

ORIGINAL RESEARCH ARTICLE

An Interview-Based Retrospective Study on Long-Term Outcomes of Shelter Cats with Feline Lower Urinary Tract Disease (FLUTD) and a History of Urethral Obstruction (UO)

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Abstract

Introduction: Concerns regarding poor adoptability and guarded long-term prognoses have historically influenced some shelters to elect euthanasia or decline intake of cats with feline lower urinary tract disease (FLUTD) and urethral obstruction (UO). Specifically, UO remains an acute life-threatening condition, and mortality can occur despite treatment. Recurrence of FLUTD signs has been reported in up to 51% and recurrent UO in 15–47% of cats that have previously experienced obstruction. This retrospective study evaluated long-term prognoses of shelter cats with a history of UO, including recurrence of urinary signs and UO and overall post-adoption outcomes, to assess adoptability and identify how shelters can prepare adopters.

Methods: A standardized owner questionnaire evaluated recurrence of FLUTD signs and UO, lifestyle factors, and adopter experience in cats with prior UO adopted from a limited-admissions shelter between 2018 and 2023. Inclusion criteria required one diagnosed UO event in which a urinary catheter was maintained for at least 24 h, absence of comorbidities, successful adoption, and residence in the home for at least 3 months following the UO event.

Results: Of the 78 eligible cats, 31 owners responded to the questionnaire (39.7% response rate). All cats were alive and remained in their adopted homes; 10 (32.3%) showed recurrent FLUTD signs, and two (6.5%) experienced recurrent obstruction. Lifestyle factors related to housing environment, household composition, or diet were not statistically associated with recurrence of urinary signs post-adoption. All respondents indicated that they would consider adopting another FLUTD cat.

Conclusion: Adoption of cats with a history of UO in this shelter was associated with positive overall adopter experience and good long-term outcomes; low recurrence of FLUTD signs or UO, minimal need for hospitalization or surgery, and remained in their adoptive homes. These outcomes, however, should be interpreted with caution due to several study limitations.

Keywords: *shelter cats; adoption; FLUTD; UO; recurrence; prognoses*

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Supplementary material

Supplementary material for
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Feline lower urinary tract disease (FLUTD) encompasses disorders associated with abnormal urination in cats, including urolithiasis, urethral plugs, and urinary tract infections (UTI).¹ Clinical signs of FLUTD commonly include stranguria, hematuria, pollakiuria, periuria, and behavioral changes.^{1,2} While FLUTD can be seen in cats of any age and sex, it is most frequently seen in middle-aged, neutered male cats who have little exercise, use an indoor litter box, have restricted outside access, eat a dry diet, and live in a multi-animal household.¹ When no medical cause is identified, FLUTD is termed feline idiopathic cystitis (FIC), with risk factors similar to those of FLUTD, and is often linked to environmental stressors in susceptible cats.² Although clinical signs often resolve within 2–7 days (with or without

treatment), recurrence is common. In a study with a median 38-month follow-up, urinary signs recurred in 58.1% of FLUTD cats with FIC, urolithiasis, or UTI, with no significant differences between the groups.³ Management of FLUTD relies on a multimodal approach incorporating owner education, environmental modification, and dietary strategies.^{1,2}

Male cats with FLUTD are at risk of developing a life-threatening condition called urethral obstruction (UO), in which urine outflow is blocked, resulting in dangerous electrolyte abnormalities (hyperkalemia, metabolic acidosis, and hypocalcemia) and subsequent cardiac arrhythmias, kidney failure, or urinary bladder rupture.² FIC is the most commonly reported underlying cause of UO.^{2,3} Management of UO requires urgent relief of the

