

Summary of the AUA Guideline on Management of Primary Vesicoureteral Reflux in Children

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Abbreviations and Acronyms

APN = acute pyelonephritis
BBD = bladder and bowel dysfunction
BT-UTI = breakthrough UTI
CAP = continuous antibiotic prophylaxis
DMSA = dimercaptosuccinic acid
PGC = Practice Guidelines Committee
UTI = urinary tract infection
VCUG = voiding cystourethrogram
VUR = vesicoureteral reflux

The complete Guideline is available at <http://www.auanet.org/content/guidelines-and-quality-care/clinical-guidelines.cfm>.

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Purpose: The American Urological Association established the Vesicoureteral Reflux Guideline Update Committee in July 2005 to update the management of primary vesicoureteral reflux in children guideline. The Panel defined the task into 5 topics pertaining to specific vesicoureteral reflux management issues, which correspond to the management of 3 distinct index patients and the screening of 2 distinct index patients. This report summarizes the existing evidence pertaining to children with diagnosed reflux including those young or older than 1 year without evidence of bladder and bowel dysfunction and those older than 1 year with evidence of bladder and bowel dysfunction. From this evidence clinical practice guidelines were developed to manage the clinical scenarios insofar as the data permit.

Materials and Methods: The Panel searched the MEDLINE® database from 1994 to 2008 for all relevant articles dealing with the 5 chosen guideline topics. The database was reviewed and each abstract segregated into a specific topic area. Exclusions were case reports, basic science, secondary reflux, review articles and not relevant. The extracted article to be accepted should have assessed a cohort of children with vesicoureteral reflux and a defined care program that permitted identification of cohort specific clinical outcomes. The reporting of meta-analysis of observational studies elaborated by the MOOSE (Meta-analysis Of Observational Studies in Epidemiology) group was followed. The extracted data were analyzed and formulated into evidence-based recommendations.

Results: A total of 2,028 articles were reviewed and data were extracted from 131 articles. Data from 17,972 patients were included in this analysis. This systematic meta-analysis identified increasing frequency of urinary tract infection, increasing grade of vesicoureteral reflux and presence of bladder and bowel dysfunction as unique risk factors for renal cortical scarring. The efficacy of continuous antibiotic prophylaxis could not be established with current data. However, its purported lack of efficacy, as reported in selected prospective clinical trials, also is unproven owing to significant limitations in these studies. Reflux resolution and endoscopic surgical success rates are dependent upon bladder and bowel dysfunction. The Panel then structured guidelines for clinical vesicoureteral reflux management based on the goals of minimizing the risk of acute infection and renal injury, while minimizing the morbidity of testing and management. These guidelines are specific to children based on age as well as the presence of bladder and bowel dysfunction. Recommendations for long-term followup based on risk level are also included.

Conclusions: Using a structured, formal meta-analytic technique with rigorous data selection, conditioning and quality assessment, we attempted to structure clinically relevant guidelines for managing vesicoureteral reflux in children. The lack of robust prospective randomized controlled trials limits the strength of these guidelines but they can serve to provide a framework for practice and set boundaries for safe and effective practice. As new data emerge, these guidelines will necessarily evolve.

Key Words: vesico-ureteral reflux, urinary bladder, ureter, intestines, child

In 1997 the American Urological Association published the guideline on the management of primary vesicoureteral reflux in children. There has been an expanding body of literature dealing with evaluation and management, as well as screening for vesicoureteral reflux. Therefore, the AUA appointed a Panel to update the 1997 document and elected to expand its scope to include guidelines for the screening of siblings of children with VUR and of neonates/infants with prenatally diagnosed hydronephrosis. A literature search, review of the evidence and data extraction from relevant clinical studies and case series were performed (see technical chapters online at <http://www.auanet.org/content/guidelines-and-quality-care/clinical-guidelines.cfm>). Extracted data underwent meta-analysis to determine the outcomes related to the 5 topics of 1) management of children older than 1 year with VUR, 2) evaluation and management of infants with VUR, 3) management of children with VUR, and bladder and bowel dysfunction, 4) screening of siblings and offspring of patients with VUR, and 5) screening of neonates and infants with prenatal hydronephrosis. This document summarizes the guideline statements of the first 3 sections derived from the meta-analysis. The screening topics are presented separately. Additional chapters published online provide a detailed summary of each topic.

From the evidence and expert opinion when explicit data were not available, the Panel drafted guideline statements. According to AUA definitions, these statements are graded with respect to the degree of flexibility in application. A "standard" is the most rigid treatment policy and, given limited definitive data, only 3 standards are included in this document. A "recommendation" has significantly less rigidity, being a statement for which there is sufficient evidence, even if not consistently of the highest quality, to advocate for a particular clinical approach. An "option," which has the most flexibility, is a statement when there is evidence of relatively equal strength and quality supporting more than 1 approach, with any of the approaches being acceptable and justifiable. In the absence of definitive evidence stronger guidelines cannot appropriately be made and decisions regarding clinical care reside with the physician and family. Definitions are available in the Appendix (see [\[www.auanet.org/content/guidelines-and-quality-care/clinical-guidelines.cfm\]\(http://www.auanet.org/content/guidelines-and-quality-care/clinical-guidelines.cfm\)\).](http://</p></div><div data-bbox=)

INITIAL EVALUATION OF THE CHILD WITH VUR

While VUR may be a benign condition with few long-term sequelae, it may also produce end stage renal failure. At initial presentation the nature of the severity is unknown and must be documented. This strategy focuses attention on patients with potential renal impairment, as well as providing an important baseline for future comparisons. The somatic effects of reflux are generally linked to renal scarring, and include hypertension, growth impairment and renal insufficiency. These effects are present in a small number of children but early identification is important.

