	0.001	7	–461.51	0.001	8	–575.47	0	9
26	–169.31	0	36	–379.00	0	35	–483.85	0	17	–588.70	0.002	14
27	–103.11	0	13	–343.94	0	4	–464.36	0	10	–584.78	0	12
28	–164.14	0	35	–362.04	0.004	23	–460.99	0.008	7	–559.94	0.01	7
30	–120.22	0	21	**–332.22**	**0.22**	**1**	**–438.22**	**0.229**	**1**	–544.22	0.198	2
31	–170.00	0	37	–360.58	0.024	22	–455.87	0.048	5	–551.16	0.056	4
32	–278.47	0	46	–539.09	0	55	–669.39	0	60	–799.70	0	61
33	–271.68	0	44	–527.65	0	47	–655.63	0	52	–783.62	0	56
34	–278.22	0	45	–537.46	0	54	–667.08	0	57	–796.70	0	60
35	–319.73	0	54	–569.58	0	67	–694.50	0	67	–819.43	0	65
36	–97.78	0	11	–357.75	0.014	18	–487.73	0.026	21	–617.72	0.035	21
37	–302.57	0	49	–546.39	0	60	–668.30	0	58	–790.21	0	57
38	–333.02	0	61	–551.13	0	61	–660.18	0	54	–769.23	0	54
39	–321.42	0	57	–531.28	0	49	–636.21	0	47	–741.14	0	46
40	–319.55	0	53	–535.22	0	52	–643.05	0	49	–750.89	0	49

continued

TABLE 53 *Simulation results (boy, 1–2 years) (cont'd)*

Strategy no.	Threshold value											
	£0			£20,000			£30,000			£40,000		
	Exp. NMB	Prob. ranked 1st	Rank	Exp. NMB	Prob. ranked 1st	Rank	Exp. NMB	Prob. ranked 1st	Rank	Exp. NMB	Prob. ranked 1st	Rank
41	–397.09	0	69	–596.33	0	70	–695.95	0	69	–795.57	0	59
42	–142.98	0	24	–359.88	0.001	21	–468.33	0.001	11	–576.78	0.002	10
43	–304.53	0	50	–493.24	0	39	–587.59	0	39	–681.94	0	39
44	–333.66	0	62	–534.15	0	51	–634.39	0	46	–734.64	0	45
45	–322.11	0	58	–512.88	0	42	–608.27	0	40	–703.65	0	40
46	–320.21	0	55	–517.80	0	43	–616.60	0	41	–715.39	0	41
47	–397.85	0	70	–576.13	0	69	–665.28	0	56	–754.42	0	50
48	–143.63	0	26	–342.68	0.103	3	–442.21	0.163	2	**–541.73**	**0.187**	**1**
49	–305.36	0	51	–471.24	0.001	38	–554.18	0.009	38	–637.12	0.025	28
50	–93.07	0	10	–373.39	0	30	–513.55	0	37	–653.71	0	33
51	–118.14	0	19	–377.57	0	33	–507.29	0.001	32	–637.01	0.001	27
53	–109.49	0	15	–375.86	0	31	–509.04	0	33	–642.22	0	31
54	–122.32	0	23	–378.22	0	34	–506.17	0	31	–634.12	0	25
55	–117.39	0	17	–369.79	0	26	–495.99	0	26	–622.19	0	23
56	–156.12	0	28	–372.03	0	28	–479.99	0	14	–587.95	0	13
58	–143.14	0	25	–371.05	0	27	–485.00	0	19	–598.96	0	17
59	–162.65	0	32	–372.35	0	29	–477.20	0	12	–582.05	0	11
60	–117.80	0	18	–358.64	0	19	–479.06	0	13	–599.47	0	18
61	–156.77	0	29	–354.67	0.004	13	–453.62	0.012	4	–552.57	0.016	5
63	–143.71	0	27	–355.71	0	16	–461.71	0	9	–567.72	0	8
64	–163.34	0	33	–353.92	0.038	11	–449.21	0.081	3	–544.50	0.13	3
65	–290.71	0	47	–551.33	0	62	–681.64	0	64	–811.95	0	64
66	–295.70	0	48	–551.68	0	63	–679.66	0	63	–807.65	0	62
67	–307.44	0	52	–566.68	0	66	–696.31	0	70	–825.93	0	67
68	–320.25	0	56	–570.10	0	68	–695.02	0	68	–819.95	0	66
69	–121.63	0	22	–381.60	0	37	–511.59	0	35	–641.57	0	29
70	–327.83	0	59	–545.93	0	59	–654.99	0	51	–764.04	0	53
71	–335.96	0	63	–545.82	0	58	–650.75	0	50	–755.68	0	51
72	–345.51	0	65	–561.18	0	64	–669.01	0	59	–776.85	0	55
73	–364.47	0	67	–563.71	0	65	–663.33	0	55	–762.95	0	52
74	–159.22	0	30	–376.12	0	32	–484.57	0	18	–593.02	0	15
75	–328.47	0	60	–528.95	0	48	–629.20	0	44	–729.44	0	44
76	–336.65	0	64	–527.42	0	46	–622.81	0	42	–718.19	0	42
77	–346.17	0	66	–543.76	0	57	–642.56	0	48	–741.36	0	47
78	–365.23	0	68	–543.51	0	56	–632.66	0	45	–721.80	0	43
79	–159.87	0	31	–358.92	0.001	20	–458.44	0.001	6	–557.97	0.001	6

