

INTRODUCTION

- Urinary tract infections (UTIs) are among the most common bacterial infections in children.¹
- The gold standard diagnostic test is urine culture; however, this test requires specific sample types and collection methods, clinical laboratory resources and takes 24-48 hours.²
- Point-of-care tests (POCTs) enable rapid, near-patient diagnosis of UTIs, supporting early treatment, especially in resource-limited settings. This helps prevent renal scarring, long-term complications, and sepsis, while also reducing inappropriate antimicrobial use.³⁻⁶

OBJECTIVE

To conduct a systematic literature review (SLR) and meta-analysis to determine the diagnostic accuracy of POCTs for UTIs in children (aged 0-19 years) with suspected UTI.

METHODS

- This review followed the WHO Handbook for Guideline Development⁷, the Cochrane Handbook for Diagnostic Test Accuracy (v2.0), and PRISMA-DTA guidelines.⁸
- The study protocol was prospectively registered in the PROSPERO database of systematic review protocols (CRD42023474006).
- Electronic databases (EMBASE, MEDLINE, MEDLINE In-Process, CENTRAL, & CDSR) were searched in Aug.-Sept. 2023 from inception, supplemented with searches of registries (ClinicalTrials.gov, EU CTR, WHO ICTRP).
- Searches of conference abstracts (2020-2023), Google Scholar were conducted in Sept. 2023; reference lists of SLRs and included articles were also manually screened.
- We included studies on UTI screening in the broader pediatric population (e.g., general population). Adult-only studies (>19 years) were excluded.
- POCTs were defined as tests performed near or on the patient (or specimen).
- Two reviewers screened for studies reporting diagnostic accuracy measures for POCTs compared with urine culture.
- Data was extracted; quality assessed by 2 reviewers (QUADAS-2).⁹ Random-effects meta-analysis generated pooled POCT estimates for outcomes reported by ≥3 studies.
- Certainty of evidence (CoE) for pooled estimates was determined using Grading of Recommendations, Assessment, Development and Evaluation (GRADE).¹⁰

RESULTS

- Screening of 6,212 records, review of 271 full texts from databases and 44 from complementary searches, resulted in inclusion of 68 studies (67 cross-sectional, 1 case-control) on diagnostic accuracy of 28 POCTs (**Figure 1**).
- A total of 78,227 patients were included and study cohorts ranged from 32 to 8,815 patients.
- Eight POCTs were assessed by ≥ 3 studies and considered for meta-analyses (dipstick LE, dipstick nitrite, dipstick LE or nitrite, dipstick LE and nitrite, dipstick blood, dipstick protein, dipstick LE and/or nitrite and/or blood and/or protein, and Uriscreeen); CoE was moderate to very low.
- For the diagnosis of pediatric UTIs, sensitivity ranged from 42.2% to 93.3%, and specificity ranged from 47.5% to 98.3% across the eight POCTs assessed in the meta-analysis of this SLR (**Table 1**).
- The highest diagnostic accuracy was identified with dipstick leukocyte esterase (LE) or nitrite (i.e., test considered positive when ≥1 test component was positive; sensitivity 87.4%) and dipstick LE (sensitivity 81.0%).

Table 1. Summary estimates of POCTs for the diagnosis of UTIs in children (<19 yrs.)

POCT	Sensitivity			Specificity		
	No. of studies	No. of children (TP+FN)	Sensitivity, % (95% CI)	No. of studies	No. of children (TN+FP)	Specificity, % (95% CI)
Dipstick blood	6	355	43.3 (26.0, 62.5)	5	1897	80.0 (62.5, 90.6)
Dipstick LE	34	3940	81.0 (72.9, 87.0)	33	25,215	86.2 (81.8, 89.7)
Dipstick nitrite	44	5207	47.0 (41.2, 52.9)	42	35,343	98.3 (97.4, 98.9)
Dipstick protein	4	254	42.2 (31.1, 52.1)	4	1431	83.8 (73.2, 90.7)
Dipstick LE ⁺ or nitrite	31	5431	87.4 (82.7, 91.0)	30	33,149	85.5 (79.8, 89.7)
Dipstick LE and nitrite	12	1933	60.0 (47.6, 77.7)	11	5929	96.8 (92.9, 98.6)
Dipstick LE, nitrite, blood, or protein	4	279	93.3 (82.5, 97.7)	4	1635	47.5 (38.5, 56.7)
Uriscreeen	3	96	87.7 (40.6, 98.7)	3	381	75.3 (63.9, 84.0)

Abbreviations: CI, confidence interval; FN, false negative; FP, false positive; LE, leucocyte esterase; POCT: point of care test; TN, true negative; TP, true positive; UTI, urinary tract infection

DISCUSSION & CONCLUSIONS

- Review findings support using dipstick LE or dipstick LE or nitrite for potential UTIs in children.
- In triage settings, false-negative POCT results delay UTI treatment by 24-48 hours, risking infection worsening and renal scarring in children.
- In replacement settings, false negatives pose even greater risks due to longer treatment delays.
- False-positive results lead to unnecessary antibiotics (full course in replacement settings), harming antimicrobial stewardship and delaying correct infection management.
- Future research should assess POCT feasibility across clinical/geographic settings, analyzing investment cost, cost/test, turnaround time, supply security, and resource use.

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DISCLOSURES

Authors have no conflicts of interest to declare

Figure 1. Study selection flowchart

