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Acute kidney injury in queens with pyometra: prevalence, severity and the prognostic role of cervical status

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Summary

This retrospective group study characterised the prevalence and severity of acute kidney injury (AKI) in 92 queens with pyometra. They were diagnosed on the basis of a combination of consistent clinical signs, laboratory findings and ultrasonographic evidence of a fluid-filled, enlarged uterus, with particular attention to the prognostic role of cervical status. AKI was defined and staged using modified IRIS criteria. Among the 92 queens, 55 (60.0%) met the criteria for AKI, while 37 (40.2%) had normal renal function after rehydration. Among the AKI queens, closed-cervix cases (n = 29) presented exclusively with IRIS Stage III or IV AKI, whereas open-cervix cases (n = 26) were confined to Stages II and III. The odds ratio for creatinine exceeding 500 µmol/L in closed- versus open-cervix queens was 5.13 (95% CI: 1.41-18.63, p = 0.006), and day-15 mortality was 34.5% in closed-cervix AKI queens versus 15.4% in open-cervix AKI queens. The odds ratio for death or euthanasia in AKI versus non-AKI queens was 12.3 (95% CI: 1.54-98.1, p < 0.001). Serum lactate, globulins and UPC ratios were significantly higher in closed-cervix pyometra. Abdominal ultrasonography confirmed the characteristic uterine changes in all 92 cases. OHE was performed in 87.0% of cases; medical management was attempted in 12 open-cervix queens, with a 41.7% failure rate (defined as the need for secondary OHE due to a lack of clinical improvement or worsening of the condition). AKI is a frequent and severe complication of feline pyometra and is substantially worse in closed-cervix presentations. Cervical status is the dominant prognostic determinant and should drive immediate triage and treatment decisions. Systematic renal assessment at admission and structured post-discharge follow-up are mandatory in all affected queens.

Keywords: acute kidney injury, cat, cervical status, IRIS staging, pyometra

Pyometra is a potentially life-threatening uterine condition in intact female cats, arising under prolonged progestogenic stimulation. Its pathophysiology centres on cystic endometrial hyperplasia, altered uterine vascularity and a pronounced local and systemic inflammatory response (1, 21). Beyond uterine involvement, pyometra regularly induces systemic complications, of which renal dysfunction is clinically the most consequential. Renal involvement ranges from transient prerenal azotaemia to established acute kidney injury (AKI), driven by dehydration, endotoxemia, immune-complex deposition and direct nephrotoxic injury (10, 16, 19, 23).

Pyometra is less prevalent in cats than in dogs, partly owing to the widespread adoption of early ovariohysterectomy and species-specific differences

in the reproductive cycle. Nevertheless, it remains an important clinical emergency. Predisposing factors include age, exogenous progestogen administration and cystic endometrial hyperplasia, though their relative contribution varies across populations (12, 16). Clinical presentation in queens is frequently subtle and non-specific, complicating timely diagnosis (11, 14). Cervical status is a decisive prognostic variable: closed-cervix pyometra prevents uterine drainage, promotes sustained endotoxemia and substantially raises the risk of septic peritonitis, organ failure and death (10, 24).

The feline pyometra literature remains limited compared to its canine counterpart. Most published series are small, retrospective and focused on clinical description rather than systematic assessment of renal complications. No feline study has stratified AKI severity by cervical status using standardised IRIS grading criteria, or quantified the associated mortality differential using odds ratios. This gap is clinically important, since decisions regarding urgency of surgery, fluid management and post-discharge monitoring depend directly on understanding the renal risk profile of each presentation subtype.

Diagnosis is established by combining clinical findings with abdominal ultrasonography, which confirms the presence of a fluid-filled, enlarged uterus with intraluminal echogenic content and mural changes (3, 4). However, while ultrasonography is the most valuable diagnostic modality for identifying intrauterine fluid and uterine wall changes, the echogenicity of the fluid is not diagnostic of pyometra per se; ultrasonographic data must be coupled with other clinical and laboratory findings (22).

Laboratory evaluation of serum creatinine, electrolytes, urine protein-to-creatinine (UPC) ratio and lactate is essential for prognosis and therapeutic planning (16, 19, 23).

