Research Article

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Cranberry For Preventing Recurrent Urinary Tract Infections in Children and Adults

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ABSTRACT

Background: Cranberry is widely used to prevent recurrent urinary tract infection, but benefit varies with population, formulation and outcome definition. This review examines its clinical role across the lifespan, prioritising patients without major urinary tract abnormalities.

Methods: A structured narrative review with a focused literature update combined a review-of-reviews approach, a PubMed update to 26 October 2026 and targeted reference tracing. References from supplied artificial-intelligence-assisted searches were verified against publications or bibliographic records. Evidence was mapped by age, clinical setting, formulation and directness. No new meta-analysis was performed.

Results: Current syntheses favour non-pregnant women with recurrent infection and selected children but do not support routine use in institutionalised older adults, pregnancy or neuromuscular bladder dysfunction. Recent adult trials strengthen the signal without establishing interchangeability between products. Infant evidence remains sparse and anatomically mixed. A commonly used adult target of approximately 36 mg of proanthocyanidins daily is not a validated paediatric dose or a universal efficacy threshold. Commercial assays, labelling and outcome ascertainment introduce substantial uncertainty.

Conclusions: Cranberry can be offered as an optional preventive strategy to appropriately assessed non-pregnant women and considered, with specialist advice, in selected children aged at least one year. Routine infant use is not supported. Product verification, shared decisions and planned reassessment are essential. Cranberry must not replace indicated antimicrobial treatment, investigation of recurrent systemic infection or established measures addressing impaired voiding and constipation.

Keywords: Cranberry, Vaccinium Macrocarpon, Recurrent Urinary Tract Infection Non-Antibiotic Prophylaxis, Paediatrics, Adults

Abbreviations

AUA	:	American Urological Association
BBD	:	Bladder and Bowel Dysfunction
CI	:	Confidence Interval
EAU	:	European Association of Urology
EFSA	:	European Food Safety Authority
IRR	:	Incidence Rate Ratio
PAC	:	Proanthocyanidin
RR	:	Risk Ratio
UTI	:	Urinary Tract Infection
VUR	:	Vesicoureteral Reflux

Introduction

Cranberry products occupy an unusual place in the prevention of recurrent urinary tract infection (UTI): they are readily available as foods and supplements, yet the supporting trials

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evaluate chemically dissimilar interventions in populations with very different risks. The relevant clinical question is whether a particular preparation offers a worthwhile reduction in symptomatic recurrences for a defined patient. The 2023 Cochrane update supports interpreting prevention by population [1].

The scope of contemporary recommendations has also changed. The 2025 American Urological Association, Canadian Urological Association and Society of Urodynamics, Female Pelvic Medicine and Urogenital Reconstruction guideline recommends offering cranberry as one option for women with recurrent UTI [2]. The 2026 European Association of Urology (EAU) adult guideline gives a strong recommendation to advise on cranberry while explicitly acknowledging low-quality and contradictory evidence [3]. Its paediatric guideline is more cautious, permitting dietary supplementation as an alternative or additional measure in selected cases [4]. National Institute for Health and Care Excellence (NICE) guidance allows some non-pregnant women to try cranberry and advises paediatric specialist input for children and young people under 16 years; its cranberry discussion largely reflects the 2018 evidence review rather than a new cranberry-specific appraisal in the 2024 update [5].

Recurrence of urinary tract infections (UTIs) in childhood results in repeated exposure to antibiotics, consultations, and diagnostic tests. In children with normal urinary tracts, prevention should begin by confirming that the episodes are true UTIs and by intervening on modifiable functional factors. A review spanning childhood and adulthood is useful because it exposes the limits of extrapolation. Evidence from otherwise healthy adult women cannot establish a dose for infants. Conversely, null findings in frail care-home residents should not be applied automatically to independent postmenopausal women. A transient catheter after gynaecological surgery is not equivalent to long-term catheterisation or a neurogenic bladder.

This review therefore maps efficacy, safety and implementation across the lifespan, with the principal focus on recurrent infection in patients without known major structural urinary tract abnormalities or clinically important retention. Pregnancy, institutionalisation, neurogenic dysfunction and perioperative catheterisation are addressed separately to define boundaries, not to broaden the principal indication. The aim is to support realistic, practical decisions and identify research gaps rather than promote a particular commercial preparation.

Materials and Methods

Review Design and Scope

This was a a structured narrative review with a focused literature update informed by the reporting domains of the PRISMA extension for scoping reviews and by Joanna Briggs Institute methodological guidance [6, 7]. It combined a review-of-reviews approach with a focused update of primary and implementation literature. It was not prospectively registered, did not use independent duplicate screening or extraction, and did not undertake a new meta-analysis or a de novo formal GRADE assessment. The term rapid scoping review describes these deliberate methodological limits; complete PRISMA-ScR compliance is not claimed.

The population–concept–context framework included children and adults; ingestion of American cranberry, Vaccinium macrocarpon, as juice, syrup, powder, tablets or extract; and prevention of recurrent symptomatic UTI in outpatient or related settings. The principal target was a patient without a known major urinary tract malformation, obstruction, neurogenic bladder or significant residual urine. Trials with mixed anatomy or after a first infection were retained as indirect evidence and labelled accordingly. Functional BBD in children was considered a modifiable determinant requiring treatment, not evidence that supplements were sufficient.

Recurrent UTI was generally interpreted as at least two episodes in six months or three in twelve months in adult studies. Paediatric definitions were preserved as reported because they varied and may distinguish recurrent upper from recurrent lower UTI. The preferred outcome was symptomatic infection supported by an appropriately obtained culture. Clinical diagnoses without culture, asymptomatic bacteriuria, pyuria alone, ex vivo anti-adhesion and microbiome changes were kept distinct. Prevention of pyelonephritis, sepsis, renal scarring, antibiotic exposure, adverse effects and acceptability were secondary domains.