Table 54 *Simulation results (boy, 2–3 years)*

	Threshold value											
	£0			£20,000			£30,000			£40,000		
Strategy no.	**Exp. NMB**	**Prob. ranked 1st**	**Rank**	**Exp. NMB**	**Prob. ranked 1st**	**Rank**	**Exp. NMB**	**Prob. ranked 1st**	**Rank**	**Exp. NMB**	**Prob. ranked 1st**	**Rank**
1	–29.14	0.316	2	–219.81	0.002	6	–315.14	0	10	–410.48	0	28
2	**–27.43**	**0.684**	**1**	**–204.17**	**0.755**	**1**	**–292.55**	**0.618**	**1**	–380.92	0.519	3
3	–254.57	0	43	–397.58	0	41	–469.09	0	41	–540.59	0	40
4	–454.15	0	71	–566.91	0	72	–623.30	0	72	–679.68	0	72
5	–455.46	0	72	–555.28	0	71	–605.19	0	71	–655.10	0	71
6	–36.98	0	6	–220.57	0	7	–312.36	0	8	–404.15	0	23
7	–33.61	0	4	–213.27	0	3	–303.10	0	3	–392.93	0	12
9	–34.74	0	5	–215.67	0	4	–306.13	0	5	–396.60	0	16
10	–33.08	0	3	–212.08	0	2	–301.57	0	2	–391.07	0	9
11	–208.06	0	40	–388.01	0	40	–477.99	0	43	–567.97	0	49
12	–207.24	0	39	–386.24	0	39	–475.74	0	42	–565.24	0	46
13	–223.83	0	42	–403.52	0	44	–493.37	0	48	–583.22	0	60
14	–222.27	0	41	–400.14	0	43	–489.08	0	45	–578.01	0	55
15	–38.64	0	7	–218.40	0	5	–308.29	0	6	–398.17	0	18
16	–194.50	0	38	–371.25	0	38	–459.63	0	39	–548.00	0	42
17	–68.58	0	8	–234.93	0	9	–318.11	0	13	–401.28	0	21
18	–99.82	0	14	–252.79	0.001	16	–329.28	0	21	–405.76	0.001	24
20	–76.38	0	9	–233.67	0.03	8	–312.32	0.036	7	–390.96	0.04	8
21	–102.76	0	16	–253.45	0.005	17	–328.80	0.011	20	–404.15	0.014	22
22	–96.26	0	12	–247.22	0	13	–322.70	0	15	–398.18	0	19
23	–156.98	0	34	–286.04	0	36	–350.58	0	36	–415.11	0	32
25	–112.93	0	20	–249.12	0	14	–317.22	0	12	–385.32	0	4
26	–162.92	0	36	–288.30	0	37	–351.00	0	37	–413.69	0	31
27	–96.93	0	13	–241.29	0	11	–313.47	0	9	–385.65	0	5
28	–158.01	0	35	–276.86	0.001	31	–336.28	0.003	26	–395.70	0.007	15
30	–113.85	0	21	–241.00	0.12	10	–304.57	0.147	4	**–368.14**	**0.172**	**1**
31	–164.02	0	37	–278.57	0.006	33	–335.84	0.02	25	–393.11	0.025	13
32	–271.65	0	46	–425.63	0	48	–502.61	0	52	–579.60	0	56
33	–264.88	0	44	–415.59	0	46	–490.94	0	46	–566.30	0	48
34	–271.30	0	45	–424.56	0	47	–501.19	0	49	–577.82	0	54
35	–312.61	0	53	–459.40	0	64	–532.80	0	66	–606.20	0	67
36	–90.61	0	11	–243.93	0.013	12	–320.59	0.02	14	–397.25	0.028	17
37	–294.95	0	49	–437.96	0	52	–509.46	0	56	–580.97	0	58
38	–326.56	0	61	–457.20	0	62	–522.52	0	63	–587.84	0	61
39	–315.05	0	57	–440.42	0	54	–503.10	0	53	–565.78	0	47
40	–312.92	0	55	–442.32	0	56	–507.02	0	54	–571.72	0	51