Ovariohysterectomy (OHE) remains the definitive treatment and is associated with a favourable prognosis in the majority of cases when performed promptly, although surgical and anaesthetic risks remain, and mortality rates can reach 3% to 20%, particularly in cases with severe systemic illness or complications, such as uterine rupture or septic shock (11, 22).

Medical management with antiprogestogens may offer a fertility-sparing alternative, but this approach is strictly reserved for a carefully selected subset of queens with open-cervix pyometra that are haemodynamically stable, show no clinical or laboratory evidence of systemic inflammatory response syndrome (SIRS) and do not have severe acute kidney injury (IRIS Stage III or IV) (15, 18, 20).

The primary objective of this study was to characterise the prevalence and severity of AKI in a group of 92 queens with pyometra, which were diagnosed on the basis of a combination of consistent clinical signs, laboratory findings and ultrasonographic evidence of a fluid-filled, enlarged uterus, and to determine whether cervical status independently predicts AKI severity, short-term mortality and renal recovery.

The study was conducted at both a private veterinary clinic and a veterinary teaching hospital. As the teaching hospital serves as a referral centre, the cohort may include a higher proportion of severely affected or diagnostically challenging cases compared to the general feline population with pyometra. This potential referral bias should be considered when interpreting the results.

This represents one of the largest feline pyometra cohorts in which IRIS-graded AKI has been systematically evaluated by cervical status and the first to quantify the associated mortality differential with odds ratios.

Material and methods

Study design and setting. The study was conducted at a private veterinary clinic and a veterinary teaching hospital. As the teaching hospital serves as a referral centre, cases seen at this facility may represent a more severely affected or diagnostically challenging population compared to those seen in a primary care setting alone. Medical records of all intact female cats presented for emergency consultation and diagnosed with pyometra between 2023 and 2025 were reviewed.

Case selection and diagnostic criteria. Records were included when all of the following criteria were met: intact female cat, diagnosis of pyometra confirmed by abdominal ultrasonography (as detailed below), complete clinical and laboratory data at presentation, documented therapeutic management, and known short-term outcome. Records were excluded when ultrasonographic confirmation was absent or outcome data were incomplete.

Pyometra was diagnosed on the basis of compatible clinical signs (lethargy, anorexia, vaginal discharge, abdominal distension, polyuria-polydipsia, vomiting, hyperthermia or hypothermia) combined with ultrasonographic evidence of a fluid-filled, enlarged uterus containing echogenic intraluminal material consistent with purulent content. Bacterial culture and antimicrobial susceptibility testing were performed on uterine fluid samples obtained either at presentation (in open-cervix queens with visible vaginal discharge) or intraoperatively during ovariohysterectomy. Detailed bacteriological and histopathological findings will be presented in a separate publication.

Cases were classified as open-cervix pyometra when visible vaginal discharge was present, or closed-cervix pyometra when purulent material was confined to the uterine lumen without external drainage.

Data collection and clinical evaluation. All queens underwent a complete physical examination at presentation. Data extracted from medical records included age, breed, reproductive history, progestogen exposure, presenting clinical signs, vital parameters, hydration status and duration of signs before admission. Abdominal ultrasonography

was performed in all cases by a board-certified veterinary radiologist.

The following clinical signs were recorded at presentation: lethargy, anorexia, vaginal discharge, abdominal distension, polyuria-polydipsia, vomiting, hyperthermia (> 39.5°C) and hypothermia (< 37.5°C). A standard haematological and serum biochemistry profile (including creatinine, urea, electrolytes, albumin, globulins and lactate) was performed for all 92 queens upon admission. In addition, a urine protein-to-creatinine (UPC) ratio was measured on a spot urine sample obtained at admission from all queens. The reference ranges for the in-house biochemistry analyzer were as follows: creatinine 50-140 μmol/L, urea 5-12 mmol/L, potassium 3.8-5.2 mmol/L, phosphorus 0.8-1.7 mmol/L, albumin 25-35 g/L and globulins 28-45 g/L.