Information Sources and Search Update

The November 2023 Cochrane review provided the principal trial inventory and population-level synthesis; selected original studies were traced to clarify recruitment, age, anatomy, formulation and outcome. A reproducible PubMed update covered 14 March 2023, immediately after the Cochrane search cut-off, to 26 October 2026. It combined controlled vocabulary and free text for cranberry with urinary infection or cystitis and returned 123 records. The exact query and retrieval limits are provided in Supplementary Methods.

Titles and abstracts were examined for human prevention studies, systematic syntheses, guidelines and directly relevant safety or analytical evidence. Full reports were consulted when accessible, especially where a detail could alter clinical interpretation. Targeted searches retrieved foundational trials, nutrition advice, anticoagulation advice and current society documents. References originating from OpenEvidence/Consensus-assisted discovery in the supplied bibliography were treated only as leads and were checked against original publications or bibliographic records.

Human comparative prevention studies were prioritised. Combination products were retained only as contextual evidence when the contribution of cranberry could not be isolated. Animal experiments, acute-treatment studies, overactive-bladder studies without preventive UTI outcomes and non-clinical anti-adhesion studies did not contribute to clinical efficacy conclusions; a small number of mechanistic studies were retained to explain dose uncertainty. No pooled total of unique participants was calculated across reviews because their included trials overlap.

Data Charting and Interpretation

Charting recorded population, age, recurrence criteria, urinary anatomy, product and assay, comparator, follow-up, endpoint and effect estimate. Relative effects were extracted as reported, retaining the distinction between risks, rates, odds and hazards. The original review certainty ratings were reproduced only for

their corresponding comparisons. Additional judgements of directness by age or anatomy were qualitative, not new GRADE ratings. Recommendations presented here are a clinical synthesis, not a formal consensus guideline.

The update search count is reported for reproducibility, but no combined PRISMA selection total is presented: records from the original drafts, review reference lists, guidelines and targeted searches were not collected within one prospectively managed deduplicated database. Historical draft counts were not carried into the expanded review. This limits completeness and auditability and is considered explicitly in the Discussion.

Results

Evidence Architecture and Overall Effects

The principal Cochrane review included 50 trials with 8,857 participants and searched to 13 March 2023. Table 1: presents its population-specific estimates [1]. These comparisons do not establish a common dose, product interchangeability or uniform benefit at every age.

Table 1: Effects by Population in the Principal Cochrane Synthesis

Population	Studies and participants	Risk ratio and 95% CI	Source certainty	Applicability
Women with recurrent UTI	8 / 1,555	0.74 (0.55–0.99)	Moderate	Best adult fit; products differ.
Children	5 / 504	0.46 (0.32–0.68)	Moderate	Mixed ages, recurrence criteria and anatomical eligibility; not an infant estimate.
Risk following an intervention	6 / 1,434	0.47 (0.37–0.61)	Low	Heterogeneous procedures; not chronic-catheter prophylaxis.
Institutionalised older adults	3 / 1,489	0.93 (0.67–1.30)	Moderate	No demonstrated routine benefit.
Pregnant women	3 / 765	1.06 (0.75–1.50)	Moderate	Do not substitute for obstetric care.
Neuromuscular bladder dysfunction	3 / 464	0.97 (0.78–1.19)	Low	Outside principal normal-tract target.

The update added recent adult trials, contemporary guidelines, a product-specific regulatory assessment and analytical studies. These sources mainly refine patient and product selection; they do not remove the heterogeneity in definitions, formulations, follow-up and ascertainment. Table 2: maps selected adult trials, Table 3: maps paediatric trials, and Table 4: separates guideline positions from a regulatory health-claim assessment. Effect estimates from overlapping meta-analyses were not treated as independent replications.

Table 2: Selected Adult Prevention Trials

Study and population	Preparation and follow-up	Main finding	Interpretation
Stothers 2002; 150 women [10]	Juice or tablets versus placebo; 12 months	At least one symptomatic UTI: 20%, 18% and 32%, respectively.	Older products; small three-arm study; historical costs not current.
Barbosa-Cesnik 2011; 319 college women after acute UTI [11]	240 mL 27% cranberry drink twice daily versus placebo; 6 months	Recurrence 20% versus 14%; no significant benefit.	Not exclusively established recurrent UTI; retain negative evidence.
Maki 2016; 373 women with recent UTI [12]	240 mL cranberry beverage daily versus placebo; 24 weeks	Clinical episode IRR 0.61 (0.41–0.91); culture-positive time-to-event result null.	Clinical and microbiological endpoints differ.
Babar 2021; 145 women with recurrent UTI [13]	37 versus 2 mg PAC/day, divided doses; 24 weeks	Primary IRR 0.76 (0.51–1.11); not significant.	Favourable subgroup was post hoc; no universal threshold proven.
Tsiakoulias 2024; 172 randomised, 160 analysed [14]	Proprietary high-PAC capsule versus placebo; 12 months	UTI IRR 0.49; $p<0.001$.	Product and assay specific; not automatically equivalent to other PAC labels.
Stonehouse 2025; 150 women; FAS 145 [15]	Whole-fruit powder 500 mg/day versus placebo; 6 months	Participants with ≥1 culture-confirmed UTI: 13/73 versus 25/72; adjusted RR 0.48 (0.26–0.87).	Recruitment ended early; PP analysis not significant; scheduled cultures adjudicated.

