

Cranberry products in the prevention of recurrent urinary tract infections in adult women: Efficacy, safety, and place in non-antibiotic prophylaxis – literature review

Julia Gładkowska¹, Marta Tokaj², Katarzyna Mórdas-Żylińska²

¹DEPARTMENT OF PEDIATRIC SURGERY, MEDICAL UNIVERSITY OF WARSAW, WARSAW, POLAND

²DEPARTMENT OF FAMILY MEDICINE, MEDICAL UNIVERSITY OF WARSAW, WARSAW, POLAND

ABSTRACT

Recurrent urinary tract infections are among the most frequent bacterial infections in adult women and are associated with impaired quality of life, like repeated medical consultations, and cumulative exposure to antibiotics. In the context of increasing antimicrobial resistance, non-antibiotic preventive strategies have attracted growing attention. Cranberry products remain one of the most commonly used and most extensively studied options. The aim of this review was to summarize current evidence regarding the efficacy, safety, and practical role of cranberry products in the prevention of recurrent urinary tract infections in adult women. Contemporary guidelines, systematic reviews, meta-analyses, and randomized clinical trials indicate that cranberry products may reduce recurrence risk, particularly in women with recurrent uncomplicated cystitis. However, cranberry should not be regarded as a single uniform intervention. The clinical effect appears to depend on formulation, proanthocyanidin content, and duration of administration. Preparations providing at least 36 mg of proanthocyanidins daily seem to offer the most consistent benefit, whereas non-standardized products yield heterogeneous and less reliable results. Cranberry products are generally safe and well tolerated, although adherence may be affected by palatability, pill burden, or uncertainty regarding product composition. Overall, cranberry may be considered a reasonable non-antibiotic prophylactic option for selected adult women, provided that counseling includes realistic discussion of expected benefits, limitations of the evidence, and the importance of using standardized preparations.

KEY WORDS: drug resistance, female, dietary supplements, proanthocyanidins, cystitis

Wiad Lek. 2026;79(6):1411-1420. doi: 10.36740/WLek/222496 

INTRODUCTION

Recurrent urinary tract infections are one of the most common infectious problems in adult women. They are usually defined as at least two symptomatic episodes within six months or at least three episodes within one year [1, 2]. Although recurrent infection is rarely life-threatening in otherwise healthy women, it causes considerable morbidity, including dysuria, urinary frequency, pain, sleep disturbance, anxiety, repeated healthcare contacts, and reduced quality of life [1, 2]. In many patients, recurrence also leads to repeated empirical antibiotic treatment, which increases the risk of adverse effects, disturbs the intestinal and vaginal microbiota, and contributes to antimicrobial resistance [2-4].

For these reasons, the modern approach to recurrent uncomplicated cystitis increasingly includes non-antibiotic prophylaxis. Among the available options, cranber-

ry products have retained particular interest because they are widely accessible, generally well tolerated, biologically plausible, and supported by a relatively broad clinical literature [2, 4]. Nevertheless, cranberry remains a controversial topic. The literature contains both positive and neutral studies, and the interpretation of results has long been complicated by wide variation in formulation, proanthocyanidin content, treatment duration, and outcome definitions [2-4].

AIM

The aim of this review was to evaluate the role of cranberry products in the prevention of recurrent urinary tract infections in adult women, with particular emphasis on mechanisms of action, evidence from guidelines and clinical trials, product heterogeneity, safety, and practical use in non-antibiotic prophylaxis.

MATERIALS AND METHODS

SEARCH STRATEGY AND INFORMATION SOURCES

A systematic literature search was conducted in April 2026 by two independent reviewers to identify studies evaluating the efficacy and safety of cranberry products in the prevention of recurrent urinary tract infections (rUTIs). The primary source of evidence was the PubMed/MEDLINE database. To ensure inclusion of the most recent clinical data, only articles published between January 2021 and April 2026 were considered. The search was limited to full-text articles published in English.

The search strategy combined Medical Subject Headings (MeSH) and free-text terms using Boolean operators. The following search string was applied: “cranberry” AND (“urinary tract infection” OR “cystitis”) AND “prevention”.

Study eligibility was determined according to pre-defined PICO-based criteria. Eligible studies included adult women (≥ 18 years of age) with recurrent urinary tract infections, defined as at least two episodes within six months or at least three episodes within one year, who received prophylaxis with standardized cranberry products, including capsules, tablets, or extracts with a specified proanthocyanidin (PAC) content. Only randomized controlled trials (RCTs), systematic reviews, and meta-analyses were included.

Studies involving pregnant women, pediatric patients (< 18 years of age), individuals with indwelling urinary catheters, or patients with neurogenic bladder were excluded. Case reports, editorials, conference abstracts, animal studies, and pilot studies with insufficient sample sizes were also excluded. Furthermore, studies evaluating non-standardized cranberry juice preparations or products with unspecified PAC concentrations were not considered.

Titles and abstracts were screened independently by both reviewers, followed by full-text assessment of potentially eligible articles. Any disagreements regarding study selection were resolved through discussion and consensus. A total of 19 publications met the eligibility criteria and were included in the final narrative review.