General Evaluation

“Standard: VUR and UTI may detrimentally affect the overall health and renal function in affected children. Therefore, on initial presentation the child with VUR should undergo a careful general medical evaluation including measurement of height, weight and blood pressure, as well as serum creatinine if bilateral renal cortical abnormalities are found.”

“Recommendation: Urinalysis for proteinuria and bacteriuria is recommended. If the urinalysis indicates infection, urine culture and sensitivity are recommended.”

“Option: A baseline serum creatinine may be obtained to establish an estimate of glomerular filtration rate (GFR) for future reference.”

Imaging Procedures

At initial presentation it is recommended that the status of the kidneys be assessed. The presence or absence of renal cortical abnormalities guides initial management decisions and establishes a baseline for future decisions. Ultrasound is the most widely available, inexpensive and radiation-free means to obtain this information. It is limited in being unable to provide a quantitative assessment of relative function, may not detect all renal scarring and is operator dependent. DMSA renal imaging can better

provide information regarding the degree of existing renal cortical abnormalities. Limitations include expense, radiation exposure, possible need for sedation and limited availability. Those most likely to have scarring include patients with grades III–V reflux, younger children, those with an abnormal renal ultrasound study and those with recurrent febrile UTIs.

“Recommendation: Because VUR and UTI may affect renal structure and function, performing renal ultrasound to assess the upper urinary tract is recommended.”

“Option: DMSA renal imaging can be obtained to assess the status of the kidneys for scarring and function.”

Assessment of Voiding Patterns

Abnormal bladder and bowel function, and VUR are recognized to be associated and linked with each other and UTI. VUR outcomes are affected by the presence or absence of BBD. The terminology and assessment of the various manifestations of bladder dysfunction in children are unsettled and complex. Therefore, we used the broadest possible approach to capture the general relationship, even if specific associations remain undocumented, emphasizing the importance of bladder dysfunction in the management and understanding of VUR.

The term bladder and bowel dysfunction refers to abnormalities of storage as well as emptying, and often includes constipation.¹ A careful inquiry for signs and symptoms of BBD is important. Many parents are unaware of their child’s toileting patterns or consider what is abnormal to be normal or routine. It is appropriate to consider the potential for BBD to be a clinically important factor throughout management, particularly as the child moves through toilet training when BBD is thought to emerge in many children.

“Standard: Symptoms indicative of BBD should be sought in the initial evaluation (including urinary frequency and urgency, prolonged voiding intervals, daytime wetting, perineal/penile pain, holding maneuvers [posturing to prevent wetting] and constipation/encopresis).”

Family and Patient Education

Involvement of the family in clinical decision making related to VUR is critical, and must include balanced and objective education to permit informed decisions regarding imaging and therapy, particularly when one approach may have no demonstrable benefit or advantage over another. Given the potential, although uncertain, risk of severe renal injury and lifelong consequences of reflux in some patients,

the importance of information cannot be overestimated. For that reason the Panel considers this information transfer to be a standard of care of the child with reflux, including the recognition that definitive guidance as to optimal therapy may be lacking in some areas.

“Standard: Family and patient education regarding VUR should include a discussion of the rationale for treating VUR, potential consequences of untreated VUR, the equivalency of certain treatment approaches, assessment of likely adherence with the care plan, determination of parental concerns and accommodation of parental preferences when treatment choices offer a similar risk-benefit balance.”

INITIAL MANAGEMENT OF THE CHILD WITH VUR

The goals of treating the child with VUR are to 1) prevent recurring febrile UTIs, 2) prevent renal injury, and 3) minimize the morbidity of treatment and followup. The rationale for any treatment of children with VUR is based on several assumptions.

VUR increases the risk of pyelonephritis when a bladder infection occurs, as evidenced by a higher rate of febrile infection in the child with than without VUR. VUR increases the risk of renal scarring when pyelonephritis develops. Data demonstrate that in children who have presented with febrile UTI and DMSA documentation of acute pyelonephritis there is a higher rate of permanent scarring at least 6 months after the index UTI in those with than without VUR, with an odds ratio of 2.8 for patients and 3.7 for renal units (fig. 1). Renal cortical abnormalities (ie reflux related scarring) are more frequent in children with VUR who have had previous UTIs (fig. 2). These data indicate that the presence of VUR increases the risk of upper tract infection and upper tract damage. These observations provide a rationale for preventive and curative therapy in selected patients.