obstruction, typically through urethral catheterization while under sedation or general anesthesia, or decompressive cystocentesis in unstable patients. Additional treatments include maintenance of an indwelling catheter, administration of intravenous fluid therapy to address dehydration, electrolyte imbalances, and toxin accumulation, as well as the use of analgesics for pain management and antispasmodics to reduce urethral spasms.^{2,4,5} Regardless of management strategy, treatment for UO often requires several days of hospitalization, intensive monitoring, and considerable expenses for owners. Mortality associated with UO in cats can be linked to owner financial constraints, which may lead to surrender to a shelter or euthanasia when the cost of treatment and hospitalization is prohibitive. UO remains an acute life-threatening condition, and mortality can still occur despite prompt treatment and appropriate medical management. Surgical intervention in the form of a perineal urethrostomy (PU) to create a wider urethral opening in male cats or cystotomy to remove cystic calculi may be required in some cases of UO. Historically, PU has been reserved for cats that cannot successfully be unobstructed or those who have obstructed repeatedly (typically after their third blockage) despite appropriate medical management; however, recent evidence suggests that earlier implementation of PU can reduce the risk of repeat UO and associated morbidity.^{6,7} In a study of 45 cats with UO, 10 underwent PU, with re-obstruction occurring in 2/10 cats and recurrent FLUTD signs in 5/10 cats, suggesting that PU may reduce re-obstruction but not recurrence of clinical signs.⁵ Within the same study, it was concluded that long-term prognosis for cats with UO appears guarded, as 51% experienced recurrent FLUTD signs regardless of underlying cause, 36% developed recurrent UO, and 23% were euthanized due to FLUTD-related complications, primarily recurrent UO.⁵ Other studies have reported UO recurrence rates of 47% after the first week and through 6 months of the initial obstruction, 22 and 24% after 6 months and 2 years, respectively, and 15% after 1 month.^{8,9,10}

UO and inappropriate elimination are distinct conditions. While there are no studies directly linking UO to relinquishment in shelters, periuria, a form of inappropriate elimination in cats, can sometimes be a clinical sign of UO, particularly when related to stress, urethrospasm, or incomplete bladder voiding. Inappropriate daily or weekly elimination has been reported to be the behavioral problem most strongly associated with relinquishment of cats to shelters, with a 6.82-fold greater risk compared with cats without inappropriate elimination.¹¹ Another study identified behavior issues as the most frequent reason for cat relinquishment (21%), with inappropriate elimination (23%) being one of the most common behavioral causes, following aggression (26%) and social conflict (37%).¹² Based on the authors' experience and anecdotal reports,

concerns regarding poor adoptability and guarded long-term prognoses have historically influenced some shelters to elect euthanasia or decline intake of cats with FLUTD or UO. A recent study evaluating outcomes of surrendered cats with periuria reported similarly high adoption rates for both periuria and non-periuria cats. Although periuria cats had a longer average length of stay over the full study period, year-by-year analysis revealed no significant differences between the groups.¹³ While direct comparisons with cats with UO are not possible due to the lack of data at this time, these findings suggest that cats with periuria can have favorable outcomes when admitted to shelters that provide medical evaluation, behavioral support, and transparent communication with adopters. Despite favorable outcomes reported for shelter cats with periuria, long-term post-adoption outcomes for FLUTD cats with a history of UO remain unstudied.

This interview-based retrospective study aimed to evaluate long-term prognoses of shelter cats with a history of UO, including recurrence of FLUTD signs and UO, and overall post-adoption outcomes.

Methods and materials

Data retrieval began in January 2024 from a private limited-admissions shelter in the Pacific Northwest United States with a live release rate of 98% and an annual intake of approximately 9,000 animals, including 6,250 cats. Between April 2018 and July 2023, 161 cats were identified from the shelter's animal management database (ShelterBuddy) using the FLUTD diagnosis code, which was assigned to any cat diagnosed with FLUTD or UO. To determine eligibility for inclusion in the study with respect to UO, each cat's medical record was reviewed. Medical histories regarding previous UO events were limited prior to admission into the shelter. Inclusion criteria included: (1) at least one known UO event in which a urinary catheter was maintained for at least 24 h in the shelter, (2) no other concurrent systemic diseases, (3) successful adoption or redemption to the previous owner, and (4) at least 3 months in a home following the UO event. A 3-month benchmark was used as a phased adjustment period to help with the cat's transition into a new home.