Beerepoot 2011; 221 premenopausal women [20]	Cranberry 500 mg twice daily versus TMP–SMX 480 mg/day; 12 months	Antibiotic more effective; much greater resistance selection.	Antibiotic-sparing trade-off; cranberry non-inferiority not established.
McMurdo 2009; 137 older women [17]	Extract 500 mg/day versus trimethoprim 100 mg/day; 6 months	Women with ≥1 antibiotic-treated recurrence: 25 versus 14; reported RR 1.62 (0.93–2.79).	Wide interval; not evidence of equivalence.
Rondanelli 2024; 46 diabetic postmenopausal completers [18]	Cranberry phytosome 120 mg/day versus placebo; 6 months	Favourable culture/urinalysis-based signal.	Specialised SGLT-2 inhibitor population; small study; symptom ascertainment limits.

Doses are descriptions of investigated products, not interchangeable prescriptions. FAS, full analysis set; PP, per protocol; TMP–SMX, trimethoprim–sulfamethoxazole. Trade names are not endorsements.

Table 3: Paediatric Clinical Evidence and Directness

Study and population	Preparation and comparator	Clinical result	Main limitation
Salo 2012; 263 randomised; 255 analysed; 1–16 years [31]	Juice 5 mL/kg/day, maximum 300 mL, versus placebo; 6 months of treatment, 12 months of observation	At least one recurrence 16% versus 22% (p=0.21); fewer total episodes and antibiotic days.	Recruited after one verified UTI; volumes not a current nutritional recommendation.
Afshar 2012; 40 children; 5–18 years [32]	PAC-containing juice 2 mL/kg/day versus control beverage; 12 months	0.4 versus 1.15 UTI/person-year.	39 girls; very small; primary VUR permitted; no transferable PAC dose.
Ferrara 2009; 84 girls; 3–14 years [33]	Cranberry–lingonberry concentrate 50 mL/day versus Lactobacillus or control; 6 months	Fewer recurrences reported in cranberry arm.	Open study; combination fruit; inconsistent control count and percentage in abstract.
Fernández-Puentes 2015; 192 children; >1 month–13 years [34]	Syrup 0.2 mL/kg nightly versus trimethoprim; mixed VUR status	Authors reported non-inferiority only above one year; lower efficacy at tested dose in infants.	Only 32 cranberry-exposed infants; no normal-tract infant subgroup; active comparator.
Wan 2016; 55 randomised boys; 6–18 years [35]	120 mL/day juice versus placebo; 6 months	Participants with reported culture-positive bacteriuria 7/28 versus 10/27.	Small sample; endpoint ambiguity; circumcision comparison not randomised.
Dotis conference abstract; 76 children; characterised in Cochrane [1]	Capsule with cranberry plus vitamins versus no treatment	Favourable estimate in the source synthesis.	Abstract-only reporting; co-ingredients; limited independent verification.
Beerepoot 2011; 221 premenopausal women [20]	Cranberry 500 mg twice daily versus TMP–SMX 480 mg/day; 12 months	Antibiotic more effective; much greater resistance selection.	Antibiotic-sparing trade-off; cranberry non-inferiority not established.
McMurdo 2009; 137 older women [17]	Extract 500 mg/day versus trimethoprim 100 mg/day; 6 months	Women with ≥1 antibiotic-treated recurrence: 25 versus 14; reported RR 1.62 (0.93–2.79).	Wide interval; not evidence of equivalence.

These studies differ in recurrence criteria, anatomy and outcome definition; they are not six trials exclusively in children with recurrent culture-confirmed UTI and completely normal anatomy. The infant subgroup is not the overall trial result, and volume-based regimens are not interchangeable between products.

Table 4: Guideline and Regulatory Positions Verified for this Review

Document	Population or remit	Position	Important distinction
AUA/CUA/SUFU amended 2025 [2]	Women with recurrent localised UTI	Offer cranberry as a preventive option; moderate recommendation, Grade B evidence.	An option, not a requirement; approximately 36 mg PAC is a pragmatic product target.
EAU Urological Infections 2026 [3]	Adult recurrent cystitis	Strong recommendation to advise on cranberry, with explicit warning of low-quality, contradictory evidence.	Do not repeat the older weak rating; strength is not high certainty.

NICE NG112 updated 2024 [5]	Recurrent UTI self-care	Some non-pregnant women may wish to try cranberry; benefit uncertain. Paediatric specialist advice for patients under 16 years.	Cranberry discussion retained from 2018, including no evidence of benefit in older women; product and dose uncertain.
EAU Paediatric Urology 2026 [4]	Children including normal urinary tract	Dietary supplementation may be an alternative or add-on in selected cases; weak recommendation.	Treat BBD and constipation; no routine infant dose established.
EFSA product opinion 2025 [16]	Specified Pacran food health claim	Evidence insufficient to establish the submitted cause-and-effect claim.	A product-specific regulatory conclusion, not a clinical guideline for all cranberries.

Systems and remits differ; ratings have not been converted into a new common GRADE scale. Guideline wording was paraphrased; the review does not endorse acute-treatment substitution.

A 2024 network meta-analysis of 20 trials and 3,091 participants favoured cranberry juice over no treatment and placebo liquid and suggested reduced antibiotic use. Certainty was moderate to low. Its formulation-level conclusions require caution because populations, outcome definitions and comparators differed across the network. The analysis supports discussing juice as an option but does not establish that every juice is superior to every capsule, or that fluid intake and cranberry-specific effects can always be separated [8].

Recurrent lower Urinary Infection in Women Who Are Not Pregnant

Early trials suggested benefit but were frequently small or used open comparators. Kontiokari and colleagues randomised 150 women to cranberry–lingonberry concentrate, a Lactobacillus drink or no intervention. At six months, recurrence had occurred in 16%, 39% and 36%, respectively; the cranberry product contained another berry and the comparison was not blinded [9]. In Stothers' three-arm trial of 150 women, juice and tablets both reduced the proportion experiencing at least one symptomatic UTI over a year compared with placebo, although the cost estimates and products are not transferable to the contemporary market [10].