The most common medical therapy for VUR while awaiting spontaneous resolution has been continuous low dose antibiotic prophylaxis. The IRSC demonstrated equivalence of CAP (medical therapy) and surgical therapy.^{2,3} The use of CAP was not able to be assessed in the 1997 VUR guidelines but recent studies have attempted to address this question. An attempt was made to differentiate between febrile UTI and cystitis, and nonfebrile UTI but this was not always possible (table 1).

Figure 3 shows the distribution of UTI incidence in patients with and without CAP. This finding challenges the long-standing convention of using CAP in

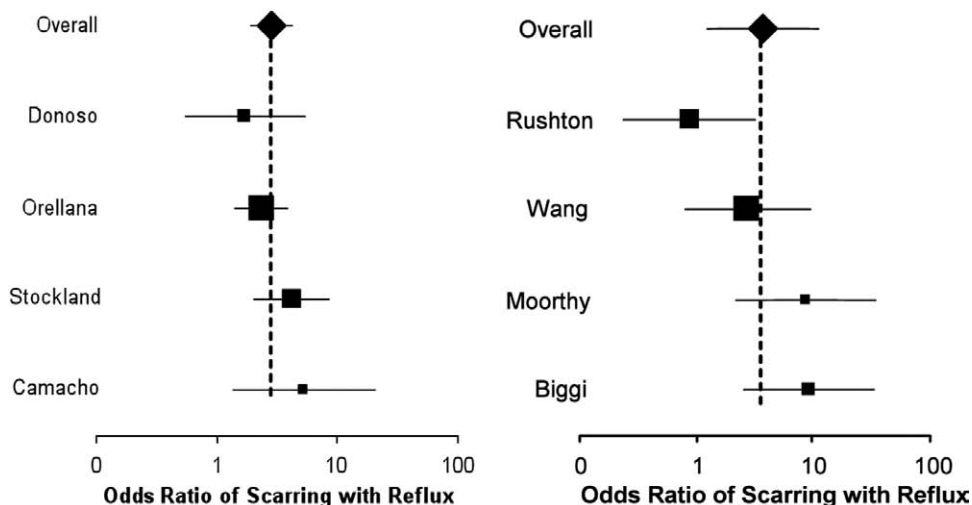


Figure 1. Forest plots of odds ratios on log scale of scarring after acute pyelonephritis among children with VUR compared to those without VUR (A) and by renal unit (B).

children with VUR until resolution or surgical cure. Several large, prospective, randomized controlled trials have shown little to no benefit of CAP in terms of reducing the incidence of febrile UTI or renal scarring.⁴⁻⁶ These data have been broadly interpreted as “proving” the lack of efficacy of CAP for VUR management. These data cannot be interpreted to mean that modern preventive measures are useless in all children, and it is uncertain if these conclusions can be generalized to a broader population. In most of these studies children had a history of only 1 UTI, there was no assessment of voiding patterns, followup was only 1 to 2 years, compliance with CAP was not assessed and in some the means of diagnosing UTI was imperfect. Most of the studies included grades I–III (a group at lower

risk of renal scarring), only 1 included grade IV and none included grade V reflux. Overall patient numbers were small and individual study power was limited. Nonetheless, these data clearly indicate that not all children with VUR must have CAP.

These data indicate that treatment of a child with VUR without CAP may be an acceptable and safe approach in the proper clinical setting. However, the specific criteria for which this may be appropriate have not been definitively determined. Clinical parameters that may permit more selectivity in therapy include the presence of BBD and a history of UTI. Future studies may better identify patient subgroups most likely to benefit from VUR identification and treatment.

The Child Younger Than 1 Year With VUR

Outcomes of the studies on the use of CAP for VUR were not stratified by age, and the number of children younger than 1 year was small. The data must be viewed with the recognition that the conclusions may not be fully validated for children younger than 1 year nor with all grades of VUR. It must also be recognized that the child younger than 1 year is more likely to suffer more significant morbidity with APN than the older child, and will be less able to communicate their symptoms, leading to a potential delay in diagnosis. Younger patients had a higher

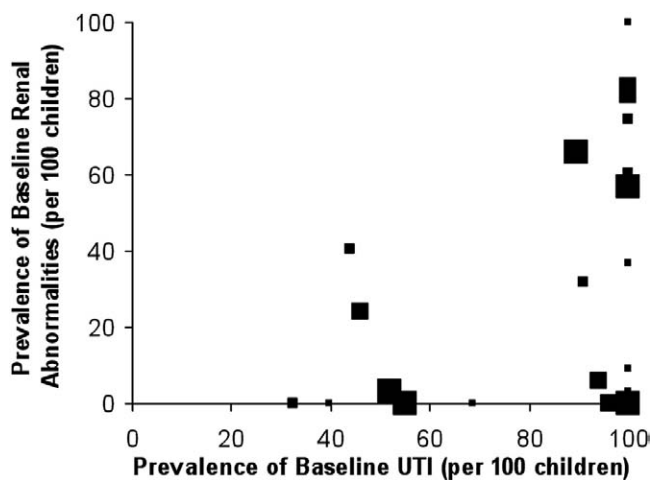


Figure 2. Relationship between baseline UTI incidence in different study populations and DMSA renal cortical abnormalities.