The shelter maintained a policy of conducting follow-up communications with adopters for educational and support purposes. Adopters of the cats included in the study were contacted via email and phone, then sent a questionnaire with open-ended and closed-ended questions regarding current outcome, lifestyle, recurrence of FLUTD signs (specifically stranguria, hematuria, or periuria), recurrence of UO, veterinary visits, overall adoption experience, and willingness to adopt another cat with FLUTD. Questions were framed as neutral to encourage respondent honesty.

The observation period spanned from each cat's adoption date to completion of the owner questionnaire (see the

supplementary material). Cats included in the study were either transferred or surrendered to the shelter with active UO or became obstructed while in care. Emergency treatment was defined as urinary catheter placement for relief of a diagnosed obstruction, performed either by a veterinarian before transfer or at the shelter. Diagnosis of UO was based on clinical signs and successful catheterization to relieve the obstruction. Post-obstructive management included hospitalization, inpatient monitoring, an indwelling urinary catheter, IV fluids, and analgesics; additional supportive care treatments were at the veterinarian's discretion. Cats with more than one UO event in the shelter underwent PU surgery and remained eligible for inclusion in the study.

Once the cats were urinating independently without a urinary catheter and clinical signs of FLUTD were controlled, they were made available for adoption. All cats were reproductively sterilized before adoption. Pre-adoption counseling with trained staff covered medical history, recurrence risks, prompt intervention recommendations for UO, potential treatment costs, and home management strategies, including stress reduction and litterbox hygiene. Counseling largely focused on maintaining a low-stress home and routine, and did not recommend that cats be kept exclusively indoors or on a urinary diet. Adopters also received printed educational resources on FLUTD and UO (see the Supplementary material).

All statistical analyses were performed using Jamovi 2.6.44 for Windows. Normality of age at time of adoption and time in the home was assessed using the Shapiro–Wilk test. Associations between categorical variables were assessed using the Odds Ratio (OR) and the χ^2 test, with $p < 0.05$ considered statistically significant.

Results

Seventy-two cats were excluded from the study due to the presence of comorbidities, clinical signs of FLUTD without obstruction, or UO that did not require urinary catheter maintenance. Ten cats that died before adoption due to complications from UO were also excluded from the study (6/10 euthanized; 4/10 unassisted deaths). Two cats underwent PU surgery in the shelter; one was included in the study, while the other was excluded due to a comorbidity. A total of 78 cats fulfilled the inclusion criteria and their adopters were contacted. Questionnaire data were collected regarding recurrence of FLUTD signs and UO, the need for emergency treatment for UO, the cat's environmental conditions, and the adopter's overall experience with the adoption process.

Out of the 78 adopters, 31 responded (39.7% response rate) and completed the questionnaire; the remaining 47 adopters either did not reply to the questionnaire (36/47), declined to participate in the study (1/47), or could not be reached due to an unavailable phone number or email address (10/47). Twenty-nine cats were adopted into new

homes, while two cats were returned to their previous owners. There was no strict policy governing the redemption of cats to prior owners; instead, each case was evaluated individually. Decisions may have been influenced by an animal's history, temperament, and overall adoptability. All 31 cats remained in their adoptive homes. The demographics of the 31 cats are presented in Table 1. The median age of the cats at the time of adoption was 2 years old (IQR 1–7 years), and the median duration time in the adoptive home was 2 years (IQR 0.75–4 years), as shown in Table 2. Ten cats (10/31; 32.3%) exhibited FLUTD signs (periuria, hematuria, or stranguria) in the home, and seven of those cats (7/31; 22.6%) visited a veterinarian for these signs at least once after adoption. Frequency of signs was assessed as rare (6/10; 60%), sometimes (2/10; 20%), often (1/10; 10%), or always (1/10; 10%). Two cats (2/31; 6.5%) had recurrence of UO that required emergency treatment; one was unobstructed with a urinary catheter and then medically managed, while the other was unobstructed with a urinary catheter and underwent a PU surgery immediately thereafter. The two cats with post-adoption UO were included among the 10 cats with recurrence of FLUTD signs. The adopter of the cat that received a PU in the shelter did not reply to the questionnaire. Three cats (3/31; 9.7%) received long-term daily gabapentin for FLUTD management; all three exhibited recurrent FLUTD signs post-adoption, reported as rare in two cats and sometimes in one. This medication was initially prescribed by a veterinarian at the shelter; however, its long-term use was not discussed upon adoption. Overall, all of the cats (31/31; 100%) were alive and remained in their adoptive homes at the time of the study.

