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Outcome of cats referred to a specialized adoption program for feline leukemia virus-positive cats

Heather L Lockhart[1], Julie K Levy[1], E Susan Amirian[1,2], Natascha T Hamman[2] and Monica K Frenden[2]

Abstract

Objectives The purpose of this retrospective study was to assess outcomes of cats referred to a specialized adoption program for feline leukemia virus (FeLV)-positive cats.

Methods Cats referred to an FeLV-specific adoption program between January 2018 and July 2019 at an animal shelter in Austin, TX, USA, were first identified based on their putative FeLV status as reported by the referring shelter, rescue group, veterinarian or individual. Each cat was re-screened for FeLV upon admission and subsequently deemed infected or uninfected. Data on cat source, admission date, outcome date, outcome type, signalment and comorbidities at the time of admission were extracted from the shelter database. Outcomes were recorded up to 15 December 2019.

Results In total, 801 cats suspected to be infected with FeLV were referred to the FeLV adoption program. Of these, 149 (18.6%) were ultimately deemed uninfected, and infection was confirmed in 652 (81.4%) cats. Adoption was the most common outcome for FeLV-infected cats (n = 514 cats; 78.8%), followed by euthanasia or death in care (n = 109; 16.7%). Upper respiratory infection (URI) was the most common comorbidity in FeLV-infected cats (n = 106; 16.3%) at the time of admission, which was not significantly different than URI in the cats that were deemed not to be infected with FeLV (n = 29; 19.5%).

Conclusions and relevance This study demonstrated high national demand for a lifesaving option for cats diagnosed with FeLV. FeLV infections could not be confirmed in approximately one in five cats referred to the FeLV adoption program, a reminder of the risk behind basing the fate of a cat on a single positive test result. The majority of cats referred to the FeLV program were adopted, demonstrating that programs centered on adopter education and post-adoption support can create lifesaving outcomes for most FeLV-infected cats, despite uncertainty regarding their long-term prognosis.

Keywords: Feline leukemia virus; animal shelter; pet adoption; feline welfare; shelter medicine; animal shelter outcomes

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Introduction

Approximately 3–4% of cats in the USA test positive for feline leukemia virus (FeLV), a diagnosis that affects an estimated 60,000 cats in animal shelters each year.[1,2] However, there is a paucity of information on the outcomes of FeLV-infected cats at animal shelters. Overpopulation of cats in shelters, combined with limited shelter resources, apprehension about viral transmission and preconceptions about how FeLV infection may impact quality of life or adoption potential often lead to routine euthanasia for shelter cats following a single positive FeLV test.[3] However, the Association of Shelter Veterinarians and the American Association of Feline Practitioners do not support euthanasia based solely on infection status.[1,4]

[1]Maddie's Shelter Medicine Program, College of Veterinary Medicine, University of Florida, Gainesville, FL, USA
[2]Austin Pets Alive!, Austin, TX, USA

Corresponding author:
Julie K Levy DVM, PhD, DACVIM, DABVP (Shelter Medicine Practice), Maddie's Shelter Medicine Program, College of Veterinary Medicine, University of Florida, 2015 SW 16th Avenue, Gainesville, FL 32608, USA
Email: levyjk@ufl.edu

Public expectations and evolving animal shelter paradigms are increasing the focus on creating positive outcomes for a higher proportion of shelter pets, including those with chronic medical or behavioral conditions, if quality of life can be maintained. Overall, FeLV-infected cats have a shorter life expectancy than uninfected cats,[5–7] but a substantial proportion of these cats are generally healthy at the time of testing. Moreover, several studies have demonstrated that FeLV test results can revert from positive to negative status, potentially signaling a regressive or abortive infection.[1,8–10]