Important negative evidence should remain visible. Barbosa-Cesnik and colleagues followed 319 college women presenting with an acute UTI. Twice-daily cranberry juice did not prevent a second culture-supported infection over six months; recurrence was numerically higher with cranberry. This population was not selected solely for an established recurrent-UTI phenotype. Differences in baseline risk, culture thresholds and ascertainment may influence estimates, but a lower culture threshold is not automatically inappropriate in a symptomatic woman and should not be dismissed simply to explain an unfavourable trial [11].

Maki and colleagues studied 373 women with a recent UTI using a 240-mL cranberry beverage daily for 24 weeks. Investigator-diagnosed clinical episodes were reduced, whereas time to a culture-positive UTI was not. The distinction matters: an intervention that reduces clinically labelled episodes need not produce an equally large effect on microbiologically supported disease. The study also illustrates that a cranberry beverage should not be assumed to be unsweetened juice or to have the same PAC profile as another liquid product [12].

The PACCANN trial directly tested a commonly proposed dose strategy. Among 145 women with recurrent UTI, 37 mg PAC daily, divided into two doses, did not significantly reduce the primary symptomatic-UTI rate compared with 2 mg daily over 24 weeks. A favourable result among women with fewer than five previous infections arose from a post hoc analysis. That finding is hypothesis-generating and does not validate either a minimum threshold or a rule for selecting patients according to recurrence frequency [13].

More recent studies support a preventive signal without resolving these issues. Tsiakoulias and colleagues randomised 172 women to a proprietary high-PAC preparation or placebo for twelve months; 160 were analysed and the UTI rate favoured cranberry. The product's numerical dose designation must not be equated with a PAC amount obtained using another analytical method [14].

Stonehouse and colleagues randomised 150 women to 500 mg whole-fruit powder or placebo for six months. At least one culture-confirmed UTI occurred in 13/73 versus 25/72 participants in the full analysis set; the adjusted risk ratio was 0.48 (95% CI 0.26–0.87). Recruitment stopped at half the target, the full analysis set excluded five participants, and the per-protocol result was not significant. Scheduled-visit cultures were adjudicated, but ambiguous cases were counted as positive on the culture result; this endpoint was not identical to uniformly symptomatic, culture-confirmed recurrence. These qualifications limit generalisation to other powders [15].

The 2025 EFSA assessment of Pacran is an important counterweight to an exclusively positive reading. It considered the specific product sufficiently characterised but found the submitted evidence insufficient to establish the proposed cause-and-effect health claim. It noted inconsistency between relevant intervention studies, sensitivity to statistical decisions and limited mechanistic substantiation. This is not a finding that all cranberry products are ineffective: regulatory substantiation for one specified food and clinical decisions about an optional preventive intervention answer different questions. Nevertheless, the opinion argues against product-wide certainty based on one positive analysis [16].

Postmenopausal and Independently Living Older Women

Menopause, frailty and residence in long-term care are different modifiers. McMurdo and colleagues randomised 137 women with recurrent antibiotic-treated infections to 500 mg cranberry extract or 100 mg trimethoprim daily for six months.

An antibiotic-treated recurrence occurred in 25 versus 14 women; the confidence interval was wide and did not establish equivalence. These women should not be combined conceptually with residents whose dominant outcomes are chronic bacteriuria and non-specific symptoms [17].

A small 2024 trial in diabetic postmenopausal women taking sodium–glucose cotransporter-2 inhibitors reported a favourable signal with a 120-mg cranberry phytosome formulation. Only 46 participants completed the study. Urinalysis/culture-based ascertainment and the specialised population limit inference about symptomatic recurrence and applicability to otherwise healthy postmenopausal women. It is not a basis for routinely prescribing cranberry to all patients taking these medicines [18].

In women with genitourinary symptoms of menopause, vaginal oestrogen addresses a relevant biological deficit and has randomised evidence for reducing recurrence. Cranberry can be discussed as an optional adjunct but should not displace indicated local oestrogen without a reason. Age alone does not establish that cranberry will fail; conversely, postmenopausal status alone does not establish efficacy for a particular extract [19].

Comparison with Antibiotics and Antimicrobial Resistance

The most informative adult direct comparison is the NAPRUTI non-inferiority trial in 221 premenopausal women. Daily trimethoprim–sulfamethoxazole was more effective than cranberry capsules, with approximately two rather than four symptomatic episodes over twelve months, but selected substantially more resistant Escherichia coli. After one month, resistance to that antibiotic exceeded 85% in the antibiotic arm's sampled faecal isolates. Resistance returned towards baseline after cessation. The trade-off is reduced antimicrobial selection pressure, not proof that cranberry is equally effective or that it cannot influence microbial ecology [20].

An imprecise comparison yielding no statistically significant difference is not a successful equivalence test. Its interpretation depends on the outcome definition, prespecified margin, analysis population and confidence interval. Pooling children and adults or comparing clinical diagnoses with culture-verified endpoints can obscure these distinctions. Cranberry should therefore not replace an otherwise indicated prophylactic antibiotic simply because a pooled estimate is close to unity.

Institutionalised Older Adults

Care-home evidence is not supportive of routine prescribing. In the trial by Juthani-Mehta and colleagues, 185 older women received capsules providing 72 mg PAC daily or placebo for one year. The primary endpoint, bacteriuria plus pyuria, was not reduced; symptomatic infections and other clinical outcomes were also not improved. The primary endpoint was not recurrent symptomatic UTI, but the clinical secondary findings do not supply a persuasive preventive signal [21].

Caljouw and colleagues studied 928 long-term-care residents. A reduction in broadly clinically defined infections was observed in the higher-risk stratum, but disappeared when a stricter definition was applied. This endpoint dependence is particularly relevant when non-specific changes can prompt a UTI diagnosis. Neither a positive dipstick nor chronic bacteriuria alone should justify cranberry, routine urine surveillance or antibiotics in an otherwise asymptomatic resident [22, 23].