Table 1. Demographics of cats in the study

Study cats	Cat N = 31 (100%)
Age (years)	
Mean (SD)	2.65 (1.78)
Range	1–7
Sex	
Male intact	3 (9.7%)
Male neutered	28 (90.3%)
Intake type	
Owner/Guardian surrender	26 (83.9%)
Transfer	5 (16.1%)
Outcomes	
Adopted	29 (93.4%)
Redeemed to previous owner	2 (6.5%)
Post-adoption	
Recurrence of FLUTD signs	10 (32.3%)
Recurrence of UO*	2 (6.5%)

*Among the 10 cats that exhibited FLUTD signs, two of them developed UO in the home. FLUTD: Feline Lower Urinary Tract Disease; UO: Urinary Obstruction.

Table 2a. Distribution of age at adoption and duration in the adoptive home (years)

Adoption information	Age
N	31
Missing	0
Mean (years)	2.65
Median (years)	2
Standard deviation	1.78
Minimum	1
Maximum	7
Shapiro–Wilk W	0.809
Shapiro–Wilk p	< 0.001

Table 2b. Distribution of age at adoption and duration in the adoptive home (years)

Adoption information	Average time in home
N	31
Missing	0
Mean (years)	2.61
Median (years)	2.00
Standard deviation	1.19
Minimum	0.750
Maximum	4.00
Shapiro–Wilk W	0.773
Shapiro–Wilk p	< 0.001

In this study, lifestyle differences of housing environment, household composition, or diet were not significantly associated with recurrence of urinary signs of FLUTD post-adoption. Recurrence occurred in 36.0% (9/25) of indoor-only cats compared with 16.7% (1/6) of cats with outdoor access ($\chi^2(1) = 0.83$, OR = 2.81, 95% CI 0.28–28.00, $p = 0.363$; Table 3). Similarly, recurrence was observed in 40.0% (6/15) of cats living in multi-pet households and 25.0% (4/16) of cats in single-pet households ($\chi^2(1) = 0.80$, OR = 2.00, 95% CI 0.43–9.26, $p = 0.372$; Table 4). Recurrence rates also did not differ significantly by diet, occurring in 27.3% (6/22) of cats fed a combination of wet and dry food versus 44.4% (4/9) fed dry food alone ($\chi^2(1) = 0.86$, OR = 0.47, 95% CI 0.09–2.36, $p = 0.353$; Table 5). Likewise, recurrent FLUTD signs occurred in 37.5% (6/16) of cats fed a urinary diet and 26.7% (4/15) of cats not fed a urinary diet ($\chi^2(1) = 0.42$, OR = 1.65, 95% CI 0.36–7.60, $p = 0.519$; Table 6).

All 31 adopters indicated they would consider adopting another FLUTD cat in the future. Despite a majority responding they felt prepared at the time of adoption, 14 disclosed that they would benefit from additional guidance on dietary management, recognition of recurrent UO, the potential cost of emergency treatment, and

Table 3a. Significance of the environment between cats with FLUTD signs and those without

Environment	Housing environment	Urinary signs		Total
		Yes	No	
Indoor only	Observed	9	16	25
	% within row	36.0%	64.0%	100.0%
Outdoor access	Observed	1	5	6
	% within row	16.7%	83.3%	100.0%
Total	Observed	10	21	31
	% within row	32.3%	67.7%	100.0%

Table 3b. Significance of the environment between cats with FLUTD signs and those without

Housing environment	χ^2 tests		
	Value	df	P
χ^2	0.828	1	0.363
N	31		

Table 3c. Significance of the environment between cats with FLUTD signs and those without

Housing environment	Comparative measures		
	95% Confidence intervals		
	Value	Lower	Upper
Odds ratio	2.81	0.283	28.0

FLUTD: Feline Lower Urinary Tract Disease; UO: Urinary Obstruction.

stress-reduction strategies in the home environment. Five of those 14 adopters, however, reported recurrent FLUTD signs in their cats. Of the two cats that experienced recurrence of UO, 1 adopter reported feeling unprepared and a lack of awareness that re-obstruction was possible, whereas the other adopter reported feeling extremely prepared and aware of the potential clinical signs, costs, and risks associated with adopting a cat with a history of UO after counseling.