Even when using high-accuracy tests, the complex natural history of FeLV infection makes it difficult to secure a definitive diagnosis, which presents an added challenge to the identification and effective management of FeLV-infected shelter cats.[10,11] Regressive infections are associated with a robust immune response that may, at times, suppress viral loads below the level of detection following an initial period of transient antigenemia.[1,10] Cats with regressive infection usually fail to shed detectable virus, have a low risk of developing clinical disease and may live a normal lifespan. By contrast, progressive infection occurs in the absence of an adequate immune response, is characterized by persistent antigenemia and is detectable through antigen screening tests with relative consistency. Cats with progressive infection are also more likely to shed infectious virus and have an increased risk for secondary conditions and premature mortality.[2] Disentangling whether a cat is uninfected, has a regressive or progressive FeLV infection, or was initially infected but cleared the virus (abortive) can be a complicated, resource-intensive and sometimes unsuccessful process. As a result, many shelters rely on simple screening protocols that will correctly identify a majority of cats.

Austin Pets Alive! is an animal shelter in Austin, TX, USA with an annual admission of more than 10,000 animals, a >90% live outcome rate and a unique program for FeLV diagnosis, treatment and adoption. Hundreds of FeLV-infected cats are managed through this program each year, including cats that are sent to the shelter from other shelters, rescue groups and individuals across the world. The purpose of this study was to characterize the outcomes of cats referred to the shelter's specialized FeLV adoption program based on a positive FeLV test result.

Materials and methods

Study population and facility

Austin Pets Alive! is a non-profit limited-admission animal shelter focused primarily on transferring in cats and dogs at risk for euthanasia in other regional shelters. The cats in the shelter's custody are housed either in the shelter or in foster homes pending outcomes (eg, adoption or euthanasia). The shelter has an in-house veterinary clinic and maintains specific programs for the following conditions in cats: treatment of dermatophytosis, feline panleukopenia and other medical conditions; a neonatal kitten nursery; a 'barn cat' program for poorly socialized cats; and an adoption center specifically tailored to FeLV-infected cats. Euthanasia was reserved for cats deemed unsavable owing to irremediable suffering.

Cats selected for inclusion in this study were those referred to the shelter's FeLV adoption program from other shelters, rescue groups, veterinarians, individuals or internal transfer between January 2018 and July 2019.

Standard preventive healthcare

All cats in the shelter's custody, including the cats in this study, received standard preventive healthcare and were treated for medical conditions, as appropriate, in the shelter clinic. Core vaccines were administered as described in national guidelines.[12] This included a modified live virus vaccine against feline panleukopenia virus, feline herpesvirus and feline calicivirus administered at the time of shelter admission and repeated 2 weeks later in cats aged 5 months and older. In kittens, vaccination was initiated at 4 weeks of age and repeated every 2 weeks until 5 months of age. Inactivated rabies vaccines were administered to cats aged 12 weeks and older. All cats were treated with pyrantel pamoate for intestinal parasites at the time of admission and 2 weeks later. In addition, cats were treated at intake with one of several topical flea/tick preventives approved for cats and on an ongoing monthly basis. Cats were surgically sterilized prior to adoption, beginning at 8 weeks of age.

In addition to the standardized preventive care protocols, a specialized protocol was routinely applied to cats diagnosed with FeLV. FeLV-infected cats received fenbendazole, praziquantel and ponazuril, and packed cell volume and total protein tests were performed to screen for anemia. Surgical sterilization was delayed until 6 months of age owing to the impression of shelter staff that early surgery and stress may increase the risk of secondary conditions such as feline infectious peritonitis, although this was not documented by statistical analysis.

