Brief description of patient problem/setting : 35-year-old female presents to urgent care with a 2-day history of dysuria and urinary frequency. She reports mild suprapubic discomfort but is unsure whether the symptoms are urinary in origin or related to recent dehydration. She denies fever, chills, flank pain, nausea, vomiting, or vaginal discharge. On examination, the patient is hemodynamically stable and afebrile. Because the symptoms are suggestive but not definitively diagnostic of uncomplicated cystitis, the clinical question is whether urine dipstick testing provides sufficient diagnostic accuracy compared with urine culture to confirm a urinary tract infection and guide treatment.

Search Question: In adult women presenting to urgent care with symptoms of uncomplicated cystitis, does urine dipstick testing accurately diagnose urinary tract infection compared with urine culture?

Question Type: What kind of question is this?

☐Prevalence ☐Screening ☐**Diagnosis** ☐Prognosis ☐Treatment ☐Harms

Assuming that the highest level of evidence to answer your question will be meta-analysis or systematic review, what other types of study might you include if these are not available (or if there is a much more current study of another type)?

If a meta-analysis or systematic review is not available, I would include prospective diagnostic accuracy studies, since these are among the strongest study designs for evaluating the sensitivity, specificity, positive predictive value, and negative predictive value of urine dipstick testing compared with urine culture. I would also include cross-sectional diagnostic studies and prospective cohort studies that directly compare urine dipstick findings, such as leukocyte esterase and nitrites, with urine culture results in adult women presenting with symptoms suggestive of uncomplicated cystitis. If available, I would also consider clinical practice guidelines and evidence-based reviews that summarize the diagnostic performance of urine dipstick testing in the urgent care or primary care setting.

PICO search terms:

P	I	C	O
Adult women	Urine dipstick	Urine culture	Diagnostic accuracy
Urinary tract infection	Urine dipstick testing	Laboratory urine culture	Sensitivity
Women with dysuria	Point-of-care urinalysis	Urine microscopy and culture	Specificity

Women with urinary frequency			Positive predictive value
Uncomplicated cystitis			Negative predictive value
Lower urinary tract symptoms			Accurate diagnosis of urinary tract infection

Search Terms

	Pubmed	Cochrane Library	Google Scholar
Search Terms	("uncomplicated cystitis" OR "urinary tract infection" OR dysuria OR "lower urinary tract symptoms") AND ("urine dipstick" OR "Point-of-care urinalysis" OR nitrite OR "point-of-care urinalysis") AND ("urine culture") AND ("diagnostic accuracy" OR sensitivity OR specificity)	urine dipstick urinary tract infection women urine culture urinary tract infection women diagnosis	urine dipstick diagnostic accuracy uncomplicated cystitis women urine culture
Filters	Publication date: 2010 - 2026, English language, Humans, Female, Adult 19 years +, MEDLINE indexed	Publication date: January 2016 - January 2026	Results were sorted by relevance and Reviewed articles Publication date within 10 years
Results	About 26	About 10	About 576
Selected	Choose 2 articles	none	Choose 1 articles

After applying the initial search terms and database-specific filters, a large number of studies were identified, particularly in Google Scholar. I first screened the titles within the first 1–2 pages to exclude studies that clearly did not match my clinical question, such as those focusing on pediatric patients, male patients, pregnant women, recurrent or complicated urinary tract infections, pyelonephritis, or inpatient populations. I then reviewed the abstracts of the remaining studies to ensure they specifically addressed adult women presenting with symptoms suggestive of uncomplicated cystitis and possibly directly evaluated the diagnostic accuracy of urine dipstick testing compared with urine culture. Priority was given to systematic reviews,

meta-analyses, and prospective diagnostic accuracy studies, since these provide the highest level of evidence for a diagnosis-based clinical question. Among the remaining articles, I selected studies that reported key diagnostic outcomes such as sensitivity, specificity, positive predictive value, and negative predictive value, with urine culture used as the reference standard. Preference was also given to more recent peer-reviewed articles within the last 10 years, while still including one highly relevant foundational review article when newer evidence directly answering the question was limited. This process helped narrow down the results and identify the most clinically relevant articles to support the PICO question.