Pregnancy and Lactation

The pregnancy evidence does not support routine cranberry prophylaxis. Wing and colleagues' pilot trial recruited 188 women and required modification of a high-volume beverage regimen to improve adherence. Almost 39% withdrew, mainly because of gastrointestinal intolerance, and infection estimates were imprecise. Ordinary dietary consumption and therapeutic supplementation are different exposures; absence of a clear safety signal in small studies is not proof of safety for high-dose or multi-ingredient preparations [24].

Unlike the principal non-pregnant population, pregnant women should be screened for asymptomatic bacteriuria and treated when it is confirmed, in accordance with obstetric guidance; symptomatic UTI also requires appropriate assessment and treatment, not substitution with cranberry [23]. Breastfeeding women were excluded from some adult trials, so lactation-specific efficacy and supplement safety cannot be inferred from those results. A woman who becomes pregnant during an elective preventive trial should have the plan reviewed.

Men and Patients with Neurogenic Dysfunction or Catheters

No convincing direct evidence was identified for routine prophylaxis in otherwise healthy adult men with recurrent UTI. Recurrence warrants attention to prostatic infection, obstruction, residual urine, stones and other causes. Male sex should not itself be treated as synonymous with an anatomical abnormality, but evidence in women cannot supply the missing male-specific estimate.

Neurogenic bladder and spinal cord injury fall outside the principal target population. In the 305-participant SINBA factorial trial, cranberry tablets did not prolong the symptomatic UTI-free period compared with placebo. This is consistent with the absence of demonstrated benefit in the relevant pooled subgroup and argues against routine extrapolation from community women [25].

Postoperative catheter exposure is a separate question. Foxman and colleagues found fewer clinically diagnosed and treated infections after benign gynaecological surgery with cranberry capsules, but their endpoint did not require a positive culture in every case [26]. A later 210-participant pelvic-floor-surgery trial did not show a statistically significant benefit [27]. Letouzey and colleagues likewise found no reduction in postoperative bacteriuria with 36 mg PAC daily; importantly, bacteriuria was the primary outcome rather than symptomatic infection [28]. These heterogeneous studies do not justify a blanket recommendation for catheter-associated infection prevention or replacement of procedure-specific prophylaxis.

Children with Recurrent Infection and a Largely Normal Urinary Tract

Cranberry may reduce symptomatic, culture-supported recurrences in selected children. The EAU paediatric guideline allows dietary supplementation as an alternative or additional preventive measure in selected cases, but this is a weak recommendation and does not establish an infant regimen [1,

4]. Paediatric syntheses favour a reduction in recurrence, but the directness for the strict target population varies. Meena and colleagues found a favourable cranberry comparison within a systematic review of non-antibiotic interventions [29]. The 2024 network meta-analysis by Gkiourtzis and colleagues included 23 studies of preventive strategies and found a signal for cranberry and nitrofurantoin. The certainty of its network estimates was very low. Its comparisons should not be interpreted as establishing cranberry superiority over antibiotics for a specific child: doses, indications and anatomy varied, and some included reports had limited design information. No preventive strategy in that synthesis was shown to reduce renal scarring [30].

The largest paediatric placebo-controlled study, by Salo and colleagues, recruited 263 children aged 1–16 years after a verified UTI rather than exclusively after recurrent disease. Eight children were excluded after randomisation, leaving 255 in the analyses. Juice or placebo was given for six months and infections were monitored for twelve months. The proportion with a subsequent infection was not significantly different, although the total episode burden and antibiotic days were reduced over follow-up. Thus, the trial supports the possibility of reducing recurrent-event burden but not an unqualified claim that most children will avoid any further infection [31].

Afshar and colleagues studied 40 children aged 5–18 years, almost all girls, with at least two previous non-febrile infections. A PAC-containing juice reduced the annualised event rate compared with a matched low/no-PAC beverage. The small sample and female predominance limit age- and sex-specific claims, and the reported product cannot be translated confidently to a universal milligram dose [32].

Ferrara and colleagues randomised 84 girls aged 3–14 years to cranberry–lingonberry concentrate, a Lactobacillus drink or no intervention. The study reported fewer infections with cranberry, but it was open and the published abstract contains an internally inconsistent control event count and percentage [33].

Infants and the Limits of Age Extrapolation

Infant evidence is limited, not entirely absent. Fernández-Puentes and colleagues reported a double-blind active-comparator study in 192 children older than one month, including 85 younger than one year. According to the full report, 32 infants received cranberry and 53 trimethoprim. The sample included VUR and did not provide an infant estimate restricted to a normal urinary tract. The authors' non-inferiority conclusion applied to children older than one year; they considered the tested dose less effective in infants. The frequently quoted cumulative rates of 35% with cranberry and 28% with trimethoprim belong to the infant stratum, not the whole trial [34].

Several limitations change clinical interpretation: uneven allocation, small subgroups, mixed anatomy, an active comparator rather than placebo, and older urine-collection practices. The tested syrup volume of 0.2 mL/kg nightly is a description of that formulation, not a transferable prescription for juice or a different extract. Tolerability in a few dozen exposed infants cannot exclude uncommon harms. Routine prophylaxis in children younger than twelve months is therefore not supported, and no neonatal preventive regimen can be recommended.

Additional Evidence in Schoolchildren and Adolescents

Evidence in boys is particularly sparse. Wan and colleagues randomised 55 uncircumcised boys aged 6–18 years to cranberry or placebo and included a separate non-randomised circumcised comparison group. Reported culture-positive bacteriuria occurred in 7/28 versus 10/27 participants. Endpoint ambiguity and the small numbers preclude a confident treatment effect; the design cannot establish superiority over circumcision [35]. A 36-participant adolescent registry reported benefit with a standardised extract, but allocation was not random and follow-up was short [36].