REVIEW AND DISCUSSION

CLINICAL IMPORTANCE OF RECURRENT URINARY TRACT INFECTION AND THE SHIFT TOWARD ANTIBIOTIC-SPARING PREVENTION

The index patient in contemporary guidance is an otherwise healthy adult woman with recurrent localized cystitis, without structural or functional abnormalities

of the urinary tract and without features suggesting upper or systemic infection [2]. This distinction is important because recurrent uncomplicated cystitis differs substantially from catheter-associated urinary tract infection, neurogenic bladder, postoperative infection, or infection related to foreign bodies. The updated American Urological Association/ Canadian Urological Association/ Society of Urodynamics, Female Pelvic Medicine & Urogenital Reconstruction (AUA/CUA/SUFU) guideline emphasizes that diagnosis should rely on the combination of symptoms, evidence of urinary inflammation, and bacteriuria interpreted in clinical context, rather than on microbiology alone [2].

The clinical burden of recurrent infection extends beyond the acute episodes themselves. Women with recurrent urinary tract infections often report substantial physical and psychological distress, dissatisfaction with care, and delayed access to specialist management [1,2]. Repeated antibiotic exposure is one of the main reasons why non-antibiotic prophylaxis has become a central topic. Recent reviews frame recurrent urinary tract infection as a setting in which antibiotic-sparing strategies are not only desirable but increasingly necessary from both an individual and public health perspective [3,4]. Cranberry therefore needs to be considered not in isolation, but as part of a broader movement toward prevention strategies that may reduce recurrence while limiting cumulative antimicrobial exposure.

CRANBERRY PRODUCTS AND PROPOSED MECHANISMS OF ACTION

The most widely accepted mechanism of cranberry is anti-adhesion. Cranberry contains proanthocyanidins, particularly A-type proanthocyanidins, which are thought to inhibit the adhesion of uropathogenic *Escherichia coli* to the urothelium [2, 5]. Since bacterial attachment is an early step in the pathogenesis of cystitis, interference with this process provides a biologically plausible explanation for preventive benefit. Importantly, this mechanism differs fundamentally from that of antibiotics, because cranberry does not primarily aim to kill bacteria but rather to reduce successful colonization.

More recent research suggests that cranberry may have broader biological effects. González de Llano et al. showed that cranberry-derived digestive fluid and cranberry phenolic metabolites can improve intestinal and urinary epithelial barrier-related parameters, including transepithelial resistance and expression of tight-junction-associated genes [5]. These findings support the concept that cranberry may contribute not only to anti-adhesion but also to preservation of epithelial integrity in the gut and urinary tract (Fig. 1).