FeLV and feline immunodeficiency virus screening

At the time of admission to the shelter, cats were routinely screened for FeLV and feline immunodeficiency virus (FIV) using anticoagulated whole blood in a point-of-care ELISA kit (SNAP FIV/FeLV Combo Test; IDEXX Laboratories). Cats with a negative FeLV test result at the time of admission to the shelter were deemed uninfected and integrated into the standard adoption program. Cats with FIV were also managed within the general population. Cats with a positive FeLV test on whole blood were immediately tested again using serum; if the serum test was negative (discordant result), the cats were deemed to be FeLV uninfected for the purposes of managing

their shelter and adoption experience. If the serum test was positive, cats were deemed FeLV infected and enrolled in the FeLV adoption program. Discordant results from tests performed in the shelter were reported to potential adopters and explained as potential false-positive/false-negative results or regressive infection. Discordant results between in-shelter testing and results claimed by referring organizations prior to admission were not reported to potential adopters because of the generalized lack of documentation regarding the timing of testing, type of sample and type of test performed.

Neonatal kittens (<8 weeks old) represented a special circumstance. Most frequently, neonates were admitted as part of a group that included littermates and/or their queen or were born in care at the shelter. Each of the cats in a neonatal group was tested using whole blood drawn from the jugular vein with a heparinized syringe for FeLV only (SNAP FeLV Antigen Test; IDEXX Laboratories). Kittens born in the shelter were tested at birth, and kittens born in foster care were tested at the time of their first wellness examination at 4–6 weeks of age. Cats in groups with at least one FeLV-positive test result were separated based on FeLV status and re-tested for both FeLV and FIV according to the standard protocol when the kittens reached sterilization at the age of 8 weeks.

Some divergences from the routine testing protocol occurred based on clinical judgment or for other reasons. For example, the first admission screening step with whole blood was sometimes waived if there was a documented record of a prior FeLV-positive test result with whole blood from the referring organization. In such cases, screening proceeded directly to using serum instead. When deemed appropriate, some cats referred from other shelters with a history of a positive test result for FeLV and having a negative test result at admission received additional testing over time in an attempt to clarify their status.

FeLV adoption program

FeLV-infected cats were group-housed in the FeLV Adoption Center, housed singly if they were not compatible with other cats or placed in foster homes, pending adoption. Adoption of FeLV-infected cats was promoted through social media and in person at the shelter. Interested adopters were provided with extensive educational material about FeLV, including information about impact on life expectancy. Adoption fees were waived, and adoptions were restricted to indoor homes with no other cats or with other FeLV-infected cats. Adopters were informed that for the duration of the cat's life the shelter would provide certain post-adoption 'palliative' veterinary care at no cost for conditions deemed attributable to FeLV infection. Specifically, the policy stated, 'In the category of palliative care, heroic measures such as hospitalization, advanced imaging, specialist referrals, and invasive surgery would not be pursued. Minimal laboratory or other diagnostic tests may be warranted. Pain medication, supplements, prescription diets, or other medications to treat chronic conditions would be utilized. The focus for these patients is on quality of life'. Examples of covered conditions included dehydration, fever, respiratory disease, anorexia, lethargy, lymphoma and anemia.

Data collection and statistical analysis

Data on cat admission and exit dates, referral source, estimated age, sex, length of stay (LOS) and outcome were abstracted retrospectively from shelter records for cats admitted into the FeLV adoption program from 1 January 2018 to 1 July 2019, with the follow-up period extending through 15 December 2019. In addition, subjective assessments of concurrent medical conditions at admission and a cause of death were recorded but were not necessarily confirmed by diagnostic testing or necropsy.

Descriptive statistics were used to summarize signalment, clinical characteristics and outcomes in the study cohort. Continuous variables (eg, estimated age) were described using median, mean, SD and range. Categorical variables (eg, sex) were described as counts and percentages. Variables were compared between the group of cats that was deemed to be uninfected and the group that was deemed infected based on screening tests at the time of admission. To compare characteristics, χ^2 tests (or Fisher's exact tests for observed frequencies <5) were used to analyze categorical variables. Student's *t*-tests or Kruskal–Wallis ANOVA were used, as appropriate, to compare continuous variables by outcome or by other variables of interest.