A 2023 paediatric trial evaluated cranberry–lingonberry effects on the intestinal and urinary microbiome. It contributes biological plausibility but not a substitute estimate of clinically confirmed recurrence [37]. A 2026 self-controlled cohort of 39 children aged 3–16 years, including some with mild-to-moderate VUR, used cranberry together with probiotics and vitamin C. Its before–after reduction is vulnerable to regression to the mean, and the intervention cannot isolate the effect of cranberry [38].

For children aged at least one year, especially those close to the school-age populations studied, cranberry may be considered after reliable diagnosis and management of constipation, infrequent voiding and BBD. No evidence-defined age threshold at one year suddenly establishes efficacy: it is a practical boundary reflecting infant uncertainty and nutrition guidance. Recurrent febrile or atypical infection requires renewed evaluation irrespective of supplement use. Table 5: summarises proposed use across age groups and clinical settings.

Table 5: Proposed Practical use by Age and Clinical Setting

Group	Proposed practice	Evidence and directness	Priority or safeguard
Neonates 0–27 days	Do not use as routine prevention.	No direct preventive evidence.	Prompt assessment of suspected infection; no fruit juice regimen.
Infants 28 days to <12 months	Do not recommend routinely; exceptional specialist decisions only.	One small, anatomically mixed active-comparator subgroup enrolled above one month [34].	No validated dose; proper sampling and indicated imaging take priority.
Children 1–5 years	Consider only in selected recurrent cases with paediatric advice.	Included within mixed-age trials; little age-specific evidence.	Treat constipation/BBD; ensure a safe formulation; no adult PAC extrapolation.

Children 6–11 years	Optional monitored adjunct after baseline measures.	Closer to direct trial populations, but heterogeneous products.	Document symptomatic cultured episodes; reassess febrile recurrences.
Adolescents 12–17 years	Optional monitored strategy with shared decisions.	Small trials and indirect evidence.	Assess pregnancy possibility and relevant sexual-health factors confidentially.
Non-pregnant adult women	Offer as one preventive option for recurrent lower UTI.	Most directly supported adult population.	Exclude red flags/retention; select a verifiable product and review response.
Independent postmenopausal women	May consider; do not displace indicated vaginal oestrogen.	Adult evidence includes some older women; precise subgroup effect uncertain.	Distinguish menopause from frailty and institutionalisation.
Diabetic women taking SGLT-2 inhibitors	No general routine indication solely because of the medicine.	One small specialised trial [18].	Separate genital infection from UTI; review glucose control and urinary risk.
Frail care-home residents	Do not prescribe routinely for UTI prevention.	Strict clinical outcomes not convincingly improved.	Do not treat asymptomatic bacteriuria or a positive dipstick alone [23].
Pregnancy or lactation	No routine prophylactic recommendation.	No established pregnancy benefit; lactation-specific evidence sparse.	Pregnancy screening/treatment pathways and product safety review; do not replace indicated treatment [23].
Adult men	No routine population-specific recommendation.	Convincing direct normal-tract evidence lacking.	Assess prostate, retention, obstruction and recurrent systemic infection.
Neurogenic bladder or chronic catheter	Do not extrapolate the community-women benefit.	No established benefit for neurogenic dysfunction.	Optimise bladder management and catheter indication/care.
Temporary postoperative catheter	No blanket recommendation.	Procedure-specific findings and endpoints conflict.	Follow perioperative protocols; bacteriuria is not synonymous with UTI.

These are review-derived practice proposals, not a newly validated GRADE guideline. A 3–6-month trial with an approximately 3-month review is pragmatic, not a proven optimum. Cranberry does not replace indicated antibiotics or evaluation of systemic infection.

Biological Rationale and why a PAC Threshold is Not a Universal Dose

The principal proposed mechanism is reduced bacterial adhesion rather than urinary sterilisation. Howell and colleagues demonstrated dose-related ex vivo urinary anti-adhesion after standardised powders in 32 healthy volunteers, with longer persistence at the higher exposure. This does not establish that intact ingested PAC is the sole urinary effector, that the assay predicts an individual's clinical benefit, or that twice-daily dosing is superior in preventive clinical trials [39].

A 2024 meta-analysis associated exposures of at least 36 mg PAC daily with a small reduction in infection risk. Its comparison was largely between different trials and products, not a randomised test of one universal threshold. Moreover, it classified an adolescent registry among the trials. The finding should therefore support product characterisation and hypothesis generation, not a claim that preparations below 36 mg cannot work or that every preparation above it will work [40].

Analytical method is clinically consequential. The Stonehouse powder was labelled >1.5% PAC by high-performance liquid chromatography, >7.2% by the European Pharmacopoeia method and >0.3% by the Brunswick Laboratories 4-dimethylaminocinnamaldehyde assay (BL-DMAC). Those method-dependent figures cannot be treated as interchangeable quantities. In particular, 36 mg calculated from its Pharmacopoeia percentage is not 36 mg BL-DMAC PAC [15].

In a 2026 multilaboratory analysis of 53 cranberry supplements, only three delivered soluble PAC at or above 36 mg/day under the analytical framework used; label claims frequently overstated measured content. This survey does not test clinical efficacy, but it shows why a label alone may fail to reproduce an investigated exposure [41]. An open comparative study of 219 women also highlighted soluble and insoluble fractions, but lacked a no-cranberry control and cannot establish causal superiority of a formulation [42].

A 2026 phenotyping study found substantial variability in urinary anti-adhesion and response to short-term juice intake among 152 healthy women. Its laboratory-defined susceptibility categories were not validated against prospective infection risk. Metabolic phenotyping remains a research approach, not a basis for a clinical test to decide who should receive cranberry [43].