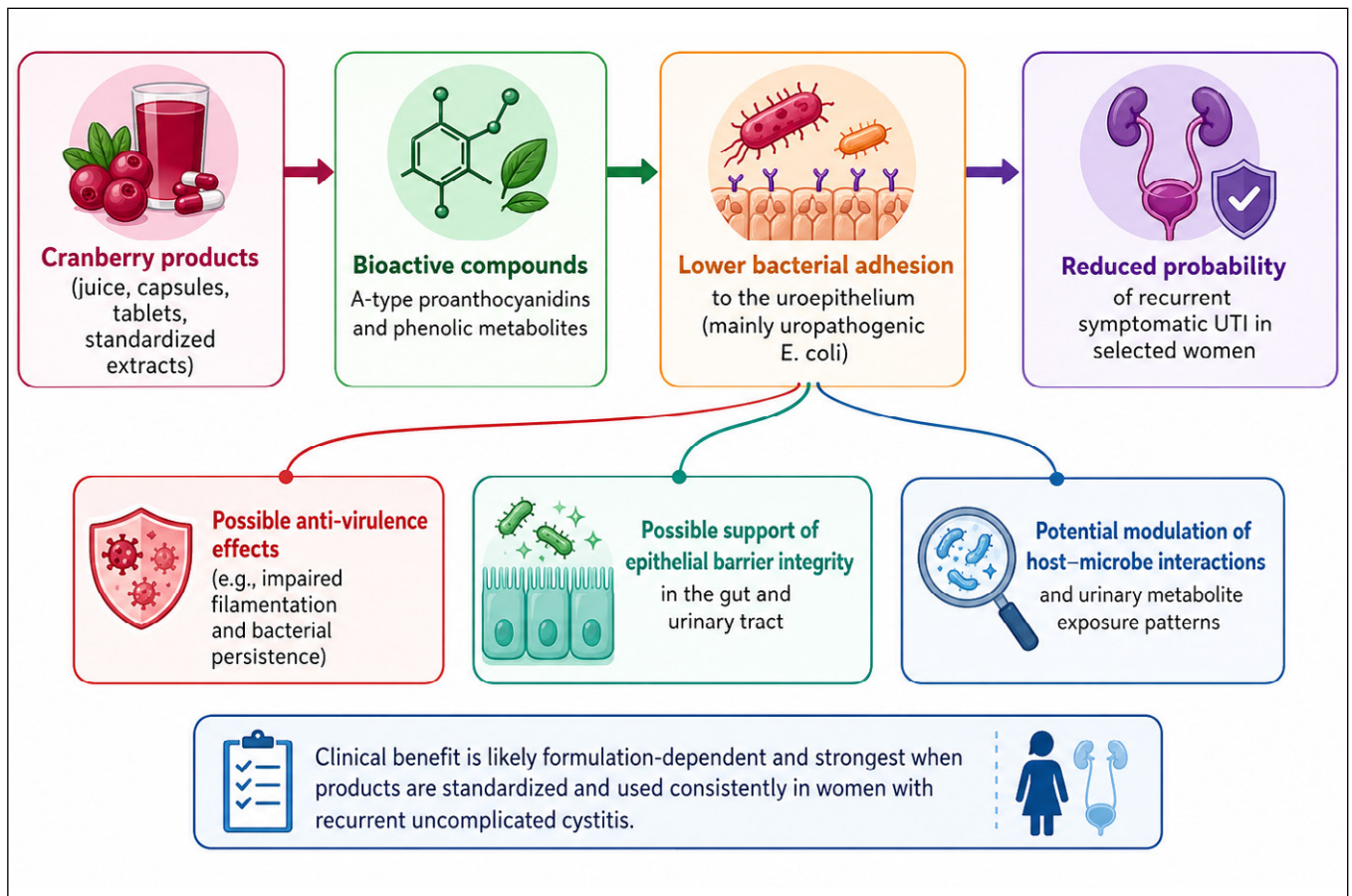


Fig. 1. Proposed mechanisms by which cranberry products may reduce the risk of recurrent urinary tract infections in adult women

Source: Own materials

Additional mechanistic support comes from the work of Zhao et al., who showed that cranberry intake produces measurable urinary metabolites that may serve as intake biomarkers, which is especially important in a field where patient adherence and actual exposure are often difficult to confirm [6]. Prinster et al. further demonstrated that cranberry constituents can prevent SOS-mediated filamentation of uropathogenic *Escherichia coli* [7]. Because bacterial filamentation may promote persistence and immune evasion, this anti-virulence effect provides a novel explanation for the possible clinical efficacy of cranberry.

At the same time, interpretation of mechanistic findings is complicated by variability in the polyphenolic composition of cranberry-derived products, as different processing methods may yield fractions with different biological activity [8].

EVIDENCE FROM GUIDELINES AND SYSTEMATIC REVIEWS

The updated AUA/CUA/SUFU guideline clearly states that clinicians should offer cranberry as an option for

prophylaxis in women with recurrent urinary tract infections [2]. This is one of the most important practical messages in the current literature. The recommendation is moderate, with evidence level B, which reflects meaningful but not definitive evidence. Of particular relevance is the guideline's observation that products standardized to at least 36 mg of proanthocyanidins daily appear more effective than lower-dose preparations, while many commercial products fail to validate the amount of active compound they contain [2].

The most influential modern evidence synthesis is the 2023 Cochrane review [9]. It included 50 randomized comparisons involving 8857 participants and concluded that cranberry products reduce the risk of symptomatic, culture-verified urinary tract infections in selected susceptible populations, with a particularly relevant signal in women with recurrent infection. At the same time, the review emphasized heterogeneity among populations and interventions, and the effect was not equally convincing in all groups [9]. This dual conclusion is clinically important: cranberry is no longer unsupported, but neither is it universally effective.

Other meta-analyses broadly align with the Cochrane

Table 1. Key guidelines, systematic reviews, and meta-analyses on cranberry products for prevention of recurrent urinary tract infections

Uncomplicated Urinary Tract Infections in Women: AUA/CUA/ SUFU Guideline (2025). [2]	Guideline update	Women with recurrent uncomplicated UTI	Cranberry should be offered as a non-antibiotic prophylactic option; products standardized to at least 36 mg PAC daily appear more effective	Recommendation based on heterogeneous underlying studies; commercial products are poorly standardized	Key guideline source for clinical positioning of cranberry
Cranberries for preventing urinary tract infections. Cochrane Database Syst Rev. 2023 [7]	Cochrane systematic review	Multiple susceptible populations, including women with recurrent UTI	Cranberry products reduced the risk of symptomatic, culture-verified UTI in selected groups, particularly women with recurrent infection	Marked heterogeneity in populations, formulations, and outcome definitions	Core evidence synthesis supporting cranberry prophylaxis
Cranberry Juice, Cranberry Tablets, or Liquid Therapies for Urinary Tract Infection: A Systematic Review and Network Meta-analysis [8]	Systematic review and network meta-analysis	Studies of cranberry juice, tablets, and liquid therapies	Cranberry juice showed the most consistent effect; lower UTI rates versus placebo liquid and no treatment; reduction in antibiotic use	Variable formulations and study quality; indirect comparisons	Essential source for comparing cranberry formulations
Consumption of cranberry as adjuvant therapy for urinary tract infections in susceptible populations: A systematic review and meta-analysis with trial sequential analysis [9]	Systematic review and meta-analysis with trial sequential analysis	Susceptible populations, including women with recurrent UTI	Cranberry products reduced UTI incidence overall and in women with recurrent UTI; juice appeared more effective than capsules/ tablets	Not limited to adult women with recurrent uncomplicated cystitis	Strong supporting evidence for efficacy
Preventive effect of cranberries with high dose of proanthocyanidins on urinary tract infections: a meta-analysis and systematic review [10]	Systematic review and meta-analysis	Cranberry products stratified by PAC dose	Preparations providing at least 36 mg PAC daily were associated with significant benefit; lower-dose products were not	Considerable inter-study heterogeneity; limited standardization across trials	Most important source on dose-response relationship
Nonantibiotic prophylaxis for urinary tract infections: a network meta-analysis of randomized controlled trials. Infection [11]	Network meta-analysis	Non-antibiotic prophylaxis for UTI	Cranberry was superior to placebo and did not significantly increase adverse events	Includes interventions beyond cranberry; not limited to one female subgroup	Useful for positioning cranberry among other non-antibiotic strategies
Stair SL, Palmer CJ, Lee UJ. Evidence-based review of nonantibiotic urinary tract infection prevention strategies for women: a patient-centered approach [4]	Narrative evidence-based review	Women, patient-centered preventive strategies	Cranberry is a reasonable non-antibiotic option in women seeking antibiotic-sparing prevention	Narrative design; not a formal pooled analysis	Helpful for the practical discussion section