Table 1. Rates of UTI in patients with VUR receiving CAP and those not receiving CAP

UTI	No.	% CAP (95% CI)	No.	% No CAP (95% CI)
Cystitis	6	7.2 (2.3, 20.3)	6	7.9 (2.1, 26.1)
Febrile UTI	11	15.2 (9.1, 24.2)	8	6.1 (2.3, 15.0)
Not specified	18	19.0 (13.3, 26.3)	7	17.8 (8.6, 33.3)

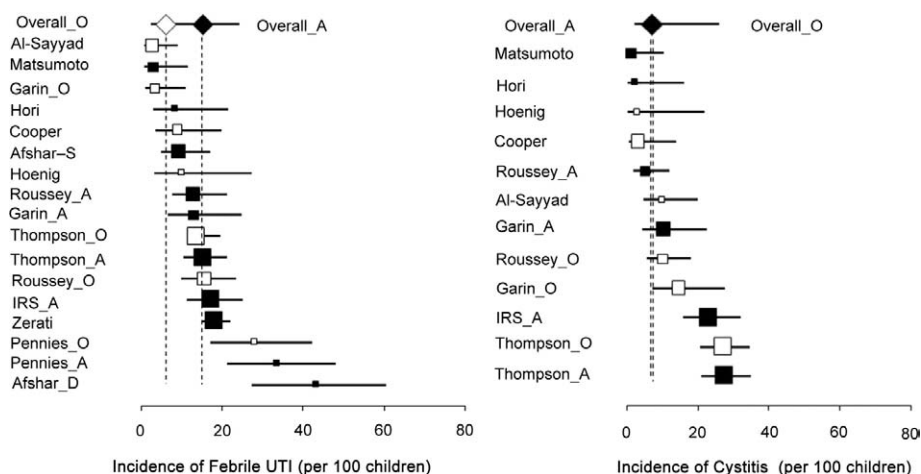


Figure 3. Incidence of febrile UTI (A) and cystitis (B) in reflux patients receiving CAP (filled) or not receiving CAP (open)

incidence of renal scarring than older patients suggesting an age related risk of scarring. Therefore, it is considered reasonable and prudent to offer more protection against reflux associated APN in the younger child.

“Recommendation: CAP is recommended for the child less than one year of age with VUR with a history of a febrile UTI. This approach is based on the greater morbidity from recurrent UTI found in this population.”

For a child with VUR identified through screening due to prenatal hydronephrosis or sibling screening who has not had a UTI, use of CAP is controversial and difficult to support through evidence. The intention of screening is to permit some measure to prevent acute illness and renal injury, yet this presumes that CAP can be effective. Although the data are imperfect, the presence of a greater incidence of renal cortical abnormalities in children following infection than those detected prenatally or by sibling screening suggests the potential risk of developing infection and renal injury. The Panel thought that a cautious approach for the patient younger than 1 year was the most appropriate, and recommends CAP for children with grade III or higher VUR detected by screening.

“Recommendation: In the absence of a history of febrile UTI, CAP is recommended for the child less than one year of age with VUR grades III–V who is identified through screening.”

“Option: In the absence of a history of febrile UTI, the child less than one year of age with VUR grades I–II who is identified through screening may be offered CAP.”

Since the goal of management of VUR is to prevent febrile UTI and renal injury, and that reduction in UTI incidence in circumcised infants is well established,^{7–9} discussion and consideration of circumcision for an infant boy with VUR are considered an option.

“Option: Circumcision of the male infant with VUR may be considered based on an increased risk of UTI in boys who are not circumcised. Although there are insufficient data to evaluate the degree of this increased risk and its duration, parents need to be made aware of this association to permit informed decision-making.”

The Child Older Than 1 Year With UTI and VUR

Guidelines for management of VUR in the child older than 1 year are somewhat different from those for the child younger than 1 year, reflecting several contributing elements that influence clinical outcomes. These include the greater likelihood of BBD, decreasing possibility of spontaneous resolution of VUR, lower risks of acute morbidity from febrile UTI and greater ability of the child to complain about symptoms to indicate acute infection. Management should be based on the clinical context, including the presence of BBD, patient age, VUR grade, presence of renal scarring and parental preferences.

Influence of BBD in VUR Management

The rationale for addressing BBD in the overall management strategy of VUR is based on 4 observations from the literature. 1) The risk of febrile UTI in children with VUR on CAP is greater in those with (44%) than without (13%) BBD (fig. 4). 2) The rate of reflux resolution 24 months after diagnosis is less for children with (31%) than without (61%) BBD (fig. 5). 3) The rate of cure following endoscopic ther-

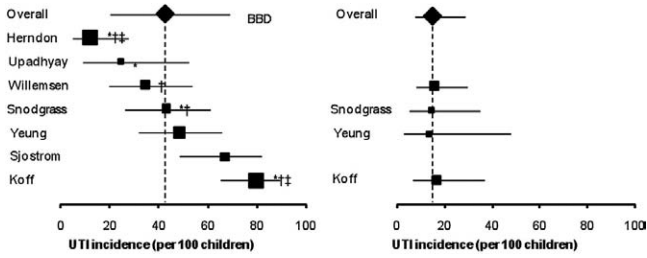


Figure 4. Forest plots of febrile UTI incidence in children (medical management of BBD vs Non-BBD). Concurrent/prior use of *bladder training, †anticholinergics, ‡stool softeners.

apy is less in children with than without BBD but there is no difference for open surgery (fig. 6). 4) The rate of postoperative UTI is greater in children with (22%) than without (5%) BBD (fig. 7).