Whole fresh cranberries are a food, but clinical prevention trials predominantly evaluate processed and characterised products. A trial of whole-fruit powder is not a trial of a serving of fresh fruit. No defensible universal number of berries, grams of fresh fruit or juice volume can be equated with a studied PAC exposure. Table 6: distinguishes reasonable implementation choices from unvalidated dose claims.

Table 6: Formulation and Dose Decisions for Clinical use

Decision	Reasonable approach	What cannot be inferred
Adult supplement	Select a characterised Vaccinium macrocarpon product with independent assay information; approximately 36 mg PAC/day by a specified method is a common practical target.	Not a universal effective threshold; no guarantee that different assays or extracts are interchangeable.
Split daily dosing	Acceptable if it matches the investigated preparation and is feasible.	No convincing clinical evidence that twice daily is universally superior to once daily.
Paediatric supplement	Use specialist advice and an age-appropriate formulation; record actual product exposure.	No validated general mg/kg regimen and no routine infant dose.
Juice	Choose pasteurised product; consider sugar, energy, total fluids and paediatric nutritional limits.	A trial volume is not a PAC-equivalent dose for another juice.
Whole fruit or powder	Fresh fruit can be part of a balanced diet; a studied powder requires its own specification.	No validated fruit-serving equivalent; whole-fruit powder is not fresh berries.
Combination products	Consider only the evidence for that complete formulation and disclose attribution limits.	Benefit cannot automatically be assigned to cranberry, PAC, probiotics or D-mannose individually.

Assay and product issues are supported by the ex vivo study, dose trial, analytical survey and product-specific trial reports [13, 15, 39, 41]. PAC content should be expressed per complete daily dose and accompanied by the method and reference standard where available.

Safety and Drug Interactions

Gastrointestinal symptoms predominate, with a possible small increase over control [1]. Absence of detected serious toxicity in selected trial populations is not proof of long-term safety in every group. The safety review by Madden and colleagues found no general serious-risk signal when cranberry ingredients were consumed appropriately, but described inconsistent evidence concerning stone formation and drug interactions [44].

Warfarin requires particular care. A small healthy-volunteer study found a pharmacodynamic signal, whereas a trial in stable anticoagulated patients did not show a clinically important interaction at the studied intake [45, 46]. Current UK National Health Service advice nevertheless tells patients taking warfarin to avoid cranberry juice. Concentrated supplements also warrant review. Elective supplementation should not be initiated in a warfarin user without the anticoagulation service's agreement; if exposure is already present, stopping or changing it should also be communicated [47].

Urinary oxalate findings are inconsistent and do not establish that ordinary cranberry intake invariably causes stones. Nevertheless, patients with recurrent calcium oxalate stones, hyperoxaluria or renal impairment merit individual review before concentrated supplementation. Sugar and energy load matter in diabetes, dental disease and obesity; high volumes may also be inappropriate when fluid intake is restricted. Avoid unpasteurised juice, assess allergy and excipients, and select a swallowing-safe form.

For children, juice must not displace appropriate nutrition. The American Academy of Pediatrics advises no fruit juice before twelve months except for a clinical indication, with total daily limits of approximately 120 mL at 1–3 years, 120–180 mL at 4–6 years and 240 mL at 7–18 years. These are nutritional ceilings for all juices combined, not cranberry prophylaxis doses [48].

Discussion

Where Cranberry Belongs in Preventive Care

The most defensible adult indication is an informed non-pregnant woman with recurrent lower-tract symptoms supported by prior cultures, no red flags and no known major abnormality or important retention. Her preferences may reasonably favour a low-burden supplement despite a smaller and less certain effect than antibiotic prophylaxis. Benefit depends on baseline recurrence risk and on whether the available product resembles an investigated intervention. Cranberry should be an option to discuss, not an obligation or a substitute for diagnostic reasoning.

Absolute benefit should be explained without presenting a single pooled number needed to treat as universal. As an illustration, applying the recurrent-women point estimate from Table 1 to a baseline risk of 40% over a comparable observation period gives a treated risk of about 30%, an absolute reduction of about ten percentage points and a number needed to treat of approximately ten to prevent one additional patient from experiencing at least one recurrence. At a 20% baseline risk, the absolute reduction is about five percentage points, corresponding to a number needed to

treat of approximately twenty over the same observation period. These are calculated scenarios, not observed pooled risks, and omit uncertainty in both the effect and the baseline risk.

Other measures may be more directly relevant. In women with low habitual fluid intake, a trial of additional water reduced cystitis recurrences; it does not justify excessive fluid intake in heart failure or renal disease [49]. Local vaginal oestrogen merits discussion when appropriate after menopause. Methenamine hippurate has direct non-inferiority evidence against daily antibiotics in selected adult women from the ALTAR trial, although the trial did not compare it with cranberry [50]. The large UK placebo-controlled D-mannose trial was negative for its primary outcome; cranberry-D-mannose combinations cannot be presumed more effective on the strength of marketing or small uncontrolled reports [51].

In children, correct sampling and recognition of BBD take priority. The clinical consequences of a febrile recurrence differ from those of an afebrile lower infection. Cranberry has not established protection against renal scarring, and a family should not be reassured that a supplement removes the need for prompt review of fever, systemic illness, poor feeding, vomiting or flank pain.

Interpreting Disagreement Between Guidelines

Recommendation strength, evidence certainty and regulatory authorisation are not interchangeable. The AUA's moderate recommendation with Grade B evidence, the EAU adult guideline's strong recommendation accompanied by low-quality evidence, and the EAU paediatric guideline's weak recommendation for selected dietary supplementation use different systems and scopes. None supplies a universal paediatric PAC dose. NICE also reflects a different update history: its retained self-care statement says there is no evidence of benefit in older women, but this is not a new 2024 demonstration of ineffectiveness [5]. Table 4 preserves these distinctions instead of converting every statement into a common GRADE label.