Diagnosis and classification of acute kidney injury (AKI). AKI was defined using modified International Renal Interest Society (IRIS) criteria adapted to the emergency setting. AKI was diagnosed when at least one of the following was present after correcting for hydration status and excluding isolated prerenal azotaemia: serum creatinine ≥ 150 μmol/L, a rise in serum creatinine of ≥ 26.5 μmol/L within 24 hours when a prior value was available or oliguria defined as urine output < 0.5 mL/kg/h for at least 6 hours. Queens with creatinine < 150 μmol/L after rehydration and no further evidence of AKI were classified as non-AKI. AKI severity was staged using creatinine-based IRIS thresholds at admission: Stage II (140-250 μmol/L), Stage III (251-440 μmol/L) and Stage IV (> 440 μmol/L).

Post-treatment renal follow-up. Renal function was reassessed in all surviving queens at day 15 post-operatively. Assessment included serum creatinine and a repeat UPC ratio on a spot urine sample to evaluate persistent proteinuria. When UPC was ≥ 0.4, a confirmatory sample was requested within 7 days. Queens were classified at day 15 using the same IRIS criteria: complete recovery (creatinine < 150 μmol/L without active treatment), mild persistent azotaemia (creatinine 150-250 μmol/L, corresponding to IRIS Stage I-II) or moderate persistent azotaemia (creatinine 251-440 μmol/L, corresponding to IRIS Stage III), stable over at least 7 days.

Therapeutic management. Treatment choice was made by the attending clinician based on clinical status, AKI severity, ultrasonographic findings and owner consent.

Surgical group: Ovariohysterectomy (OHE) under general anaesthesia was indicated for (1) all queens with closed-cervix pyometra (n = 33), (2) all queens with systemic compromise (e.g., SIRS, sepsis or severe AKI) and (3) queens that failed initial medical therapy (n = 5) and subsequently underwent secondary OHE. In total, 80 of the 92 queens (87.0%) underwent OHE.

Medical group: Medical management was offered only to haemodynamically stable, open-cervix queens without SIRS or severe AKI (IRIS Stage II or less). A total of 12 open-cervix queens (20.3% of open-cervix cases) received initial medical treatment. The protocol consisted of

Antiprogestogen: Aglepristone (10 mg/kg, SC, administered on days 1, 2 and 7, with a possible repeat on day 14 if clinically indicated).

Prostaglandin (optional): In a subset of cases (n = 4), a synthetic prostaglandin analogue (cloprostenol, 1 μg/kg, SC, once daily for 3-5 days) was used as an adjunct therapy to promote cervical relaxation and uterine evacuation. Prostaglandin administration requires caution because of potential side effects, including restlessness, salivation, vomiting, abdominal pain and diarrhoea, which were managed with anti-emetics and analgesics as needed.

Supportive care: Systemic broad-spectrum antimicrobials (based on clinical judgement and local antimicrobial guidelines) and intravenous fluid therapy were administered to all medically managed queens.

Surgery in AKI queens: All queens with AKI (n = 55) underwent emergency OHE after partial correction of electrolyte and acid-base disorders, targeting serum potassium < 6.5 mmol/L. Fluid therapy was adjusted according to cervical status: cautious rates (3-5 mL/kg/h of isotonic crystalloids) for closed-cervix pyometra, and standard rates (10-15 mL/kg/h for 2-4 hours) for open-cervix queens.

Medical treatment failure: Queens that failed medical therapy (defined as worsening or lack of improvement of clinical signs and uterine size on ultrasound within 5-7 days) underwent secondary OHE. This occurred in 5 of the 12 medically treated queens (41.7%). These 5 queens were subsequently included in the surgical group for outcome analysis.

Outcome assessment. The primary outcome was survival to day 15 post-treatment. Secondary outcomes included complete renal recovery, persistent azotaemia and post-operative complications (hyperkalaemia, anuria lasting more than 24 hours and death).

Statistical analysis. All analyses were performed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Continuous data are expressed as mean ± standard deviation (SD). Comparisons were made using Fisher's exact test for categorical variables and the independent-samples t-test with Welch's correction for continuous variables. Odds ratios (OR) with 95% confidence intervals (CI) were calculated by standard methods, with the Haldane-Anscombe correction applied where cells were empty. All tests were two-tailed; $p < 0.05$ was considered statistically significant.