continued

Table 54 *Simulation results (boy, 2–3 years) (cont'd)*

Strategy no.	Threshold value											
	£0			£20,000			£30,000			£40,000		
	Exp. NMB	Prob. ranked 1st	Rank	Exp. NMB	Prob. ranked 1st	Rank	Exp. NMB	Prob. ranked 1st	Rank	Exp. NMB	Prob. ranked 1st	Rank
41	–390.11	0	69	–509.07	0	70	–568.55	0	70	–628.03	0	70
42	–135.93	0	24	–265.52	0	24	–330.32	0	22	–395.12	0	14
43	–298.10	0	50	–410.87	0	45	–467.26	0	40	–523.64	0	39
44	–327.57	0	62	–448.23	0	58	–508.56	0	55	–568.88	0	50
45	–316.16	0	58	–430.67	0	49	–487.92	0	44	–545.18	0	41
46	–313.96	0	56	–433.16	0	50	–492.76	0	47	–552.36	0	43
47	–391.32	0	70	–498.37	0	69	–551.89	0	69	–605.41	0	66
48	–136.96	0	27	–256.41	0.055	19	–316.13	0.095	11	–375.85	0.116	2
49	–299.42	0	51	–399.24	0	42	–449.15	0.002	38	–499.06	0.005	38
50	–85.96	0	10	–252.31	0	15	–335.48	0	24	–418.65	0	36
51	–110.76	0	18	–263.73	0	22	–340.21	0	29	–416.70	0	35
53	–102.02	0	15	–259.31	0	20	–337.96	0	28	–416.60	0	34
54	–114.86	0	23	–265.55	0	25	–340.90	0	31	–416.25	0	33
55	–110.63	0	17	–261.58	0	21	–337.06	0	27	–412.54	0	30
56	–149.11	0	28	–278.18	0	32	–342.71	0	32	–407.24	0	26
58	–135.96	0	25	–272.15	0	29	–340.25	0	30	–408.35	0	27
59	–155.53	0	32	–280.91	0	34	–343.61	0	33	–406.30	0	25
60	–111.29	0	19	–255.65	0	18	–327.83	0	17	–400.01	0	20
61	–150.15	0	29	–268.99	0.005	27	–328.41	0.007	18	–387.83	0.011	7
63	–136.88	0	26	–264.03	0	23	–327.60	0	16	–391.17	0	10
64	–156.63	0	33	–271.17	0.007	28	–328.44	0.04	19	–385.72	0.06	6
65	–283.09	0	47	–437.07	0	51	–514.06	0	57	–591.05	0	63
66	–288.32	0	48	–439.03	0	53	–514.39	0	58	–589.74	0	62
67	–299.72	0	52	–452.97	0	60	–529.60	0	64	–606.23	0	68
68	–312.72	0	54	–459.52	0	65	–532.92	0	67	–606.32	0	69
69	–114.28	0	22	–267.60	0	26	–344.26	0	34	–420.92	0	37
70	–320.41	0	59	–451.05	0	59	–516.37	0	59	–581.69	0	59
71	–328.98	0	63	–454.34	0	61	–517.02	0	60	–579.71	0	57
72	–337.96	0	65	–467.36	0	67	–532.07	0	65	–596.77	0	65
73	–357.31	0	67	–476.27	0	68	–535.75	0	68	–595.23	0	64
74	–152.26	0	30	–281.85	0	35	–346.65	0	35	–411.45	0	29
75	–321.42	0	60	–442.08	0	55	–502.41	0	51	–562.73	0	45
76	–330.08	0	64	–444.59	0	57	–501.85	0	50	–559.10	0	44
77	–339.00	0	66	–458.20	0	63	–517.80	0	61	–577.40	0	53
78	–358.52	0	68	–465.56	0	66	–519.09	0	62	–572.61	0	52
79	–153.29	0	31	–272.74	0	30	–332.46	0.001	23	–392.18	0.002	11