Discussion

Adoption of shelter cats with FLUTD and a history of UO was associated with good long-term outcomes; low recurrence of FLUTD or UO, minimal need for hospitalization or surgery, and remaining in their adoptive homes.

In this study, 10 cats (32.3%) exhibited FLUTD signs in the home, mostly ‘rarely’ and ‘sometimes’ in frequency. Among the ten cats, two (6.5% of the total study population) experienced recurrent UO that required emergency veterinary intervention. These percentages are lower than previously reported with recurrence of FLUTD signs

Table 4a. Significance of living in a multi-animal household between cats with FLUTD signs and those without

Other animals	Multi-animal household	Urinary signs		Total
		Yes	No	
Yes	Observed	6	9	15
	% within row	40.0%	60.0%	100.0%
No	Observed	4	12	16
	% within row	25.0%	75.0%	100.0%
Total	Observed	10	21	31
	% within row	32.3%	67.7%	100.0%

Table 4b. Significance of living in a multi-animal household between cats with FLUTD signs and those without

Household composition	χ^2 tests		
	Value	df	P
χ^2	0.797	1	0.372
N	31		

Table 4c. Significance of living in a multi-animal household between cats with FLUTD signs and those without

Household composition	Comparative measures		
	95% Confidence intervals		
	Value	Lower	Upper
Odds ratio	2.00	0.432	9.26

FLUTD: Feline Lower Urinary Tract Disease.

(51%) and UO (15–47%) in cats with a history of obstruction; however, the difference in findings between the current and previous studies may be an artifact of the small sample size, the return to a previous environment, or the impact of recommendations for low-stress environmental management provided to adopters in the current study. Notably, the cats in those studies were treated and then returned to the same environment, whereas the cats in this study were taken to a shelter, and most were adopted into new homes.^{5,8,9,10} Given that FLUTD signs are often stress-associated in cats, the authors speculate that low recurrence rates of FLUTD signs and UO may be associated with reduced stressors, improved stress management, or significant environmental changes in the new home.

In this study, lifestyle differences in housing environment, household composition, and diet were not statistically significantly associated with recurrence of FLUTD signs. Previous research has identified the use of indoor litter boxes, restricted outside access, and living in a multi-animal household to be risk factors in FLUTD or FIC cats.^{1,2} Given this study's small sample size, these

Table 5a. Significance of wet and dry diets between cats with FLUTD signs and those without

Diet	Diet type	Urinary signs		Total
		Yes	No	
Wet	Observed	6	16	22
	% within row	27.3%	72.7%	100.0%
Dry	Observed	4	5	9
	% within row	44.4%	55.6%	100.0%
Total	Observed	10	21	31
	% within row	32.3%	67.7%	100.0%

Table 5b. Significance of wet and dry diets between cats with FLUTD signs and those without

Diet type	χ^2 tests		
	Value	df	P
χ^2	0.862	1	0.353
N	31		

Table 5c. Significance of wet and dry diets between cats with FLUTD signs and those without

Diet type	Comparative measures		
	95% Confidence intervals		
	Value	Lower	Upper
Odds ratio	0.469	0.0932	2.36

FLUTD: Feline Lower Urinary Tract Disease.

findings and comparisons should be interpreted cautiously. Interestingly, over half of the cats in the study lived in single-pet households, possibly reflecting the shelter's or the adopter's perception of a 'low-stress home' as suggested in the adopter resources.