LOS was defined as the date of shelter admission to the date of adoption, date of death/euthanasia or study end date (15 December 2019), whichever occurred first. A univariable risk ratio was calculated, using standard methods,[13] to examine mortality risk by FeLV infection status. Because follow-up ended upon adoption, any deaths or euthanasia occurring post-adoption were not recorded.

All *P* values were two-sided, with an α of 0.05 denoting statistical significance. Statistical analyses were conducted using SAS version 9.4 (SAS Institute).

Results

A total of 801 cats were referred to the FeLV adoption program between January 2018 and July 2019. Of the 801 cats, 586 originated in Texas and 215 were referred to the program from other US states (n = 211), Puerto Rico (n = 2) and Mexico (n = 2). The most common sources were transfer from municipal animal control shelters (290 cats; 36.2%), followed by private non-profit shelters (n = 235; 29.3%), and surrender by individual cat owners

Table 1 Characteristics of cats, stratified by feline leukemia virus (FeLV) status, referred to a specialized FeLV adoption program at a shelter in Austin, TX, USA

Characteristic	Confirmed FeLV infection at admission (%) (n = 652)	Deemed uninfected at admission (%) (n = 149)	*P* value*
Age at admission (months)			0.03
<2	65 (10.0)	26 (17.4)	
2–5	165 (25.3)	36 (24.2)	
⩾6	422 (64.7)	87 (58.4)	
Sex			0.22
Intact male	165 (25.3)	46 (30.9)	
Intact female	167 (25.6)	41 (27.5)	
Castrated male	191 (29.3)	32 (21.5)	
Spayed female	128 (19.6)	30 (20.1)	
Unknown	1 (0.2)	0 (0)	
Source			0.02
Municipal animal control shelter	249 (38.2)	41 (27.5)	
Private shelter	178 (27.3)	57 (38.3)	
Individual referral	147 (22.5)	39 (26.2)	
Rescue group	65 (10.0)	9 (6.0)	
Born in care	12 (1.8)	3 (2.0)	
Internal referral	1 (0.2)	0 (0)	

Data are n (%)
*From χ^2 or Fisher's exact tests as appropriate

and Good Samaritans (n = 186, 23.2%). There were significant differences in source by whether the cat was deemed FeLV infected or FeLV uninfected when re-screened upon admission to the FeLV program (Table 1; $P = 0.02$). There was no standardized protocol for diagnosis of FeLV infection by the referring sources; cats were tested upon admission with various point-of-care and laboratory assays using whole blood, plasma or serum. Specific information about the testing methods used was often undocumented in the medical records that accompanied the cats.

Of 801 putative FeLV-infected cats re-screened at the time of admission to the shelter, 149 (18.6%) were deemed to be uninfected based on the diagnostic criteria established by the shelter. Specifically, 147 cats had negative FeLV test results at admission (70 from whole blood specimens and 77 from serum specimens). Two additional cats that had ambiguous (weak positive) initial results on whole blood specimens were deemed uninfected after additional testing on serum specimens yielded negative results. These 149 cats deemed uninfected upon admission were transferred to the shelter's regular adoption program. FeLV infection was confirmed upon admission in 652 (81.4%) cats, and these cats were managed in the FeLV adoption program. Of the cats that had a positive initial test result, 533 had a subsequent test result available. Of these 533, a total of 515 (96.6%) were also positive on the second test. Of the 147 that had a negative initial test result, 93 had a subsequent test result available, of which 89 (95.7%) had a negative result again. In summary, of the total 626 cats tested twice for FeLV, 3.5% (n = 22) had discordant results between the tests.