Results and discussion

Population characteristics and disease prevalence. This study analysed the epidemiological, clinical, diagnostic and therapeutic features of pyometra in 92 queens, one of the largest feline cohorts reported to date. Of these, 55 (60.0%) met the criteria for AKI, while 37 (40.2%) had normal renal function after rehydration. This prevalence exceeds that of earlier feline case series (19), but is consistent with more recent studies applying standardised IRIS AKI grading criteria in canine pyometra (10), although comparable feline data remain scarce. The canine literature documents azotaemia in up to two-thirds of affected bitches (10). The sparse feline data probably reflect both the lower incidence of pyometra in cats and the widespread adoption of early gonadectomy.

The AKI prevalence observed here may also partly reflect referral bias, as the veterinary teaching hospital served as a referral centre, receiving more severely affected or diagnostically challenging cases. Consequently, more severely affected animals are disproportionately represented in our cohort compared to the general feline population with pyometra. This may have led to an overestimation of the true prevalence of AKI in queens with pyometra in the broader population. However, the inclusion of a substantial proportion of open-cervix cases (64.1%) and the availability of complete clinical and laboratory data for all 92 queens help mitigate this bias to some extent. The retrospective design of this study may have introduced selection and information biases, which should be considered when interpreting the results.

Clinical signs at presentation were recorded for all 92 queens. The most common findings were lethargy (82/92, 89.1%), anorexia (78/92, 84.8%) and, in open-cervix cases, vaginal discharge (59/92, 64.1%). Other signs included abdominal distension (34/92, 37.0%), polyuria-polydipsia (28/92, 30.4%), vomiting (19/92, 20.7%), hyperthermia (15/92, 16.3%) and hypothermia (6/92, 6.5%). A standard haematological and serum biochemistry profile (including creatinine, urea, electrolytes, albumin, globulins and lactate) was performed for all 92 queens upon admission.

Age distribution and reproductive risk factors. Sixty-four percent of the queens were between 4 and 6 years old, which is consistent with epidemiological profiles described previously (5, 12). The median age of 4.6 years in the AKI subgroup supports the view that feline pyometra manifests earlier in reproductive life than its canine counterpart, a difference attributable to species-specific characteristics of the luteal phase and endometrial progesterone response (11). The under-representation of queens older than 6 years (6.6%) most probably reflects regional differences in breeding practices and prophylactic ovariohysterectomy rates.

The absence of a significant breed predisposition (72.8% crossbred) reflects the local feline population structure. Exogenous progestogen administration and spontaneous cystic endometrial hyperplasia remain the principal pathogenic determinants, creating a permissive endometrial environment required for bacterial colonisation (10, 14).

Clinical presentation and cervical status. Systemic signs (lethargy, anorexia, polydipsia-polyuria) were prevalent across the cohort, reflecting the metabolic and inflammatory disturbances driven by bacterial endotoxins and cytokines. Open-cervix pyometra predominated (64.1%, 59/92), which is consistent with published feline data (10, 14). Closed-cervix disease is clinically more treacherous: the absence of vulvar discharge renders it indistinguishable from non-specific systemic illness, compressing the diagnostic window and raising the risk of uterine rupture with secondary septic peritonitis (6, 16).

Acute kidney injury: severity and the role of cervical status. The central finding of this study is the substantially greater severity of renal dysfunction in closed-cervix pyometra (Tab. 1). Among the 55 AKI queens, those with a closed cervix (n = 29) were exclusively distributed across IRIS Stages III and IV (52% and 48%, respectively), whereas open-cervix queens (n = 26) were confined to Stages II and III (54% and 46%). No closed-cervix queen presented with Stage II AKI; no open-cervix queen reached Stage IV. The odds ratio for creatinine exceeding 500 µmol/L was 5.13 (95% CI: 1.41-18.63, p = 0.006), in agreement with earlier reports (16, 19, 23).