BBD affects the critical aspects of VUR management including UTIs, spontaneous resolution and surgical cure. Therefore, it is important to identify BBD patterns to permit identification of risks in individuals and treatment of BBD. There are few data related to the impact of treating BBD on VUR outcomes. There are no standardized treatment programs for BBD but common elements include bladder training with timed voiding, relaxation measures, biofeedback if available, anticholinergic medications and treatment of constipation.¹⁰ There are no data on the role of formal urodynamic evaluation. These observations may explain the variable conclusions seen in the reflux literature. There has been limited recognition of BBD as a factor in VUR until recently, and few studies stratified outcomes by BBD status.

“Recommendation: If clinical evidence of BBD is present, treatment of BBD is indicated, preferably before any surgical intervention for VUR is undertaken. There are insufficient data to recommend a specific treatment regimen for BBD, but possible treatment options include behavioral ther-

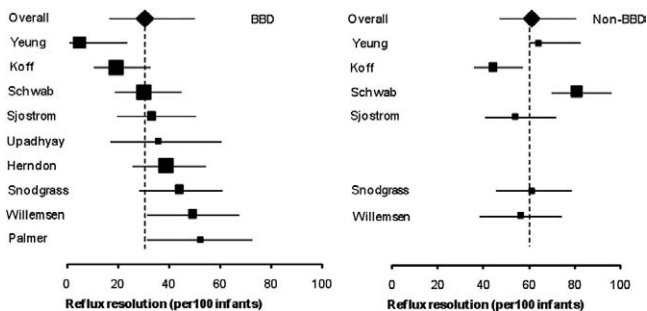


Figure 5. Forest plots of reflux resolution rate among children receiving antibiotic prophylaxis.

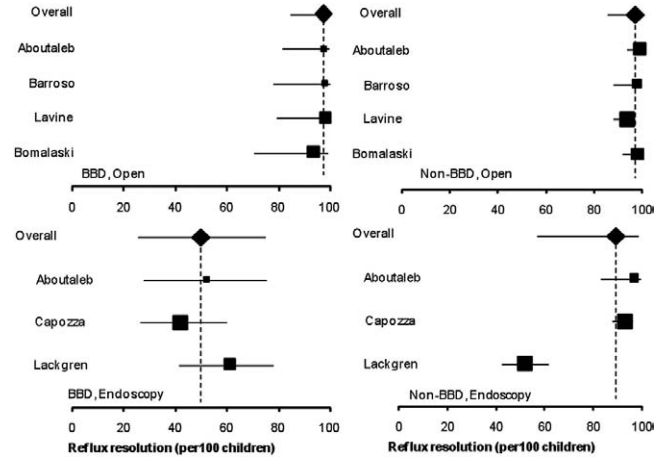


Figure 6. Forest plots of reflux resolution in children undergoing intervention with curative intent (open or endoscopic surgery).

apy (see Glossary for description), biofeedback (appropriate for children more than age five), anticholinergic medications, alpha blockers and treatment of constipation. Monitoring the response to BBD treatment is recommended to determine whether treatment should be maintained or modified.”

“Recommendation: CAP is recommended for the child with BBD and VUR due to the increased risk of UTI while BBD is present and being treated.”

Use of CAP in the child older than 1 year with VUR and a history of UTI but without BBD remains undefined. The Panel considers the use of CAP for the child older than 1 year with VUR and no BBD to be an option, as is treatment without CAP.

“Option: CAP may be considered for the child over one year of age with a history of UTI and VUR in the absence of BBD (Table 2).”

“Option: Observational management without CAP, with prompt initiation of antibi-

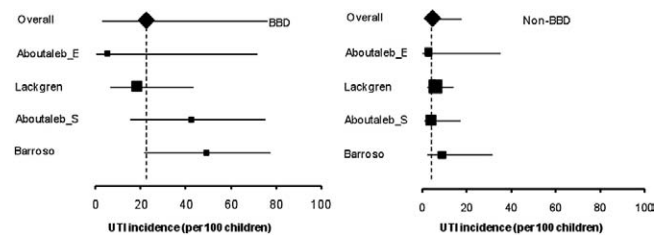


Figure 7. Forest plots of UTI incidence in children following open or endoscopic surgery (BBD vs Non-BBD).

otic therapy for UTI, may be considered for the child over one year of age with VUR in the absence of BBD, recurrent febrile UTIs, or renal cortical abnormalities (Table 2).”