The flow of cats from initial referral to the FeLV adoption program through the outcomes observed at the end of the study period is provided in Figure 1. Adoption was the most common outcome, regardless of FeLV status. Of the 652 cats deemed FeLV infected at admission and subsequently remaining in the FeLV adoption program, 625 (95.9%) reached an outcome (no longer in shelter or in foster) by the end of the study period. The majority of these cats were adopted (514 cats; 78.8%). A smaller proportion of cats were humanely euthanized or died in care (n = 109; 16.7%). Of the 625 FeLV-infected cats that permanently exited the shelter's care, the adoption rate was 82.2%. A total of 27 FeLV-infected and two uninfected cats were still available for adoption at the study end date. Average LOS until adoption, including combined time in the neonatal program, shelter and foster homes, was longer for FeLV-infected cats (15 weeks) than for uninfected cats (7 weeks; Table 2). Data on why LOS until adoption was longer among FeLV-infected cats were unavailable. Although LOS until death or euthanasia was longer among FeLV-infected cats (12 weeks) than for uninfected cats (3 weeks), the latter metric was based on only seven deaths (of 149 cats) in the FeLV-uninfected group, vs 109 deaths (of 652 cats) in the FeLV-infected group. Of the seven deaths in the

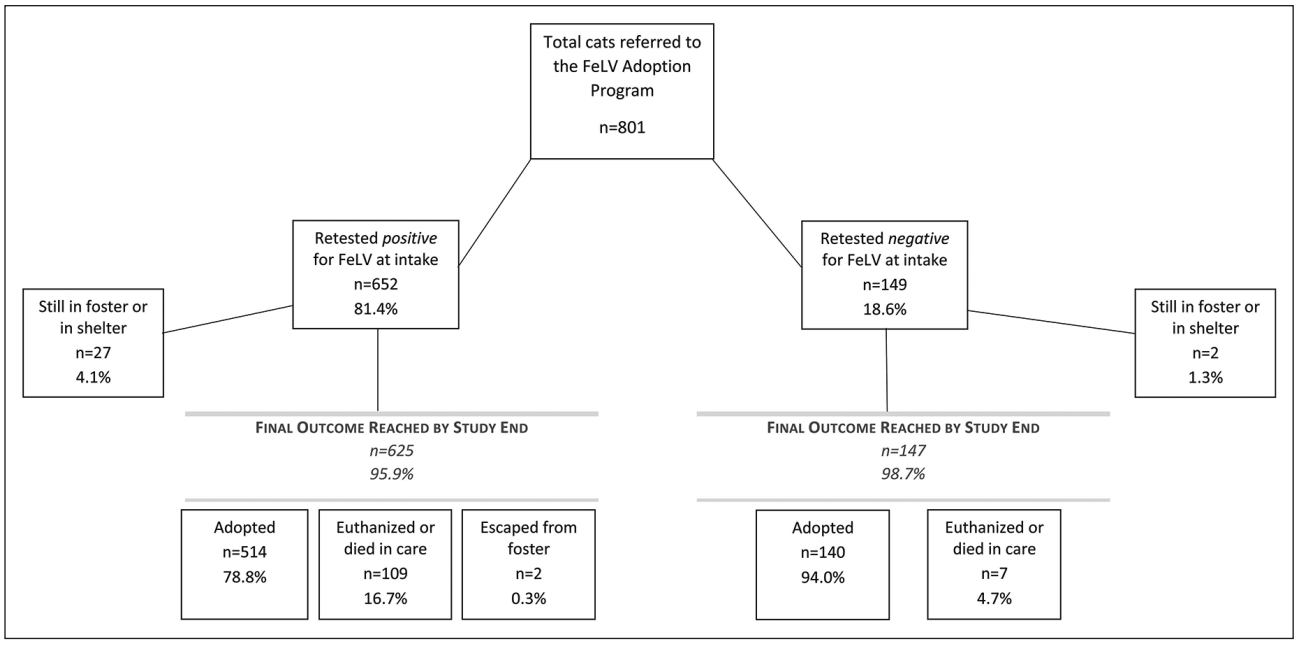

Figure 1 Flow from admission through outcome of 801 total cats referred to a specialized feline leukemia virus (FeLV) adoption program at a shelter in Austin, TX, USA

Table 2 Length of stay (LOS) in weeks for cats, overall and by feline leukemia virus (FeLV) status, referred to a specialized FeLV adoption program at a shelter in Austin, TX, USA