TABLE 55 *Simulation results (boy, >3 years)*

	Threshold value											
	£0			£20,000			£30,000			£40,000		
Strategy no.	**Exp. NMB**	**Prob. ranked 1st**	**Rank**	**Exp. NMB**	**Prob. ranked 1st**	**Rank**	**Exp. NMB**	**Prob. ranked 1st**	**Rank**	**Exp. NMB**	**Prob. ranked 1st**	**Rank**
1	–25.31	0.315	2	–198.27	0.001	6	–284.75	0	7	–371.22	0	18
2	**–23.60**	**0.685**	**1**	**–182.64**	**0.79**	**1**	**–262.16**	**0.709**	**1**	**–341.68**	**0.643**	**1**
3	–251.43	0	43	–382.06	0	43	–447.37	0	41	–512.69	0	41
4	–451.48	0	71	–557.23	0	72	–610.10	0	72	–662.98	0	72
5	–453.00	0	72	–548.23	0	71	–595.85	0	71	–643.47	0	71
6	–33.15	0	6	–199.04	0	7	–281.98	0	6	–364.93	0	11
7	–29.81	0	4	–191.81	0	3	–272.81	0	3	–353.81	0	4
9	–30.82	0	5	–193.94	0	4	–275.50	0	4	–357.06	0	5
10	–29.25	0	3	–190.54	0	2	–271.18	0	2	–351.83	0	3
11	–204.22	0	40	–366.46	0	40	–447.59	0	42	–528.71	0	43
12	–203.41	0	39	–364.72	0	39	–445.37	0	40	–526.02	0	42
13	–219.97	0	42	–381.91	0	42	–462.89	0	45	–543.86	0	49
14	–218.46	0	41	–378.64	0	41	–458.74	0	44	–538.83	0	47
15	–34.85	0	7	–196.96	0	5	–278.01	0	5	–359.06	0	7
16	–190.67	0	38	–349.71	0	38	–429.23	0	38	–508.75	0	40
17	–65.00	0	8	–216.58	0	9	–292.38	0	10	–368.17	0	13
18	–95.93	0	14	–235.52	0.002	15	–305.32	0.002	16	–375.11	0.002	22
20	–73.42	0	9	–216.47	0.032	8	–288.00	0.043	8	–359.53	0.041	8
21	–99.69	0	16	–237.17	0.001	17	–305.91	0.009	17	–374.65	0.016	20
22	–92.85	0	12	–231.80	0	13	–301.28	0	14	–370.76	0	17
23	–152.91	0	33	–272.94	0	36	–332.95	0	36	–392.96	0	36
25	–110.65	0	21	–236.06	0	16	–298.77	0	13	–361.48	0	10
26	–160.39	0	36	–277.06	0	37	–335.39	0	37	–393.73	0	37
27	–93.62	0	13	–227.25	0	10	–294.06	0	11	–360.87	0	9
28	–154.11	0	35	–265.86	0.002	32	–321.74	0.003	30	–377.61	0.004	25
30	–111.73	0	23	–229.66	0.091	12	–288.63	0.105	9	–347.60	0.106	2
31	–161.67	0	37	–269.53	0.004	35	–323.46	0.015	32	–377.39	0.017	24
32	–268.24	0	46	–408.60	0	48	–478.78	0	50	–548.96	0	53
33	–261.62	0	44	–399.15	0	45	–467.91	0	46	–536.67	0	46
34	–267.99	0	45	–407.38	0	47	–477.07	0	48	–546.76	0	52
35	–309.15	0	53	–443.23	0	62	–510.26	0	65	–577.30	0	67
36	–87.41	0	11	–227.31	0.013	11	–297.27	0.018	12	–367.22	0.028	12
37	–291.69	0	49	–422.32	0	51	–487.63	0	52	–552.95	0	56
38	–323.43	0	61	–444.66	0	64	–505.28	0	62	–565.89	0	63
39	–312.17	0	57	–428.84	0	54	–487.18	0	51	–545.52	0	51
40	–309.98	0	55	–429.56	0	55	–489.35	0	55	–549.14	0	54