The choice to use curative therapy for VUR, including open and endoscopic surgery, is an option at initial diagnosis. In general this is not appropriate for most children with VUR as spontaneous resolution is likely. However, prospective randomized controlled trials have shown a reduction in the occurrence of febrile UTIs in patients who have undergone open surgical correction of VUR compared to those receiving CAP. Specific situations may affect this choice, including the age and health of the child, status of the kidneys, grade of reflux and parental wishes. The ultimate decision must be based on a balance of these various factors with the recognition that surgical cure of VUR generally reduces the risk of febrile UTIs, although it has not been proven that this reduces renal injury.

“Option: Surgical intervention for VUR, including both open and endoscopic methods, may be used.”

FOLLOWUP MANAGEMENT OF THE CHILD WITH VUR

Ongoing monitoring of a child’s overall health and the status of the VUR is necessary until the VUR is resolved or it has been deemed clinically insignificant. These guidelines apply to all children, irrespective of age. The goal of followup observation is to identify clinically silent urinary infection or early signs of renal impairment. Children with more risk factors should be followed more closely but there are no simple formulas or data to support 1 plan over another. The prudent approach would include markers of somatic health including blood pressure and growth, with urinalysis to screen for infection and for proteinuria as a sign of renal injury.

“Recommendation: General evaluation, including monitoring of blood pressure, height and weight is recommended annually.”

“Recommendation: Urinalysis for proteinuria and bacteriuria is indicated annu-

ally, including a urine culture and sensitivity if the urinalysis is suggestive of infection.”

Cystography and Ultrasonography

The statistical likelihood of resolution should provide guidance as to the interval of imaging followup for VUR. For high grade VUR, followup as soon as 12 months may be too early, but for low grade it may be appropriate. Compliance with followup as well as parental anxiety are factors in this determination. There is little rationale for repeating a VCUG within 12 months of the previous study, and an outer limit of 24 months appears to be a reasonable time frame to avoid loss of followup or prolonged use of unnecessary CAP if the VUR has resolved. General medical followup for these children on an annual basis is recommended, with either the primary care physician or specialist, consistent with American Academy of Pediatrics recommendations.

“Recommendation: Ultrasonography is recommended every 12 months to monitor renal growth and any parenchymal scarring. Voiding cystography (radionuclide cystogram or low-dose fluoroscopy, when available) is recommended every 12 to 24 months with longer intervals between follow-up studies in patients in whom evidence supports lower rates of spontaneous resolution (i.e. those with higher grades of VUR [grades III–V], BBD and older age). This is to limit the overall number of imaging studies performed. If an observational approach is being used, follow-up cystography becomes an option.”

For children with grade I–II VUR and more likely spontaneous resolution, followup imaging to identify VUR is considered an option. While followup VCUG is appropriate, there are no data to support its necessity. This is particularly true if CAP is not being used, as the VCUG findings are not likely to alter management. Conversely, there are no data that avoiding a followup VCUG is without risk.

“Option: Follow-up cystography may be done after one year of age in patients with VUR grade I–II; these patients tend to have a high rate of spontaneous resolution and boys have a low risk of recurrent UTI.”

“Option: A single normal voiding cystogram (i.e., no evidence of VUR) may serve to establish resolution. The clinical significance of grade I VUR and the need for ongoing evaluation is undefined.”

Table 2. Treatment of the child older than 1 year with grades I–IV VUR and UTI

	CAP	Observation
No BBD	Option	Option
BBD	Recommended	Not recommended

The need and value of screening kidneys for reflux related renal scarring in ongoing VUR have not been established. The Panel thought that ongoing assessment of renal growth is important in children with VUR. Renal growth can be a useful indicator of renal health and the presence of gross scarring can be detected by ultrasound. It is not definitive, and if specific clinical factors would suggest greater concern for renal injury, DMSA scanning can be considered.

Dimercaptosuccinic Acid

The role of DMSA scanning in VUR management remains incompletely defined and controversial. Therefore, the Panel recommends selective use of DMSA scanning by focusing on children with VUR who may be at a higher risk for significant abnormalities that might affect care. Children who may benefit from DMSA scanning include those with breakthrough infections, grade III–V VUR, abnormal renal function and particularly an abnormal renal ultrasound. A normal DMSA can be reassuring to the anxious family following a significant UTI in the context of VUR.

“Recommendation: DMSA imaging is recommended when a renal ultrasound is abnormal, when there is greater concern for scarring due to breakthrough UTI or VUR grade III–V or if there is an elevated serum creatinine.”

“Option: DMSA may be considered for follow-up of children with VUR to detect new renal scarring, especially after a febrile urinary tract infection.”

INTERVENTIONS FOR THE CHILD WITH BREAKTHROUGH UTI (BT-UTI)

The incidence of BT-UTI is variable and appears to depend on age, VUR grade, sex and the presence of BBD. BT-UTI may be expected in up to 20% of children with VUR on CAP. Reports of lower rates in those not receiving CAP are difficult to assess as mentioned previously. The variable definitions of UTI also raise uncertainty about the comparability of the data.