Outcome	Overall LOS (n = 801)	Mean LOS in cats with confirmed FeLV infection at admission* (n = 652)	Mean LOS among cats deemed not to be infected with FeLV at admission (n = 149)	*P* value
Adopted	13.1 ± 12.9	14.9 ± 13.1	6.6 ± 9.3	<0.0001
Died or euthanized	11.3 ± 11.9	11.8 ± 12.0	2.9 ± 5.7	0.004
Still in foster or shelter	34.6 ± 8.3	34.8 ± 8.6	31.9 ± 2.8	0.34

Data are mean ± SD
*Two cats that escaped from their foster homes are not included in LOS calculations

uninfected group, six were attributable to acute conditions, specifically suspected feline infectious peritonitis (FIP) and fading kitten syndrome (Table 3).

The proportion of cats with at least one observed comorbidity at admission was not significantly different between FeLV-infected and FeLV-uninfected cats in this study (Table 3; $P = 0.56$). A total of 42 cats (5.2%) were FIV-antibody positive, but were managed only according to their FeLV testing status. Upper respiratory infection was the most common comorbidity in both FeLV-infected (n = 106; 16.3%) and FeLV-uninfected (n = 29; 19.5%) cats, but there was no statistically significant difference between the groups ($P = 0.42$; Table 3). Over 70% of cats with one or more comorbidities reported at admission were eventually adopted, regardless of FeLV status.

Mortality owing to euthanasia for untreatable conditions or death in care was higher in the FeLV-infected group (n = 109; 16.7%) than in the group deemed uninfected (n = 7; 4.7%) (univariable risk ratio 3.6, 95% confidence interval 1.7–7.5; $P = 0.0008$). Although a cause of fatal illness was not definitively proven in most cases, there was no significant difference in the overall distributions of putative causes of death comparing FeLV-infected to FeLV-uninfected cats (Table 3; $P = 0.39$). A suspicion of FIP was the most common differential diagnosis among FeLV-infected cats (n = 67; 61.5% of mortalities).

Discussion

To our knowledge, this is the first report of outcomes among FeLV-infected cats managed by an animal shelter. In this study, the majority of cats referred to the

Table 3 Morbidity and mortality of cats, stratified by feline leukemia virus (FeLV) status, referred to a specialized FeLV adoption program at a shelter in Austin, TX, USA

Characteristic	Confirmed FeLV infection at admission (n = 652)	Deemed uninfected at admission (n = 149)	*P* value*
Health conditions at admission			0.56
None recorded	377 (57.8)	90 (60.4)	
At least one condition recorded	275 (42.2)	59 (39.6)	
Specific condition			NA†
URI	106 (16.3)	29 (19.5)	
Ringworm	36 (5.5)	5 (3.4)	
Ocular	39 (6.0)	3 (2.0)	
Oral	29 (4.4)	10 (6.7)	
Dehydration	31 (4.8)	2 (1.3)	
FIV positive	30 (4.6)	12 (8.1)	
Cutaneous	24 (3.7)	5 (3.4)	
Anemia	23 (3.5)	0 (0)	
Skin wound	21 (3.2)	0 (0)	
Trauma	17 (2.6)	2 (1.3)	
Diarrhea	13 (2.0)	1 (0.7)	
FIP	5 (0.8)	0 (0)	
Icterus	3 (0.5)	1 (0.7)	
Lymphadenopathy	4 (0.6)	0 (0)	
Neurological	2 (0.3)	2 (1.3)	
Panleukopenia virus	4 (0.6)	0 (0)	
Internal mass	2 (0.3)	1 (0.7)	
Ascites	1 (0.2)	1 (0.7)	
Heart murmur	1 (0.2)	1 (0.7)	
Hernia	1 (0.2)	0 (0)	
Renal	1 (0.2)	0 (0)	
Pleural effusion	1 (0.2)	0 (0)	
Incontinence	0 (0)	1 (0.7)	
Cause of death‡			0.39
FIP	67 (61.5)	4 (57.1)	
Undefined illness	14 (12.8)	1 (14.3)	
Anemia	13 (11.9)	0 (0)	
Fading kitten syndrome	4 (3.7)	2 (28.6)	
Lymphoma	5 (4.6)	0 (0)	
Neurological	2 (1.8)	0 (0)	
Intussusception	1 (0.9)	0 (0)	
Kidney disease	1 (0.9)	0 (0)	
Liver disease	1 (0.9)	0 (0)	
Panleukopenia	1 (0.9)	0 (0)	