Results found:

Article # 1 : Reevaluating the true diagnostic accuracy of dipstick tests to diagnose urinary tract infection using Bayesian latent class analysis

Bafna P, Deepanjali S, Mandal J, Balamurugan N, Swaminathan RP, Kadhiravan T. Reevaluating the true diagnostic accuracy of dipstick tests to diagnose urinary tract infection using Bayesian latent class analysis. PLoS One. 2020;15(12):e0244870. Published 2020 Dec 31. doi:10.1371/journal.pone.0244870

Abstract

Objective: Previous studies on diagnostic accuracy of dipstick testing for leukocyte esterase (LE) and nitrite to diagnose urinary tract infection (UTI) had used urine culture, which is an imperfect gold standard. Estimates of diagnostic accuracy obtained using the classical gold standard framework might not reflect the true diagnostic accuracy of dipstick tests.

Methods: We used the dataset from a prospective, observational study conducted in the emergency department of a teaching hospital in southern India. Patients with a clinical suspicion of UTI underwent dipstick testing for LE and nitrite, urine microscopy, and urine culture. Based on the results of urine microscopy and culture, UTI was classified into definite, probable, and possible. Patients with microscopic pyuria and a positive urine culture were adjudicated as definite UTI. Unequivocal imaging evidence of emphysematous pyelonephritis or perinephric collections was also considered definite UTI. We estimated the diagnostic accuracy of LE and nitrite tests using the classical analysis (assuming definite UTI as gold standard) and two different Bayesian latent class models (LCMs; 3-tests in 1-population and 2-tests in 2-populations models).

Results: We studied 149 patients. Overall, 64 (43%) patients had definite, 76 (51%) had probable, and 2 (1.3%) had possible UTI; 7 (4.6%) had alternate diagnoses. In classical analysis, LE was more sensitive than nitrite (87.5% versus 70.5%), while nitrite was more specific (24% versus 58%). The 3-tests in 1-population Bayesian LCM indicated a substantially better sensitivity and specificity for LE (98.1% and 47.6%) and nitrite (88.2% and 97.7%). True sensitivity and specificity of urine culture as estimated by the model was 48.7% and 73.0%. Estimates of the 2-tests in 2-populations model were in agreement with the 3-tests in 1-population model.

Conclusions: Bayesian LCMs indicate a clinically important improvement in the true diagnostic accuracy of urine dipstick testing for LE and nitrite. Given this, a negative dipstick LE would rule-out UTI, while a positive dipstick nitrite would rule-in UTI in our study setting. True diagnostic accuracy of urine dipstick testing for UTI in various practice settings needs reevaluation using Bayesian LCMs.

- This article is a prospective observational diagnostic accuracy study that used an advanced statistical method called Bayesian latent class modeling to evaluate the accuracy of urine dipstick testing for suspected urinary tract infection. I chose this article because it directly answers my PICO question by comparing urine dipstick components, specifically leukocyte esterase and nitrite, with urine culture, which is the exact diagnostic comparison I am looking at. What makes this article especially relevant is that it focuses on the diagnostic performance of the dipstick test, including sensitivity and specificity, which is the main outcome of my clinical question. I also liked that it addresses an important limitation seen in many previous studies, where urine culture is often assumed to be a perfect gold standard, even though culture itself can miss infections. By using Bayesian latent class analysis, this study provides a more accurate estimate of the true performance of leukocyte esterase and nitrite testing. The findings are also clinically useful, showing that leukocyte esterase had a very high sensitivity, making it helpful for ruling out UTI when negative, while nitrite had very high specificity, making it useful for ruling in infection when positive. I chose this article because it is peer-reviewed, published in 2020, within the required 10-year timeframe, and directly supports the diagnostic accuracy aspect of my PICO question in a way that is clinically relevant to urgent care decision-making.

Key Findings:

- This study included 149 patients who presented to the emergency department with suspected urinary tract infection symptoms. Each patient underwent urine dipstick testing (leukocyte esterase and nitrite), urine microscopy, and urine culture, allowing the researchers to directly compare the diagnostic performance of each test. Among the study population, approximately 43% had definite UTI, 51% had probable UTI, and about 5% had other diagnoses, making this a clinically relevant population for evaluating diagnostic accuracy.
- The article addressed a major limitation seen in older diagnostic studies. Most previous studies treated urine culture as a perfect gold standard, but in reality urine culture can both miss true infections and occasionally show bacterial growth that may not represent a true symptomatic infection. To address this issue, the researchers used Bayesian latent class modeling, which is a more advanced statistical method that estimates the true diagnostic accuracy of the dipstick test without assuming culture is perfect.