Source: Compiled by the authors of this study

Table 2. Key clinical trials of cranberry products in adult women

Study	Population	Cranberry product/ formulation	PAC dose	Duration	Main outcome	Interpretation
Randomized, placebo-controlled, double-blinded study of prophylactic cranberries use in women with recurrent uncomplicated cystitis. [12]	Adult women with recurrent uncomplicated cystitis	Standardized cranberry preparation (Cysticlean)	High-dose standardized preparation	12 months	Reduced number of UTIs, prolonged UTI-free survival, reduced vaginal and rectal E. coli colonization; no adverse events reported	Strongest recent RCT supporting cranberry prophylaxis in the target population
Cranberry Juice, Cranberry Tablets, or Liquid Therapies for Urinary Tract Infection: A Systematic Review and Network Meta-analysis [8]	Women at risk of recurrent UTI	Cranberry juice vs placebo liquid / no treatment	Variable	Variable	Juice-based interventions showed the most consistent benefit among cranberry formulations	Suggests that formulation may substantially influence efficacy
Consumption of cranberry as adjuvant therapy for urinary tract infections in susceptible populations: A systematic review and meta-analysis with trial sequential analysis [9]	Women with recurrent UTI and other susceptible groups	Cranberry juice, capsules, tablets	Variable	Variable	Overall reduction in UTI incidence; stronger signal in women with recurrent UTI	Supports benefit, but heterogeneity limits direct comparison
Preventive effect of cranberries with high dose of proanthocyanidins on urinary tract infections: a meta-analysis and systematic review [10]	Women and mixed susceptible populations	Standardized and non-standardized cranberry products	<36 mg/day vs ≥36 mg/day	Variable, benefit clearer at 12–24 weeks	Significant preventive effect mainly with ≥36 mg PAC/day	Suggests a clinically relevant threshold effect for PAC dosing
The Clinical Trial Outcomes of Cranberry, D-Mannose and NSAIDs in the Prevention or Management of Uncomplicated Urinary Tract Infections in Women: A Systematic Review [15]	Women with uncomplicated or recurrent UTI	Cranberry products in various formulations	Variable	Variable	Mixed results across clinical trials	Negative or neutral findings may reflect poor standardization, dose, or adherence rather than absence of biological effect

Source: Compiled by the authors of this study

findings. Moro et al. reported the most consistent benefit for cranberry juice, which lowered recurrence rates compared with placebo liquid and no treatment and also reduced antibiotic use [10]. Xia et al. found that cranberry-based products significantly reduced urinary tract infection incidence overall and in women with recurrent urinary tract infections, and their subgroup analysis suggested that juice-based interventions may be more effective than tablets or capsules [11]. Xiong et al. further clarified the importance of dose, showing that cranberry products providing at least 36 mg of proanthocyanidins daily were associated with a significant reduction in urinary tract infection risk, whereas lower-dose products were not [12]. Han et al., in a network meta-analysis of non-antibiotic prophylaxis, also found cranberry superior to placebo without an increase in adverse events [11] (Table 1).

EVIDENCE FROM RANDOMIZED CLINICAL TRIALS

The strongest recent primary trial in adult women with recurrent uncomplicated cystitis was published by Tsiakoulis et al. [14]. This randomized, placebo-controlled, double-blinded trial showed that a standardized cranberry preparation reduced the number of urinary tract infections, prolonged infection-free survival, and lowered vaginal and rectal *Escherichia coli* colonization. No adverse events were reported [14]. The importance of this study lies not only in its positive result, but also in the fact that it addressed the appropriate target population, used a defined preparation, and followed participants for a clinically meaningful period.

Earlier and pooled trial evidence has been more variable. Some randomized studies suggested benefit, whereas others did not reach statistical significance, especially when lower-dose or poorly characterized products were used [9-12,15]. This inconsistency has often been used as an argument against cranberry, but it may be more accurately interpreted as evidence that cranberry efficacy is not class-wide. In other words, neutral trials do not necessarily refute the concept of cranberry prophylaxis; they may instead reflect inadequate standardization, suboptimal dosing, poor adherence, or inappropriate population selection.

Population differences are also relevant. Evidence is strongest in women with recurrent uncomplicated cystitis. By contrast, benefit has been less consistent in elderly institutionalized adults, pregnant women, or procedure-related settings [9-13]. Therefore, any recommendation in favor of cranberry should remain specific to recurrent uncomplicated cystitis in adult women rather than generalized to all urinary tract infection contexts (Table 2).

PRODUCT HETEROGENEITY AND THE PROBLEM OF STANDARDIZATION

Perhaps the most important issue in the cranberry literature is product heterogeneity. "Cranberry" may refer to juice, juice cocktails, tablets, capsules, dry extracts, or mixed nutraceutical combinations, all of which may differ substantially in their content of biologically active compounds [2,8]. This is not a minor technical issue but a major source of inconsistency across the literature (Fig 2).