Tab. 1. Baseline characteristics of AKI (closed vs open cervix) and non-AKI queens with pyometra

Parameter	AKI closed cervix (n = 29)	AKI open cervix (n = 26)	Non-AKI (n = 37)	p-value*	95% CI of difference (closed vs open)	p-value**	95% CI of difference (AKI vs non-AKI)
Creatinine (µmol/L)	450 ± 120	340 ± 100	85 ± 15	0.01	28-192	< 0.001	280-340
Urea (mmol/L)	50 ± 14	38 ± 12	9 ± 3	0.02	2.1-21.9	< 0.001	32-40
Potassium (mmol/L)	6.8 ± 1.0	5.6 ± 0.9	4.3 ± 0.4	0.003	0.45-1.95	< 0.001	1.4-2.0
Phosphorus (mmol/L)	2.8 ± 0.5	2.2 ± 0.6	1.3 ± 0.3	0.008	0.17-1.03	< 0.001	1.0-1.4
Albumin (g/L)	22 ± 3	24 ± 4	29 ± 4	0.14	–4.9-0.9	< 0.01	–8- –4
Globulins (g/L)	55 ± 7	45 ± 8	38 ± 6	0.002	3.7-16.3	< 0.001	9-15
Lactate (mmol/L)	4.0 ± 0.9	2.8 ± 0.8	1.5 ± 0.5	0.001	0.51-1.89	< 0.001	1.6-2.4
UPC ratio	2.2 ± 0.8	1.4 ± 0.6	0.2 ± 0.1	0.006	0.24-1.36	< 0.001	1.3-1.7
IRIS staging (creatinine-based)							
Stage II (140–250 µmol/L)	0 (0%)	14 (54%)	–	–	–	–	–
Stage III (251–440 µmol/L)	15 (52%)	12 (46%)	–	–	–	–	–
Stage IV (> 440 µmol/L)	14 (48%)	0 (0%)	–	–	–	–	–

Explanations: *p-value = comparison between closed cervix and open cervix (within AKI group); **p-value = comparison between AKI (all 55) and non-AKI (37)

Tab. 2. Post-operative outcome at day 15 (AKI closed vs open cervix)

Parameter	Closed cervix (n = 29)	Open cervix (n = 26)	p-value	95% CI of difference (closed vs open)
Survival at D15	66% (19/29)	85% (22/26)	0.22	–44%-6%
Complete recovery (creat < 150 µmol/L)	7% (2/29)	31% (8/26)	0.10	–53%-5%
Moderate persistent azotaemia (creat 251-440 µmol/L)	34% (10/29)	15% (4/26)	0.21	–12%-54%
Death	34% (10/29)	15% (4/26)	0.22	–10%-52%

These findings demonstrate that cervical status is the dominant determinant of AKI severity, as closed-cervix queens had significantly more severe renal dysfunction and a five-fold higher risk of severe azotaemia compared to open-cervix queens. The higher mortality rate in closed-cervix queens (34.5% vs 15.4%) further supports this conclusion (Tab. 2).

This severity gradient is mechanistically coherent. In closed-cervix disease, the progressive accumulation of purulent material under pressure sustains bacterial proliferation and promotes systemic endotoxin absorption, amplifying the inflammatory response and driving renal hypoperfusion. Spontaneous drainage in open-cervix cases partially limits this endotoxaemic burden. The pathophysiology of pyometra-associated AKI is multifactorial: renal hypoperfusion secondary to sepsis-induced vasodilation and myocardial depression, direct nephrotoxicity of lipopolysaccharide, immune-complex glomerulonephritis and haematogenous interstitial nephritis all contribute (8, 10). Abdelnaby et al. (1) demonstrated uterine vascular alterations and oxidative stress consistent with systemic endothelial dysfunction, providing a plausible vascular basis for the renal hypoperfusion observed particularly in closed-cervix cases. Nascimento et al. (21) identified specific downstream inflammatory pathways that may further amplify renal injury at the molecular level, though their clinical quantification remains to be validated in prospective feline studies.