Data are n (%)
*From χ^2 or Fisher's exact tests as appropriate
†Categories of specific conditions are not mutually exclusive; therefore, a *P* value for overall distribution cannot be calculated
‡Percentages were calculated using the following denominators: deaths/euthanasia in FeLV-infected cats (n = 109); deaths/euthanasia in uninfected/regressive cats (n = 7). There were 116 total deaths/euthanasia
URI = upper respiratory infection; FIV = feline immunodeficiency virus; FIP = feline infectious peritonitis; NA = not applicable

specialized FeLV adoption program were adopted by the end of the study follow-up period, demonstrating that programs centered on adopter education and post-adoption support can create lifesaving outcomes for most FeLV-infected cats, despite uncertainty regarding their long-term prognosis. However, LOS was approximately twice as long among FeLV-infected cats compared with those that were deemed uninfected after re-testing at the time of admission. Although cats diagnosed with FeLV have, on average, a reduced survival time,[5–7] many of these cats can be healthy at the time of testing, may revert from positive to negative/regressive FeLV status and/or can live quality lives that surpass life expectancy.[1]

The Association of Shelter Veterinarians' position statement on the management of FeLV-infected cats in animal shelters states that cats should not be euthanized based solely on a positive FeLV test;[3] however, shelters do commonly euthanize based on putative FeLV-positive status, regardless of the cat's health status. Euthanasia for a single positive test result, in particular, is problematic as this result may not reflect the cat's actual status. In this study, 18.4% of cats reported to be FeLV positive based on a previous test conducted by the referring source re-tested FeLV negative upon admission into the shelter. Such reversal of test results has also been documented in prior studies, particularly in the context of abortive or regressive infection.[1,8,9] Other possible reasons for such reversals could include human error in test conduct and false positives due to low positive predictive value when testing low-risk populations. The shelter utilized a point-of-care test for FeLV p27 antigen with documented high accuracy;[14,15] however, confirmation of infection status via systematic sequential testing with alternative testing brands or alternative testing modalities, such as PCR or immunofluorescence assay, was not performed. Therefore, in the case of the two cats with discrepant antigen test results, it was not possible to know with certainty whether the first test or the second test accurately identified their true infection status. Identification of FeLV-infected cats with confidence in a shelter setting can be both challenging and cost prohibitive, leading some shelters to opt out of universal FeLV screening.[16]

Based on the referral patterns observed in this study, there was high demand for a lifesaving option for cats diagnosed with FeLV. Municipal animal control agencies and private non-profit shelters sought to transfer FeLV-positive cats to the FeLV adoption program in order to increase each individual cat's chance for a live outcome. The demand for a lifesaving option for FeLV-infected cats justifies the development of evidence-based, FeLV-specific guidelines and best practices for shelter managers and veterinarians to support the initiation of new FeLV adoption programs at the local level.

In this study, medical condition at the time of admission was not significantly different between cats with confirmed FeLV infection and those deemed uninfected. Specifically, the prevalence of upper respiratory infection, ringworm, and ocular or oral conditions at admission was similar between the two groups. Overall health status is a result of complex interactions between endogenous (genetics, immune status, etc) and exogenous (group vs individual housing, presence of external stressors, LOS, etc) factors. Therefore, it is important to recognize that not all medical conditions in FeLV-infected cats may be attributable to their viral state. Regardless of FeLV status, the majority of cats that had a recorded illness at admission were eventually adopted, suggesting that an initial investment in providing medical treatment is a worthwhile endeavor for both infected and uninfected cats.