The meta-analysis by Xiong et al. is particularly informative here [12]. The authors found that cranberry products delivering at least 36 mg of proanthocyanidins daily were associated with a statistically significant reduction in urinary tract infection risk, whereas lower-dose products were not. They also suggested that benefit was more evident when cranberry was used for 12 to 24 weeks [12]. These findings are consistent with the AUA/CUA/SUFU guideline and strongly support the view that cranberry efficacy is dose-sensitive.

The challenge is that many products on the market do not state or verify their proanthocyanidin content. Reviews on cranberry chemistry and processing show that extraction methods, source material, and analytical methods can markedly affect the composition of final products [8]. As a result, two studies both labeled as "cranberry trials" may in reality be evaluating interventions that are chemically and biologically very different. This makes it difficult to interpret older trials and complicates translation into clinical recommendations.

Thus, one of the key messages of this review is that the main question is not simply whether cranberry works. The more useful clinical question is which cranberry product, in what formulation, at what proanthocyanidin dose, and for what duration may reduce recurrence risk.

SAFETY, TOLERABILITY, AND ADHERENCE

Cranberry products are generally safe. Modern systematic reviews and network meta-analyses have not shown a significant increase in adverse events compared with placebo [2, 13], and the best recent randomized trial also reported no adverse events [14]. This favorable safety profile makes cranberry attractive as a long-term preventive measure, particularly in women seeking to reduce antibiotic exposure.

However, safety alone does not guarantee effectiveness in practice. Adherence is a recurring issue in cranberry research. Juice-based regimens may be limited by taste, acidity, treatment fatigue, and caloric load, whereas solid formulations may be easier to maintain but only if they contain adequate amounts of active compounds [10,13]. Biomarker-based work suggests

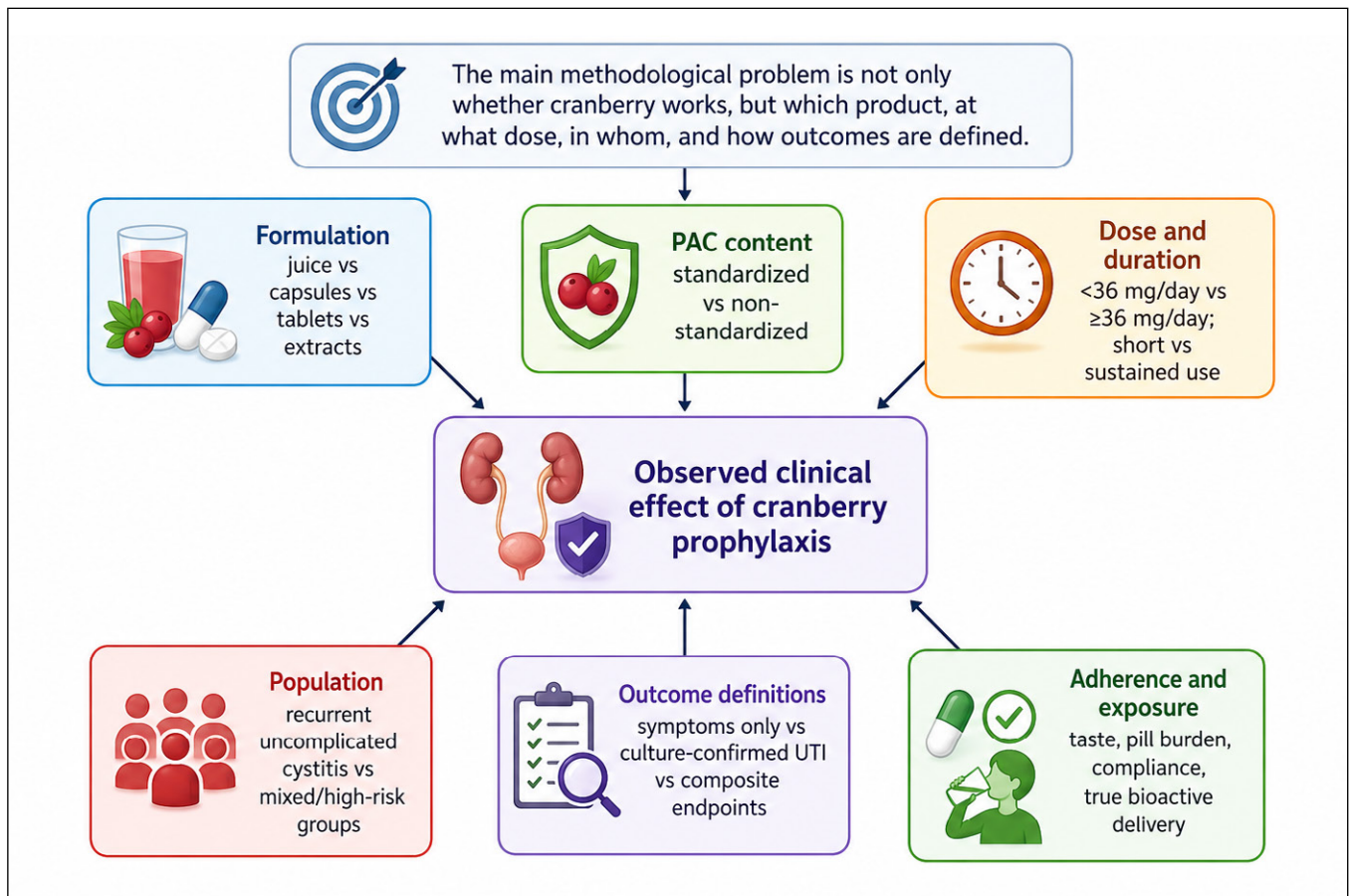


Fig. 2. Main sources of heterogeneity in studies evaluating cranberry products for prevention of recurrent urinary tract infections

Source: Own materials

that poor compliance may have contributed to the inconsistent results of earlier trials [13]. Therefore, the real-world success of cranberry prophylaxis depends not only on biological efficacy but also on whether a patient is willing and able to use a standardized product consistently.