continued

TABLE 55 *Simulation results (boy, >3 years) (cont'd)*

Strategy no.	Threshold value											
	£0			£20,000			£30,000			£40,000		
	Exp. NMB	Prob. ranked 1st	Rank	Exp. NMB	Prob. ranked 1st	Rank	Exp. NMB	Prob. ranked 1st	Rank	Exp. NMB	Prob. ranked 1st	Rank
41	–386.84	0	69	–498.03	0	70	–553.63	0	70	–609.23	0	70
42	–133.11	0	24	–253.68	0	26	–313.97	0	22	–374.25	0	19
43	–295.32	0	50	–401.07	0	46	–453.94	0	43	–506.82	0	39
44	–324.60	0	62	–437.74	0	59	–494.31	0	58	–550.88	0	55
45	–313.44	0	58	–421.31	0	50	–475.24	0	47	–529.17	0	44
46	–311.19	0	56	–422.41	0	52	–478.03	0	49	–533.64	0	45
47	–388.23	0	70	–489.76	0	69	–540.53	0	69	–591.29	0	69
48	–134.30	0	26	–246.67	0.048	21	–302.86	0.061	15	–359.05	0.076	6
49	–296.84	0	52	–392.07	0.002	44	–439.69	0.004	39	–487.31	0.013	38
50	–82.35	0	10	–233.94	0	14	–309.73	0	19	–385.52	0	29
51	–107.09	0	17	–246.69	0	22	–316.48	0	26	–386.28	0	32
53	–99.24	0	15	–242.30	0	19	–313.83	0	21	–385.36	0	28
54	–111.51	0	22	–249.00	0	23	–317.74	0	27	–386.48	0	33
55	–107.21	0	18	–246.17	0	20	–315.64	0	25	–385.12	0	27
56	–145.62	0	28	–265.65	0	31	–325.66	0	33	–385.67	0	30
58	–133.79	0	25	–259.21	0	28	–321.91	0	31	–384.62	0	26
59	–152.52	0	32	–269.19	0	33	–327.52	0	34	–385.86	0	31
60	–107.98	0	19	–241.61	0	18	–308.42	0	18	–375.23	0	23
61	–146.82	0	29	–258.57	0	27	–314.45	0.002	23	–370.32	0.005	15
63	–134.87	0	27	–252.80	0	25	–311.77	0	20	–370.74	0	16
64	–153.80	0	34	–261.66	0.014	29	–315.59	0.029	24	–369.53	0.049	14
65	–279.73	0	47	–420.09	0	49	–490.27	0	56	–560.44	0	62
66	–284.92	0	48	–422.44	0	53	–491.20	0	57	–559.96	0	61
67	–296.56	0	51	–435.95	0	58	–505.64	0	63	–575.34	0	65
68	–309.28	0	54	–443.35	0	63	–510.38	0	66	–577.42	0	68
69	–110.63	0	20	–250.54	0	24	–320.49	0	29	–390.44	0	35
70	–317.38	0	59	–438.61	0	60	–499.23	0	59	–559.84	0	60
71	–325.88	0	63	–442.55	0	61	–500.89	0	60	–559.23	0	59
72	–335.26	0	65	–454.84	0	66	–514.63	0	67	–574.42	0	64
73	–354.15	0	67	–465.34	0	68	–520.94	0	68	–576.54	0	66
74	–148.76	0	30	–269.33	0	34	–329.61	0	35	–389.90	0	34
75	–318.55	0	60	–431.69	0	56	–488.26	0	53	–544.83	0	50
76	–327.15	0	64	–435.02	0	57	–488.95	0	54	–542.88	0	48
77	–336.47	0	66	–447.69	0	65	–503.31	0	61	–558.92	0	58
78	–355.54	0	68	–457.07	0	67	–507.84	0	64	–558.60	0	57
79	–149.94	0	31	–262.32	0	30	–318.51	0	28	–374.69	0	21

Appendix 11

Protocol changes

Inclusion criteria

Population

Very few studies were identified that included only children aged less than 5 years, and those that did were generally restricted to children aged less than 2. It was therefore decided to expand the inclusion criteria so that studies that included children aged less than 18 years were eligible for inclusion, provided that they also included children aged less than 5.

Study design

The large majority of studies identified were diagnostic cohort studies, with only a small number of diagnostic case–control studies meeting inclusion criteria. As diagnostic case–control studies are subject to considerably more bias than diagnostic cohort studies, it was decided to limit the diagnostic accuracy studies included in the review to diagnostic cohort studies.

Existing systematic reviews

It was decided not to include existing systematic reviews in the current review, but instead to use these as sources of potentially relevant studies. This was due to differences between the identified systematic reviews and the proposed inclusion criteria and methods of analysis for the current review.

Feedback

The HTA Programme and the authors would like to know your views about this report.

The Correspondence Page on the HTA website (http://www.hta.ac.uk) is a convenient way to publish your comments. If you prefer, you can send your comments to the address below, telling us whether you would like us to transfer them to the website.

We look forward to hearing from you.

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