All 31 adopters indicated willingness to adopt another FLUTD cat in the future, suggesting positive experiences with their cat despite the need for long-term management. Notably, the response regarding preparedness of adopters of cats with recurrent UO suggests disparity in the information provided, depending on the counselor and the adopter, and variability in the quality and consistency of pre-adoption guidance, which may have impacted the adopter's ability to effectively manage the condition post-adoption. Targeted counseling to improve owner understanding, expectations, and interactions may support successful adoption.¹³ Based on our findings, it is proposed that FLUTD cats with a history of UO, when appropriately treated and provided with full counseling and management resources, are likely to achieve favorable outcomes and remain in their homes.

Table 6a. Significance of urinary diets between cats with FLUTD signs and those without

Urinary diet	Urinary diet	Urinary signs		
		Yes	No	Total
Yes	Observed	6	10	16
	% within row	37.5%	62.5%	100.0%
No	Observed	4	11	15
	% within row	26.7%	73.3%	100.0%
Total	Observed	10	21	31
	% within row	32.3%	67.7%	100.0%

Table 6b. Significance of urinary diets between cats with FLUTD signs and those without

Urinary diet	χ^2 tests		
	Value	df	P
χ^2	0.416	1	0.519
N	31		

Table 6c. Significance of urinary diets between cats with FLUTD signs and those without

Urinary diet	Comparative measures		
	95% Confidence intervals		
	Value	Lower	Upper
Odds ratio	1.65	0.358	7.60

FLUTD: Feline Lower Urinary Tract Disease.

This study had several limitations. With only 31 respondents and 10 and 2 instances of recurrence of FLUTD signs and UO respectively, the study is underpowered to detect anything other than large effects. Consequently, the resulting percentage estimates are associated with wide confidence intervals and should be interpreted cautiously, as potentially meaningful associations may not have been detected. The lifestyle variables should not be interpreted as predictors or risk factors for recurrence of FLUTD signs and UO. Instead, the study's findings should be viewed as preliminary associations that may help inform hypotheses for further research using prospectively designed studies with larger populations. The relatively low response rate (39.7%) also introduces the possibility of non-response bias. If adopters who experienced positive outcomes, such as the absence of recurrence or overall satisfaction with their adoption, were more likely to respond to the questionnaire, the observed recurrence rates may be underestimated, and the reported adopter experience overestimated. Conversely, adopters who had negative outcomes or challenges may have been

less likely to participate. The degree of such bias and its consequences could not be determined; however, it should be considered when interpreting the study findings. Additionally, results were based on self-reported information, and veterinary records were not obtained, which introduces the possibility of recall bias or misclassification of outcomes. Furthermore, pre-adoption counseling was conducted by multiple shelter staff members, which may have resulted in variability in the consistency or completeness of information provided to adopters, potentially influencing their preparedness to manage their FLUTD cat.

Outcomes should also be cautiously interpreted in the context of the resources available within the study shelter. This limited-admissions organization has a high live release rate, established pre-adoption counseling practices, and access to diagnostic, treatment, and surgical capabilities that support the management of FLUTD cats with UO. The authors recognize that these resources may not be available in all shelter settings; therefore, outcomes observed in this population may not be fully generalizable to shelters with more limited staffing, financial resources, or treatment capacity. Future studies across different types of shelter environments would help determine the extent to which these findings apply to organizations with varying levels of resources.

Conclusion

Despite historic negative perceptions and industry hesitancy regarding shelter cats with histories of FLUTD, this study of shelter cats with UO showed they remained in their adoptive homes, had low recurrence of FLUTD signs and UO, and required minimal medical or surgical intervention. Given that a majority of cats in our study did not show signs of FLUTD or re-obstruction following adoption – likely reflecting prepared adopters successfully providing low-stress environments as advised in pre-adoption counseling – it is recommended that adopters receive education on stress management, potential for recurrence, long-term care, and the associated costs to improve outcomes for cats recovering from UO. Overall, the study focuses on outcomes of shelter cats with UO that were successfully adopted, with findings indicating that these cats can remain in their homes and live a good, long-term quality of life, and highlighting opportunities for shelters to enhance cat welfare and public education.

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Conflict of interest

The authors declare no competing interests, and no funding was received.

Author's notes

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