PRACTICAL PLACE OF CRANBERRY IN NON-ANTIBIOTIC PROPHYLAXIS

In everyday practice, cranberry is best positioned as a reasonable non-antibiotic prophylactic option for adult women with recurrent uncomplicated urinary tract infections who prefer an antibiotic-sparing strategy or who wish to try a low-risk intervention before long-term antimicrobial prophylaxis [2, 4]. It is especially suitable in women with a well-defined recurrence pattern, no major urinary tract abnormality, and willingness to use a standardized product regularly (Fig. 3).

Real-world studies also show that preventive behaviors are common among women with recurrent infection. Most women initially receive care from primary care physicians, and specialist input remains underused, despite the fact that preventive strategies such as

cranberry extract, low-dose antibiotic prophylaxis, or other structured approaches may be implemented more often in women with recurrent disease [16]. Differences also exist across female life stages, with premenopausal women more likely to use behavioral measures and over-the-counter prevention, whereas postmenopausal women more often receive vaginal estrogen or antibiotic-based strategies [17]. These observations support the idea that cranberry has an established place in real-world prevention, although its use is not always systematic or guided by product standardization.

At the same time, counseling must remain realistic. Cranberry should not be presented as a universal solution, and patients should not be told that all cranberry products are equally effective. The expected benefit is preventive rather than curative, and the magnitude of benefit is probably modest to moderate. If cranberry is recommended, the patient should be advised to choose a standardized preparation delivering at least 36 mg of proanthocyanidins daily and to continue it for several months before efficacy is judged [2, 12].

Some supportive studies also evaluated combined nutraceutical strategies that included cranberry together