The strong 2026 EAU adult recommendation is accompanied by an explicit warning about low-quality and contradictory evidence [3]. Conversely, its reference to symptom relief does not establish cranberry as an effective antimicrobial treatment for acute infection: the same guideline describes the acute-treatment evidence as insufficient. The present review is confined to prevention and does not recommend replacing indicated antibiotics during an active infection.

A Practical Monitored Preventive Trial

A reasonable implementation pathway starts with reconstruction of the infection history. Confirm dates, symptoms, culture results, specimen quality, antibiotic exposure and whether episodes were febrile or systemic. Investigate persistent haematuria, recurrent upper-tract infection, relapsing infection, poor emptying or unusual organisms as clinically indicated. A presumed normal urinary tract does not require routine cystoscopy or extensive imaging in every otherwise healthy woman; testing should follow risk and local guidance.

Next address modifiable factors: constipation and BBD in children, habitual retention, inadequate fluid intake, relevant spermicidal exposure and menopausal symptoms. Review medicines, renal function where relevant, anticoagulation and pregnancy possibility. Explain which outcomes matter and which claims are unsupported. The patient or family should understand that breakthrough infection can still occur.

If cranberry is chosen, record the species, preparation, daily product amount, claimed PAC content, analytical method, batch or manufacturer and co-ingredients. For adult women, a verified preparation delivering approximately 36 mg/day PAC by a specified method is a pragmatic commonly used option, but matching a well-characterised trial product is preferable to treating that figure as a universal threshold. There is no justification for automatically escalating to 72, 120 or 240 mg, or converting an adult target to a paediatric mg/kg dose.

Most informative preventive studies used several months rather than intermittent rescue dosing. A three- to six-month initial trial with a planned review at approximately three months is a pragmatic proposal, not an evidence-defined optimum. In a person with infrequent baseline episodes, a longer observation window may be needed to judge change; a simple before–after comparison remains vulnerable to regression to the mean and seasonal variation. Continuing beyond six months should depend on tolerability, burden, preference and a plausible documented benefit.

Record symptomatic culture-supported recurrences per unit of follow-up, systemic or febrile episodes, antibiotic courses or days, adherence and adverse effects. In the principal non-pregnant population, do not use routine surveillance cultures solely to demonstrate a preventive response in an asymptomatic patient. Indications for screening in pregnancy and before endourological procedures involving mucosal trauma remain exceptions [23]. Stop or reassess for adverse effects, unacceptable cost or burden, lack of plausible benefit, pregnancy, a new interaction or a change in urinary risk. Escalate promptly if systemic infection develops. Table 5 summarises age- and setting-specific proposals.

Research priorities

Future trials should specify recurrence phenotype, urinary anatomy, residual urine, age, sex and menopausal status. Infant studies require an independent safety and dose programme rather than downward extrapolation from adult extracts. Adequate microbiological sampling, particularly in non-toilet-trained children, is essential. Studies should distinguish symptomatic culture-supported infection from bacteriuria and should report febrile disease, antibiotic use, quality of life and treatment burden.

Product reporting should include botanical identity, extraction process, soluble and insoluble fractions, the PAC assay and reference standard, batch stability and public access to the specification. Dose-finding trials should compare the same matrix using a prespecified assay. Mechanistic biomarker studies should demonstrate prospective prediction before being used to select patients. Trials of combination products should be designed to identify the contribution of each component, rather than attributing the whole effect to cranberry.

Limitations of this Review

This structured narrative review with a focused literature update depends on one systematic review, a single-database update, targeted reference tracing and non-duplicated screening. It may miss studies outside PubMed or grey literature, and accessible abstract records were used where full reports could not be retrieved. It is an evidence map and critical synthesis rather than a complete systematic re-evaluation of every cranberry trial. No overall new risk-of-bias assessment, formal evidence-to-decision panel or new pooled estimate was produced. Funding and manufacturers' roles were not systematically charted; these omissions limit conclusions about product-specific certainty.

The same trials appear in several reviews. Apparent agreement between meta-analyses is therefore not independent replication. Population-specific Cochrane certainty cannot be transferred unchanged to an infant, a male patient or a commercial extract. The recommendations are intended for professional review and local adaptation, and publication does not convert them into formally validated dosing guidance.

Conclusion

Cranberry has a defensible but selective role in preventing recurrent UTI. The clearest adult application is an optional, monitored strategy for non-pregnant women with recurrent lower infection and no major urinary abnormality or significant retention. Selected children aged at least one year may also be considered, particularly after treating BBD and constipation, with specialist advice and explicit acknowledgement of uncertain age-specific dosing. Routine infant or neonatal use is not supported.

Routine extension to institutionalised older adults, pregnancy, neurogenic dysfunction, chronic catheterisation or otherwise healthy adult men is not justified by the available evidence. A numerical PAC label is not a guarantee of trial-equivalent exposure. Shared decisions should incorporate product quality, cost, adherence and planned reassessment. Cranberry must not delay investigation or indicated antimicrobial treatment, and no protection against pyelonephritis or renal scarring should be promised.

Declarations

Ethical Approval and Consent

Not applicable. This review used published literature and did not recruit participants or analyse identifiable participant-level data.

Data availability: The search strategy and the principal extracted study characteristics and effect estimates are provided in the Supplementary Methods and tables. No new participant-level dataset was generated.

Use of Generative Artificial Intelligence

Generative artificial intelligence assisted literature discovery, drafting, British English language editing and document preparation. Retrievable original reports and bibliographic records were used to cross-check cited claims and reference details. These tools are not authors; responsibility for scientific accuracy, interpretation and final approval rests with the named authors.

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