Although FeLV-infected cats had a higher mortality rate (16.7%) than cats deemed uninfected, the majority of FeLV-infected cats (83.3%) were still alive at the end of follow-up. The most common presumptive cause of death, regardless of FeLV status, was FIP, which accounted for 61.5% of deaths. Some studies have indicated that feline coronavirus may be more likely to manifest as FIP in shelter settings or in the context of FeLV coinfection.[17,18] Because neither ante-mortem testing nor necropsy were conducted to confirm the presumptive causes of death, the findings should be interpreted with caution.

This report had several limitations related to the retrospective observational nature of the study. Although there was a standard protocol for FeLV/FIV testing, exceptions were made, particularly in the selection of whole blood vs serum as the test sample, when deemed appropriate by shelter staff. All cats in the study were originally referred to the shelter's FeLV adoption program owing to a suspicion of FeLV infection from their referring source. Therefore, the comparisons made in the study were between the referred cats ultimately deemed to be FeLV infected and the referred cats deemed uninfected as opposed to the general pool of uninfected cats in the shelter's custody. There may be differences between cats that re-tested negative at the shelter following a positive test at another organization vs those that were never under suspicion of being FeLV infected.

Lack of long-term survival data is another limitation of this study. LOS until death while in the shelter's custody was examined, but the LOS estimate in uninfected cats was based on a small number of deaths and may not be statistically stable. As most uninfected cats were adopted relatively quickly, their follow-up time is curtailed because post-adoption deaths were not observed in this study. Therefore, the LOS estimate, especially among the FeLV-uninfected group, should not be overinterpreted.

Because this study did not follow FeLV-infected cats post-adoption, inferences about the success of the program after permanent placement of the cats cannot be made. However, post-adoption survey data gathered by the shelter reflects high adopter satisfaction (95% positive experience) and a low return rate (4%) for cats in the FeLV adoption program.[19] A future study following a cohort of FeLV-infected cats post-adoption would provide valuable information on the long-term success of FeLV adoption programs and the impact such programs can have on improving a shelter's ability to save the lives of this subpopulation of cats.

Conclusions

There was high national demand for a lifesaving option for cats diagnosed with FeLV. The majority of cats referred to the FeLV adoption program were adopted, demonstrating that programs centered on adopter education and post-adoption support can create lifesaving

outcomes for most FeLV-infected cats, despite uncertainty regarding their long-term prognosis. FeLV infections could not be confirmed in approximately one in five cats referred to the FeLV program, a reminder of the risk behind basing the fate of a cat on a single positive test result. Illness at the time of intake was not different between cats with confirmed FeLV infection and those that were deemed to be uninfected, illustrating the importance of not attributing all medical conditions in FeLV-positive cats to their viral state.

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Conflict of interest The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Ethical approval This work involved the use of non-experimental animals only (including owned or unowned animals and data from prospective or retrospective studies). Established internationally recognized high standards ('best practice') of individual veterinary clinical patient care were followed. Ethical approval from a committee was therefore not necessarily required.

Informed consent Informed consent (verbal or written) was obtained from the owner or legal custodian of all animal(s) described in this work (either experimental or non-experimental animals) for the procedure(s) undertaken (either prospective or retrospective studies). No animals or humans are identifiable within this publication, and therefore additional informed consent for publication was not required.

ORCID iD Heather L Lockhart https://orcid.org/0000-0003-2521-5262
Julie K Levy https://orcid.org/0000-0002-4849-288X
E Susan Amirian https://orcid.org/0000-0003-1130-7609
Monica K Frenden https://orcid.org/0000-0002-8261-8968

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