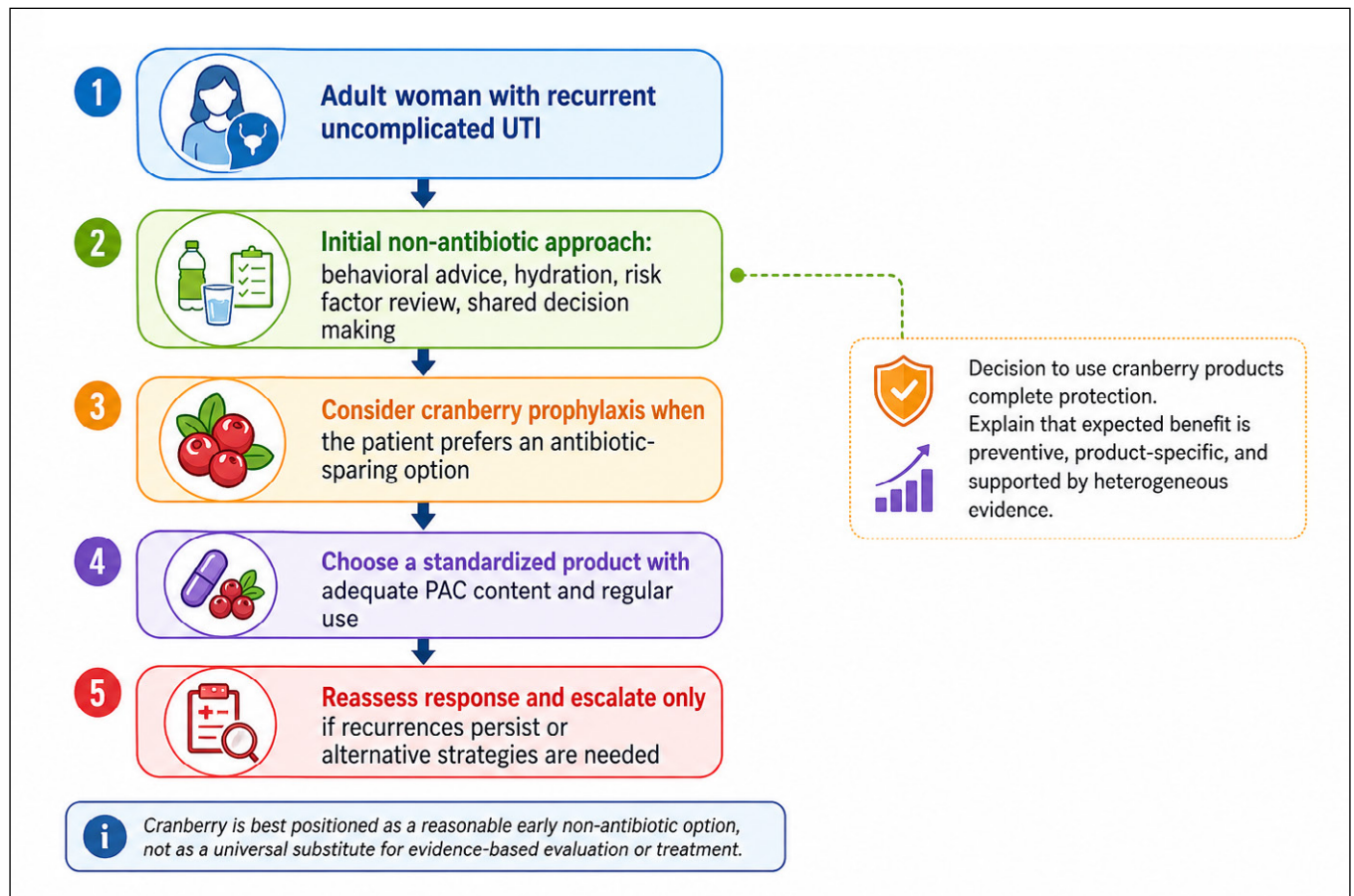


Fig. 3. Suggested practical positioning of cranberry products within non-antibiotic prophylaxis of recurrent uncomplicated urinary tract infections in adult women

Source: Own materials

er with probiotics, cinnamon, pumpkin seed extract, or vitamins [18,19]. Although such interventions may be clinically interesting, they do not provide pure evidence for cranberry alone and should be interpreted cautiously when defining cranberry's specific role in prophylaxis.

LIMITATIONS OF CURRENT EVIDENCE

The available evidence has several limitations. First, there is major heterogeneity in product composition, proanthocyanidin dose, treatment duration, population, and recurrence definition [9-13, 15]. This makes direct comparison difficult and reduces the certainty of pooled estimates. Second, some clinically relevant studies involve combined formulations rather than cranberry alone [18,19], limiting attribution of effect. Third, adherence has often been poorly measured, and true biological exposure may have varied substantially even among participants assigned to the same intervention [13].

Another limitation is the persistent variability in cranberry composition itself. Chemical composition depends on cultivar, environmental conditions, pro-

cessing, extraction, and formulation, which may directly influence biological activity and partly explain inconsistent clinical outcomes [20]. Without rigorous product standardization, the comparison of trials remains methodologically challenging.

Future trials should therefore focus on clearly defined adult female populations with recurrent uncomplicated cystitis, use rigorously standardized products, verify proanthocyanidin dose, incorporate adherence assessment or urinary biomarkers, and apply consistent microbiological outcome definitions. Without such improvements, the literature will likely continue to generate partially conflicting results despite an underlying biologically real effect.

CONCLUSIONS

Cranberry products have a plausible mechanism of action and a growing evidence base as a non-antibiotic preventive strategy in adult women with recurrent uncomplicated urinary tract infections. The most reliable data suggest that benefit is most likely when standardized products containing at least 36 mg of

proanthocyanidins daily are used consistently for an adequate period [2,12].

Cranberry should not be viewed as a single homogeneous intervention class. Much of the inconsistency in the literature is likely explained by variation in formulation, dose, and product quality. Therefore, the most accurate conclusion is that cranberry may reduce recurrence risk in selected women, but its effectiveness is product-specific and context-dependent.

In practice, cranberry may be recommended as a safe and reasonable component of non-antibiotic

prophylaxis, particularly in women seeking to reduce antibiotic exposure. Its use should be accompanied by careful product selection, realistic counseling, and awareness that it complements, but does not replace, appropriate diagnostic evaluation and evidence-based treatment of acute infection. We conclude that all commercially available cranberry products intended for medical prophylaxis should obligatorily state their standardized proanthocyanidin (PAC) content to guide appropriate clinical use.