Biochemical markers of severity. Serum lactate was significantly higher in closed-cervix pyometra (4.0 ± 0.9 vs 2.8 ± 0.8 mmol/L, p = 0.001) (Tab. 1), indicating a more severe circulatory compromise. Lactate is an independent predictor of mortality in canine pyometra (10), and the present data support a comparable prognostic role in queens: overall day-15 mortality among AKI queens was 25.5% (14/55), rising to 34.5% in closed-cervix cases versus 15.4% in open-cervix cases (Tab. 2).

Hyperglobulinaemia was more pronounced in closed-cervix pyometra (55 ± 7 vs 45 ± 8 g/L, p = 0.002) (Tab. 1), reflecting sustained antigenic stimulation driving acute-phase protein and immunoglobulin production. The absence of serum amyloid A (SAA) measurements, the major feline acute-phase protein, is a limitation of this retrospective study. However, the significantly elevated globulin levels in closed-cervix pyometra serve as a clinically accessible, albeit less specific, surrogate for the intensity of the systemic inflammatory response. Future studies should include serial SAA measurements to better quantify this response (10).

UPC ratios were elevated in both groups, but significantly higher in closed-cervix pyometra (2.2 ± 0.8 vs 1.4 ± 0.6, p = 0.006) (Tab. 1), indicating combined glomerular and tubular injury, a pattern also documented in canine pyometra-associated renal disease (8). Of 41 AKI queens surviving to day 15, 14 (34%) had persistent moderate azotaemia (creatinine 251-440 µmol/L), including 10 from the closed-cervix subgroup (Tab. 2). Immune-complex glomerulopathy can persist after OHE, particularly when disease duration was prolonged (8), and persistent proteinuria is a recognised driver of progression to chronic kidney disease in cats. Structured post-discharge monitoring including serum creatinine, UPC and blood pressure at 4-6 weeks, 3 months, and 6 months is therefore warranted in queens with initial UPC above 0.5 or closed-cervix disease.

Comparison between AKI and non-AKI groups. The inclusion of 37 non-AKI queens made it possible to directly quantify the renal impact of pyometra (Tab. 1). Three parameters most clearly delineate the two groups and carry the greatest clinical weight. Creatinine was 4.6-fold higher in AKI queens (395 ± 132 vs 85 ± 15 µmol/L, p < 0.001). Lactate was more than twice as high (3.4 ± 1.0 vs 1.5 ± 0.5 mmol/L, p < 0.001), confirming the severity of circulatory compromise. Hyperkalaemia (K+ > 5.5 mmol/L) carried an odds ratio of 56.6 (95% CI: 11.9-268, p < 0.001), underscoring its value as an early indicator of critical renal dysfunction and arrhythmia risk. The odds ratio for death or euthanasia in AKI versus non-AKI queens was 12.3 (95% CI: 1.54-98.1, p < 0.001), with day-15 survival of 74.5% versus 97.3% (p < 0.001) (Tab. 1).

Diagnostic imaging. In all 92 cases, abdominal ultrasonography identified a fluid-filled, enlarged uterus with intraluminal echogenic material. In conjunction with the compatible clinical signs and laboratory findings, this confirmed the diagnosis of pyometra, yielding a 100% diagnostic sensitivity in this cohort for identifying characteristic uterine changes (Tab. 3). No significant differences in uterine diameter or intraluminal debris were identified between closed- and open-cervix AKI queens (p = 0.45 and p = 1.00, respectively). Uterine wall thickening was significantly more fre-

Tab. 3. Ultrasonographic findings in AKI (closed vs open cervix) and non-AKI queens with pyometra

Parameter	AKI closed cervix (n = 29)	AKI open cervix (n = 26)	Non-AKI (n = 37)	p-value*	95% CI of difference (closed vs open)	p-value**	95% CI of difference (AKI vs non-AKI)
Uterine diameter (mm)	18 ± 5	17 ± 4	16 ± 4	0.45	–1.5-3.5	0.08	–0.2-4.2
Intraluminal debris (%)	29/29 (100%)	26/26 (100%)	35/37 (94.6%)	–	–	0.24	–1.2%-14.5%
Uterine wall thickening (%)	28/29 (96.6%)	25/26 (96.2%)	30/37 (81.1%)	0.94	–9.2%-9.8%	0.04	5.2%-25.4%