The child with symptomatic BT-UTI may require alternative intervention, as this indicates failure of therapy and raises concern for renal injury. The clinical manifestations of BT-UTI may not be typical, particularly in the younger child in whom systemic symptoms may predominate. The specific alternative intervention should be based on the individual risks to the patient, including clinical factors such as reflux grade, degree of scarring and BBD. Definitive therapy, including

open surgery, offers protection against febrile UTI but is associated with morbidity. Less morbid approaches, such as endoscopic injection, may have less success in VUR resolution. In any event, the occurrence of BT-UTI signals the need for a re-evaluation of the efficacy of the ongoing treatment plan for the child.

The occurrence of BT-UTI cannot be viewed as an automatic reason to move to alternative therapy but to consider this in the context of the clinical scenario. Determining the child’s risk for further infections (as indicated by history of UTIs), the potential for renal scarring (as indicated by prior demonstration of renal cortical abnormalities) or improvable voiding issues (as indicated by the presence of active BBD) will provide guidance as to the most appropriate therapeutic pathway. Parental attitudes and preferences must be factored into this decision as well.

“Recommendation: If symptomatic BT-UTI occurs (manifest by fever, dysuria, frequency, failure to thrive or poor feeding), a change in therapy is recommended. If symptomatic BT-UTI occurs, the clinical scenario will guide the choice of treatment alternatives; this includes VUR grade, degree of renal scarring, if any, evidence of abnormal voiding patterns (BBD) that might contribute to UTI and parental preferences.”

The rationale for recommending curative therapy for VUR associated with BT-UTI is the risk of renal injury. Surgical resolution of VUR has been shown to reduce the incidence of febrile UTIs,¹¹ although there is no proof for a reduction in scarring. In the child who is not receiving prophylactic antibiotics a febrile UTI may prompt a shift to using CAP. Recognition that BBD may be contributing to the UTI is appropriate and should initiate clinical evaluation of this possibility.

Surgical modalities with the intent to cure reflux include open antireflux surgery (including intravesical repairs [cross-trigonal and Leadbetter-Politano], and extravesical repairs). Laparoscopic methods were not included as there are too few reports to permit assessment. Endoscopic intervention for reflux involving subureteral or intra-ureteral injection of a bulking agent includes use of dextranomer hyaluronic acid (Deflux®) and Macroplastique®. Choice of surgical modality reflects a balance of relative morbidity and efficacy with perceived risk of ongoing reflux and the family’s desire for certainty of cure. Success rates are 98.1% (95% CI 95.1, 99.1) for open surgical proce-

dures and 83.0% for endoscopic therapy after 1 injection (95% CI 69.1, 91.4).

The presence of BBD does not affect the cure rate for open surgical procedures but does for endoscopic procedures (fig. 6). Postoperative febrile UTIs were dependent on the incidence of preoperative UTIs. In studies in which fewer than 60% of children had preoperative UTIs the postoperative UTI incidence was 4.6/100 children (95% CI 2.2, 9.6). In studies in which more than 60% of children had preoperative UTIs the postoperative UTI incidence was 10.2/100 children (95% CI 4.0, 26.2) (fig. 8). The incidence of UTI after open or endoscopic surgery was 22.6% for children with vs 4.8% for those without BBD (fig. 4). Other complications were rare, with obstruction occurring in 0.4% of all surgeries.

“Recommendation: It is recommended that patients receiving CAP with a febrile BT-UTI be considered for open surgical ureteral reimplantation or endoscopic injection of bulking agents for intervention with curative intent.”

“Option: In patients receiving CAP with a single febrile BT-UTI and no evidence of preexisting or new renal cortical abnormalities, changing to an alternative antibiotic agent is an option prior to intervention with curative intent.”

“Recommendation: In patients not receiving CAP who develop a febrile UTI, initiation of CAP is recommended.”

“Option: In patients not receiving CAP who develop a non-febrile UTI, initiation of

CAP is an option in recognition of the fact that not all cases of pyelonephritis are associated with fever.”

“Option: Surgical intervention for VUR, including both open and endoscopic methods, may be used. Prospective randomized controlled trials (RCTs) have shown a reduction in the occurrence of febrile UTIs in patients who have undergone open surgical correction of VUR as compared to those receiving CAP.”

POSTOPERATIVE IMAGING FOR PATIENTS RECEIVING DEFINITIVE INTERVENTIONS

Following any curative intervention, an assessment of renal drainage is essential as all methods of correction can be associated with ureteral obstruction. The potential consequences of silent obstruction are severe. There were insufficient data to provide any specific recommendations with regard to the duration of followup after definitive interventions.

“Standard: Following open surgical or endoscopic procedures for VUR, a renal ultrasound should be obtained to assess for obstruction.”

The reflux resolution rate following open surgery was 98%. The resolution rate of endoscopic injection for VUR ranges from 50% to 92%. Since the procedure was performed with the goal to cure reflux, it is recommended that a cystogram be performed to confirm resolution or identify those who still have VUR. Persistent VUR would prompt consideration for further endoscopic therapy, open surgical repair or ongoing medical management.

“Recommendation: Postoperative voiding cystography following endoscopic injection of bulking agents is recommended.”

The success rate of open surgical reimplantation at 98% has been considered by the Panel to not uniformly justify performing a postoperative cystogram. This decision would be affected by the postoperative clinical course and family preference.