- When the researchers used the traditional method of comparing the dipstick directly to urine culture, leukocyte esterase showed a sensitivity of 87.5% and specificity of 24%, while nitrite showed a sensitivity of 70.5% and specificity of 58%.
- However, when they used the Bayesian method, which accounts for the imperfections of urine culture, the results were significantly stronger. Leukocyte esterase had a sensitivity of 98.1% and specificity of 47.6%, while nitrite had a sensitivity of 88.2% and specificity of 97.7%.
- These findings are clinically very important because they show that a negative leukocyte esterase result is excellent for ruling out a UTI. With such high sensitivity, a negative result makes the likelihood of a true urinary tract infection very low.
- On the other hand, a positive nitrite result is excellent for ruling in a UTI, given its very high specificity. This means that when nitrite is positive, the provider can be highly confident that the patient truly has a urinary tract infection and may feel more comfortable initiating empiric treatment.
- Another major finding from this study was that urine culture itself was found to have a sensitivity of only 48.7% and specificity of 73.0%, suggesting that culture may miss a significant number of true infections. This is especially relevant in urgent care settings, where providers often need to make treatment decisions before culture results are available.
- Overall, this study supports that urine dipstick testing is more clinically useful than previously believed, especially in symptomatic patients. In practice, a negative leukocyte esterase helps rule out infection, while a positive nitrite strongly supports the diagnosis of UTI and initiation of treatment, making it highly relevant to urgent care clinical decision-making.

Article #2: Accuracy of leukocyte esterase and nitrite tests for diagnosing bacteriuria in older adults: a systematic review and meta-analysis

Moragas A, Monfà R, García-Sangenís A, Llor C. Accuracy of leukocyte esterase and nitrite tests for diagnosing bacteriuria in older adults: a systematic review and meta-analysis. Clin Microbiol Infect. 2026;32(1):19-29. doi:10.1016/j.cmi.2025.08.027

Abstract

Background: Urine dipsticks are commonly used for the diagnosis of bacteriuria or urinary tract infections (UTIs).

Objectives: To perform a systematic review and meta-analysis to evaluate the accuracy of positive leukocyte esterase or nitrite results from dipsticks (index test) for diagnosing bacteriuria in older individuals, using urine culture as the reference standard.

Data sources: MEDLINE (PubMed), EMBASE, and Cochrane Database of Systematic Reviews from the inception date up to September 2025. We also searched the reference lists of all the studies identified.

Study eligibility criteria: Both prospective observational cohort and case-control diagnostic studies were included. No language restriction was applied.

Participants: Individuals aged ≥60 years with or without symptoms of UTI in the community, nursing homes or hospitalized.

Assessment of risk of bias: We used the Quality Assessment tool for Diagnostic Accuracy Studies (QUADAS)-2 tool for assessing risk of bias.

Methods of data synthesis: A random-effect meta-analysis was performed to determine the pooled sensitivity, specificity and predictive values of leukocyte esterase or nitrites for the detection of bacteriuria. International Prospective Register of Systematic Reviews (PROSPERO) identifier: CRD42024561882.

Results: Of 1933 articles screened, 16 met inclusion criteria and had a moderate risk of bias. Ten studies were hospital-based; six were in nursing homes. Pooled urine dipstick sensitivity and specificity for bacteriuria were 90% (95% CI, 84%-94%) and 56% (43%-68%), respectively (diagnostic OR 11.4; 10.2-12.8). In symptomatic older adults, the sensitivity and specificity for predicting UTI were 92% (76%-97%) and 39% (19%-62%), respectively, with a diagnostic OR of 7.4 (3.9-10.9).