REFERENCES

1. Advani SD, Thaden JT, Perez R, Stair SL, Lee UJ, Siddiqui NY. State-of-the-Art Review: Recurrent Uncomplicated Urinary Tract Infections in Women. *Clin Infect Dis*. 2025;80(3):e31-e42. doi: 10.1093/cid/ciae653. DOI
2. Ackerman AL, Bradley M, D'Anci KE, Hickling D, Kim SK, Kirkby E. Updates to Recurrent Uncomplicated Urinary Tract Infections in Women: AUA/CUA/SUFU Guideline (2025). *J Urol*. 2026;215(1):3-12. doi: 10.1097/JU.0000000000004723 DOI
3. Sher EK, Dzidic-Krivic A, Sesar A, Farhat EK, Celikovic A, Beca-Zeco M, et al. Current state and novel outlook on prevention and treatment of rising antibiotic resistance in urinary tract infections. *Microb Pathog*. 2024;193:106789. doi: 10.1016/j.pharmthera.2024.108688. DOI
4. Stair SL, Palmer CJ, Lee UJ. Evidence-based review of nonantibiotic urinary tract infection prevention strategies for women: a patient-centered approach. *Curr Opin Urol*. 2023;33:187-192. doi: 10.1097/MOU.0000000000001082. DOI
5. Gonzalez de Llano D, Roldan M, Taladrid D, Relano de la Guia E, Moreno-Arribas MV, Bartolome B. Cranberry Polyphenols and Prevention against Urinary Tract Infections: New Findings Related to the Integrity and Functionality of Intestinal and Urinary Barriers. *J Agric Food Chem*. 2024;72:10328-10338. doi: 10.1021/acs.jafc.3c07169. DOI
6. Zhao S, Su Z, Liu H, Khoo C, Garrett TJ, Gu L. Predictive models built upon annotated and validated intake biomarkers in urine using paired or unpaired analysis helped to classify cranberry juice consumers in a randomized, double-blinded, placebo-controlled, and crossover study. *Nutr Res*. 2023;109:58-70. doi: 10.1016/j.nutres.2022.12.002. DOI
7. Prinster T, Harrison A, Dick C, Horvath DJ Jr, Li B, Sievers G, et al. Cranberry constituents prevent SOS-mediated filamentation of uropathogenic *Escherichia coli*. *Infect Immun*. 2025;93(5):e00600-24. doi: 10.1128/iai.00600-24. DOI
8. Colletti A, Sangiorgio L, Martelli A, Testai L, Cicero AFG, Cravotto G. Highly Active Cranberry's Polyphenolic Fraction: New Advances in Processing and Clinical Applications. *Nutrients*. 2021;13(8):2546. doi: 10.3390/nu13082546. DOI
9. Williams G, Stothart CI, Hahn D, Stephens JH, Craig JC, Hodson EM. Cranberries for preventing urinary tract infections. *Cochrane Database Syst Rev*. 2023;11:CD001321. doi: 10.1002/14651858.CD001321.pub7. DOI
10. Moro C, Phelps C, Veer V, Jones M, Glasziou P, Clark J, et al. Cranberry Juice, Cranberry Tablets, or Liquid Therapies for Urinary Tract Infection: A Systematic Review and Network Meta-analysis. *Eur Urol Focus*. 2024;10(6):947-957. doi: 10.1007/s00120-024-02514-0. DOI
11. Xia JY, Yang C, Xu DF, Xia H, Yang LG, Sun GJ. Consumption of cranberry as adjuvant therapy for urinary tract infections in susceptible populations: A systematic review and meta-analysis with trial sequential analysis. *PLoS One*. 2021;16(9):e0256992. doi: 10.1371/journal.pone.0256992. DOI
12. Xiong Z, Gao Y, Yuan C, Jian Z, Wei X. Preventive effect of cranberries with high dose of proanthocyanidins on urinary tract infections: a meta-analysis and systematic review. *Front Nutr*. 2024;11:1422121. doi: 10.3389/fnut.2024.1422121 DOI
13. Han Z, Yi X, Li J, Liao D, Ai J. Nonantibiotic prophylaxis for urinary tract infections: a network meta-analysis of randomized controlled trials. *Infection*. 2025;53:535-546. doi: 10.1007/s15010-024-02357-z. DOI
14. Tsiakoulis E, Gravas S, Hadjichristodoulou C, Oikonomou KG, Kyritsi M, Dadouli K, et al. Randomized, placebo-controlled, double-blinded study of prophylactic cranberries use in women with recurrent uncomplicated cystitis. *World J Urol*. 2024;42(1):27. doi: 10.1007/s00345-023-04741-0. DOI
15. Konesan J, Liu L, Mansfield KJ. The Clinical Trial Outcomes of Cranberry, D-Mannose and NSAIDs in the Prevention or Management of Uncomplicated Urinary Tract Infections in Women: A Systematic Review. *Pathogens*. 2022;11(12):1471. doi: 10.3390/pathogens11121471. DOI
16. Gleicher S, Sebesta EM, Kaufman MR, Dmochowski RR, Reynolds WS. Recurrent urinary tract infection management and prevention techniques among a population-based cohort of women. *Neurourol Urodyn*. 2023;42:1676-1685. doi: 10.1002/nau.25281. DOI
17. Ingram A, Posid T, Pandit A, Rose J, Amin S, Bellows F. Risk factors, demographic profiles, and management of uncomplicated recurrent urinary tract infections: a single institution study. *Menopause*. 2021;28(8):943-948. doi: 10.1097/GME.0000000000001791. DOI

18. Ait Abdellah S, Leblanc A, Dauchet Q, Blondeau C, Bohbot JM. Effects of a supplement associating *Lactobacillus* strains and proanthocyanidin-rich plant extracts against recurrent uncomplicated, urinary tract infections: A prospective, controlled study. *Investig Clin Urol.* 2025;66:36–46. doi: 10.4111/icu.20240092 
19. Jeitler M, Michalsen A, Schwartz A, Kessler CS, Koppold-Liebscher D, Grasmé J, et al. Effects of a Supplement Containing a Cranberry Extract on Recurrent Urinary Tract Infections and Intestinal Microbiota: A Prospective, Uncontrolled Exploratory Study. *J Integr Complement Med.* 2022;28(5):399–406. doi: 10.1089/jicm.2021.0300. 

CONFLICT OF INTEREST

The Authors declare no conflict of interest

CORRESPONDING AUTHOR

Julia Gładkowska

Department of Pediatric Surgery,
Medical University of Warsaw,
Warsaw, Poland
e-mail: gladkowska.jg@gmail.com

ORCID AND CONTRIBUTIONSHIP

Julia Gładkowska: 0009-0001-5188-3152     

Marta Tokaj: 0000-0002-7173-4058    

Katarzyna Mórdas-Żylińska: 0009-0002-0901-9747  

 – Work concept and design,  – Data collection and analysis,  – Responsibility for statistical analysis,  – Writing the article,  – Critical review,  – Final approval of the article

RECEIVED: 13.03.2026

ACCEPTED: 26.05.2026