“Option: Postoperative cystography may be performed following open ureteral reimplantation.”

FOLLOWUP MANAGEMENT AFTER RESOLUTION OF VUR

A plan should be provided to the family/patient and the primary care physician regarding monitoring for the long-term health issues related to

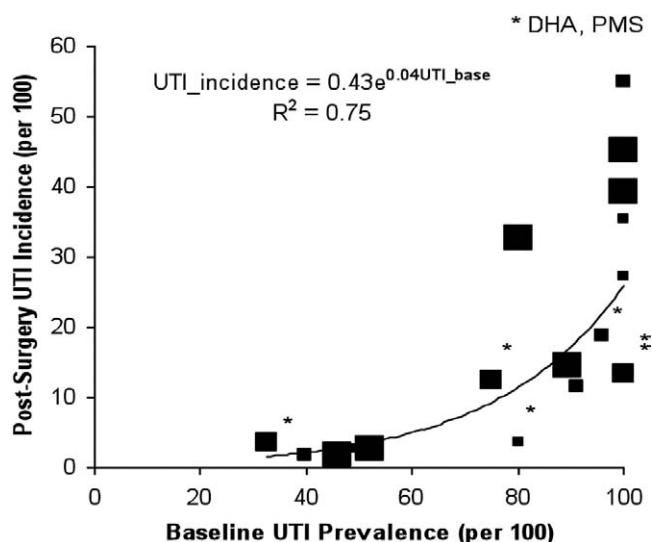


Figure 8. Incidence of postoperative UTI in relation to baseline UTI prevalence in study population (ecological association).

VUR. This is of particular importance in patients with renal scarring or recurrent UTI. The value of specific long-term followup regimens has not been reported. The Panel's recommendation is based on the fact that VUR can cause significant renal injury with long-term health effects. The limited long-term data demonstrate an increasing incidence of these consequences with longer followup in adults with prior VUR.¹² In the absence of clear predictors of long-term risk it seems prudent to provide the family with information as to the nature of these risks and the simple clinical strategies for monitoring during routine health encounters.

“Option: Following the resolution of VUR, either spontaneously or by surgical intervention and if both kidneys are normal by ultrasound or DMSA scanning, general evaluation, including monitoring of blood pressure, height and weight, and urinalysis for protein and UTI, annually through adolescence is an option.”

“Recommendation: Following the resolution of VUR, either spontaneously or by surgical intervention, general evaluation, including monitoring of blood pressure, height and weight, and urinalysis for protein and UTI, is recommended annually through adolescence if either kidney is abnormal by ultrasound or DMSA scanning.”

“Recommendation: With the occurrence of a febrile UTI following resolution or surgical treatment of VUR, evaluation for BBD or recurrent VUR is recommended.”

“Recommendation: It is recommended that the long-term concerns of hypertension (particularly during pregnancy), renal functional loss, recurrent UTI and familial VUR in the child's siblings and offspring be discussed with the family and communicated to the child at an appropriate age.”

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The supporting systematic literature review and drafting of this document were conducted by the Pediatric Vesicoureteral Reflux Clinical Guidelines Panel (the Panel) created in 2006 by the American Urological Association Education and Research, Inc. The Practice Guidelines Committee of the AUA se-

lected the Panel chair and vice chair, who in turn appointed the additional Panel members with specific expertise in this disease. The mission of the Panel was to develop either analysis or consensus based recommendations, depending on the type of evidence available and Panel processes, to support optimal clinical practices in the management and screening of primary vesicoureteral reflux in children.

This document was submitted to approximately 75 urologists and other health care professionals for peer review. After revision of the document based on the peer review comments, the report was submitted to and approved by the PGC and the AUA Board of Directors. Funding of the Panel and PGC was provided by the AUA, although Panel members received no remuneration for their work.

This document provides guidance only and does not establish a fixed set of rules or define the legal standard of care. As medical knowledge expands and technology advances, the document may change. Today it represents not an absolute mandate but rather current proposals or recommendations for treatment under the specific conditions described. For all of these reasons, the document does not preempt physician judgment in individual cases. Also, treating physicians must take into account variations in resources, and patient tolerances, needs and preferences. Conformance with the recommendations reflected in this document cannot guarantee a successful outcome.

This document may also include information or recommendations about certain drug uses (“off label”) not approved by the Food and Drug Administration, or about medications or substances not subject to the Food and Drug Administration approval process. AUA urges strict compliance with all government regulations and protocols for prescription and use of these substances. The physician is encouraged to carefully follow all available prescribing information about indications, contraindications, precautions and warnings. This document is not intended to provide legal advice about use and misuse of these substances.

All Panel members completed conflict of interest disclosures. (C) indicates compensation was received and (U) indicates no compensation was received. Scientific Study or Trial: Jack S. Elder, QMed Scandinavia (U); Meeting Participant or Lecturer: Billy Arant, Novartis (C); Other: Jack S. Elder, FSC Laboratories (U); Investment Interest: Antoine E. Khoury, Covalon (U), Interface Biologics (U); Owner: Ellen Shapiro, Medical Reviews (C); Linda E. Whetter, Zola Associates (C).

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