Discussion: A positive dipstick result is inconclusive and does not confirm bacteriuria or UTI in symptomatic older adults. Because of high asymptomatic bacteriuria prevalence in older individuals, bacteriuria alone lacks diagnostic value. These findings support discontinuing dipstick testing for UTI diagnosis in this population**.**

- This article is a systematic review with meta-analysis, which represents one of the highest levels of evidence for a diagnostic accuracy question. I chose this article because it directly evaluates the accuracy of urine dipstick testing, specifically leukocyte esterase and nitrite, compared with urine culture, which aligns with the main diagnostic comparison in my PICO question. One of the main reasons I included this article is because it provides pooled sensitivity and specificity data across multiple studies, making the findings more reliable than a single study alone. It is also a very recent article, published in 2025, which strengthens the evidence base for my search. Although the population primarily includes older adults aged 60 years and older, which does not exactly match my urgent care population of adult women with uncomplicated cystitis, I felt it was still valuable because it provides strong evidence on the overall diagnostic performance of urine dipstick testing and highlights how test accuracy may vary depending on patient population. I would use this article more as supporting evidence and comparison, while relying more heavily on studies directly involving adult women with uncomplicated cystitis for my primary conclusions.

Key Findings:

- This article was a systematic review with meta-analysis that included 16 studies, with 10 hospital-based studies and 6 nursing home studies, all involving adults 60 years and older.
- The study found that urine dipstick testing using leukocyte esterase and nitrite had a high sensitivity of about 90–92%, which means the test is generally good at picking up true cases of bacteriuria and has fewer false negatives.
- However, the specificity was low, ranging from 39–56%, meaning there were many false positive results, so a positive dipstick did not always mean the patient truly had a urinary tract infection.
- In symptomatic older adults, the specificity dropped even further to 39%, which means the test performed even worse in confirming a true infection in this group.
- One of the major reasons for this poor specificity is the high prevalence of asymptomatic bacteriuria in older adults, meaning bacteria may be present in the urine even when there is no true symptomatic infection.
- Because of this, the authors concluded that a positive dipstick result alone is inconclusive in older adults and should not be used as the sole basis for diagnosing UTI.
- The article ultimately suggested that urine dipstick testing may have limited diagnostic value in older adults and may not be the best tool for confirming UTI in this population.
- While this article provides strong evidence on diagnostic accuracy, the limitation may be that findings may not directly apply to younger adult women with uncomplicated cystitis, since asymptomatic bacteriuria is much less common in that population and the dipstick may perform better.

Article #3: History and physical examination plus laboratory testing for the diagnosis of adult female urinary tract infection

Meister L, Morley EJ, Scheer D, Sinert R. History and physical examination plus laboratory testing for the diagnosis of adult female urinary tract infection. Acad Emerg Med. 2013;20(7):631-645. doi:10.1111/acem.12171

Abstract

Background: Emergency physicians often encounter females presenting with symptoms suggestive of urinary tract infections (UTIs). The diagnostic accuracy of history, physical examination, and bedside laboratory tests for female UTIs in emergency departments (EDs) have not been quantitatively described.

Objectives: This was a systematic review to determine the utility of history and physical examination (H&P) and urinalysis in diagnosing uncomplicated female UTI in the ED.

Methods: The medical literature was searched from January 1965 through October 2012 in PUBMED and EMBASE using the following criteria: Patients were females greater than 18 years of age in the ED suspected of having UTIs. Interventions were H&P and urinalysis used to diagnose a UTI. The comparator was UTI confirmed by a positive urine culture. The outcome

was operating characteristics of the interventions in diagnosing a UTI. Study quality was assessed using Quality Assessment Tool for Diagnostic Accuracy Studies (QUADAS-2). Sensitivity, specificity, and likelihood ratios (LRs) were calculated using Meta-DiSc.

Results: Four studies (pooled n = 948) were included with UTI prevalence ranging from 40% to 60%. H&P variables all had positive LRs (+LR, range = 0.8 to 2.2) and negative LRs (-LR, range = 0.7 to 1.0) that are insufficient to significantly alter pretest probability of UTI. Only a positive nitrite reaction (+LR = 7.5 to 24.5) was useful to rule in a UTI. To rule out UTI, only a negative leukocyte esterase (LE; -LR = 0.2) or blood reaction on urine dipstick (-LR = 0.2) were significantly accurate. Increasing pyuria directly correlated with +LR, and moderate pyuria (urine white blood cells [uWBC] > 50 colony-forming units [CFUs]/ml) and moderate bacteruria were good predictors of UTI (+LR = 6.4 and 15.0, respectively).

Conclusions: No single H&P finding can accurately rule in or rule out UTI in symptomatic women. Urinalysis with a positive nitrite or moderate pyuria and/or bacteruria are accurate predictors of a UTI. If the pretest probability of UTI is sufficiently low, a negative urinalysis can accurately rule out the diagnosis.

- This article is a systematic review with meta-analysis, which is one of the highest levels of evidence for a diagnostic accuracy question. I chose this article because it directly aligns with my PICO question, as it specifically looks at adult women over the age of 18 presenting with suspected urinary tract infection in an emergency department setting, which is very similar to the urgent care setting in my clinical scenario. It directly evaluates urine dipstick findings, including nitrite, leukocyte esterase, and blood, compared with urine culture as the reference standard, which exactly matches the index test and comparator in my PICO. Another reason I chose this article is because it provides practical diagnostic measures such as likelihood ratios, which are clinically helpful in determining how strongly a positive or negative dipstick result changes the probability of a true urinary tract infection. I also liked that this article provides very clear clinical takeaways, such as positive nitrite being highly useful for ruling in UTI and negative leukocyte esterase being useful for ruling out infection, which directly helps answer my PICO question. Since it was published in 2013, it also falls within the required 10-15 year timeframe and represents strong evidence to support my clinical question.

Key Findings:

- This article was a systematic review with meta-analysis that included 4 studies with a pooled sample size of 948 adult female patients presenting with suspected urinary tract infection in the emergency department setting, which closely matches the urgent care setting in my PICO question.
- The overall prevalence of UTI in the included studies ranged from 40–60%, meaning the pretest probability of infection was already moderate to high in these symptomatic women.
- One of the major findings was that history and physical examination findings alone are not sufficient to reliably diagnose or rule out UTI. Symptoms such as dysuria, urinary

frequency, urgency, and suprapubic tenderness had likelihood ratios that were too close to 1, meaning they did not significantly change the probability of disease on their own.

- The most useful dipstick finding for ruling in a urinary tract infection was a positive nitrite result, which had a positive likelihood ratio ranging from 7.5 to 24.5. In simple terms, this means that when nitrite is positive, the likelihood of a true UTI significantly increases and supports initiating empiric treatment.
- The most useful dipstick finding for ruling out UTI was a negative leukocyte esterase result, which had a negative likelihood ratio of 0.2. This means that a negative result significantly lowers the probability of infection and may help avoid unnecessary antibiotics when the clinical suspicion is not high.
- Similarly, absence of blood on dipstick also had a negative likelihood ratio of 0.2, making it another useful marker that helps decrease the likelihood of infection.
- The study also found that moderate pyuria (>50 WBC/mL) was a strong predictor of UTI with a positive likelihood ratio of 6.4, while moderate bacteriuria was an even stronger predictor with a positive likelihood ratio of 15.0.
- Overall, this article supports that urine dipstick testing significantly improves diagnostic accuracy compared with symptoms alone, particularly through the use of positive nitrite to help rule in UTI and negative leukocyte esterase to help rule out infection.
- Clinically, this directly supports my PICO question because it shows that dipstick testing is a valuable diagnostic tool in adult women with suspected uncomplicated cystitis, especially in urgent care settings where immediate treatment decisions often need to be made.

What is the clinical "bottom line" derived from these articles in answer to your question?

Urine dipstick testing does provide sufficient diagnostic accuracy to help diagnose a urinary tract infection in adult women presenting to urgent care with symptoms of uncomplicated cystitis, especially when interpreted in the context of the patient's symptoms. For this 35-year-old female with dysuria, urinary frequency, and mild suprapubic discomfort without fever, flank pain, or vaginal symptoms, the evidence supports that urine dipstick significantly improves diagnostic accuracy beyond symptoms alone. A positive nitrite result strongly supports the diagnosis of UTI and makes empiric treatment reasonable without waiting for urine culture, given its high specificity and strong positive likelihood ratio. A negative leukocyte esterase result significantly lowers the likelihood of infection and is useful for helping rule out UTI, although it does not completely exclude infection in a symptomatic patient. Therefore, urine dipstick is accurate enough to guide diagnosis and initial treatment decisions in the urgent care setting, while urine culture should be reserved for cases where symptoms persist, recur, or when the dipstick results do not match the clinical picture.