Explanations: *p-value = comparison between closed cervix and open cervix (within AKI group); **p-value = comparison between AKI (all 55) and non-AKI (37)

quent in AKI queens than in non-AKI queens (96.4% vs 81.1%, p = 0.04; 95% CI: 5.2%-25.4%), reflecting a more pronounced mural inflammation in the AKI group. Free abdominal fluid showed a non-significant trend towards higher frequency in AKI queens (18.2% vs 5.4%, p = 0.08). These findings confirm that the severity of AKI is not predicted by uterine dimensions or intraluminal content, but by systemic inflammation reflected in mural changes. Doppler assessment of uterine vascularity (3) and vigilance for rare complications, such as uterine torsion (4), further extend the diagnostic utility of ultrasonography in this condition.

It is important to acknowledge that abdominal ultrasonography confirms the presence of a fluid-filled, enlarged uterus, but cannot definitively characterise the nature of intraluminal content (e.g., purulent vs. mucoid). As noted by Hagman (22), while ultrasonography is the most valuable diagnostic modality for identifying intrauterine fluid and uterine wall changes, the echogenicity of the fluid is not diagnostic of pyometra per se; ultrasonographic data must be coupled with other clinical and laboratory findings. The definitive differentiation of pyometra from other cystic endometrial pathologies, such as mucometra or hydrometra, ultimately relies on gross and histopathological examination of the excised uterus.

Therapeutic management and outcomes. OHE was performed in 87.0% of cases (80/92). All closed-cervix pyometra (33/33, 100%) underwent surgery; among open-cervix queens, 79.7% (47/59) were treated surgically and 20.3% (12/59) received initial medical management. The secondary OHE rate after medical failure was 41.7% (5/12). Medical management with aglepristone was attempted in 12 open-cervix queens. Of these, 7 (58.3%) showed clinical and ultrasonographic resolution of pyometra and did not require surgery. The remaining 5 (41.7%) failed medical therapy (defined as worsening or lack of improvement of clinical signs and uterine size on ultrasound within 5-7 days) and underwent secondary OHE. Survival to day 15 was 82.5% (66/80) in the surgical group and 91.7% (11/12) in the medical group (p = 0.68). Overall mortality was 16.3% (15/92). Within the surgical group, mortality was markedly higher in closed-cervix pyometra (33.3%, 11/33) than in open-cervix queens (6.4%, 3/47). The single death in the medical group occurred in an open-cervix queen that required secondary OHE.

These data confirm that OHE is the treatment of reference, providing definitive source control and eliminating recurrence risk (11, 22). Medical therapy with aglepristone is viable, but represents a genuinely narrow indication: the 40% failure rate observed here, consistent with prior feline reports (15, 20), confirms that this approach requires stringent patient selection (open cervix, haemodynamic stability, no SIRS, no severe AKI), daily renal monitoring, and immediate surgical backup. It should not be regarded as a default alternative to surgery (2, 18).

A potential source of bias is the inclusion of the five queens that failed medical therapy and subsequently underwent delayed OHE. The delay in definitive surgical treatment due to the initial medical failure could have influenced the progression of renal injury and may have biased the outcomes of the surgical group. However, this subgroup was small (n = 5, 6.25% of the surgically treated group), and their outcomes were comparable to the overall AKI population. Nevertheless, this potential bias should be considered when interpreting the results.

This study demonstrates that AKI is a frequent (60%) and severe complication of feline pyometra,

Tab. 4. Therapeutic management and short-term outcomes in 92 queens with pyometra

Parameter	Surgical group (OHE)	Medical group (aglepristone ± PGF)	p-value	95% CI of difference
Number of queens (%)	80 (87.0%)	12 (13.0%)	–	–
Closed cervix (%)	33/33 (100%)	0/12 (0%)	< 0.001	78.5%-100%
Open cervix (%)	47/59 (79.7%)	12/59 (20.3%)	–	–
Secondary OHE after medical failure (%)	–	5/12 (41.7%)	–	15.2%-72.3%
Death (all causes) (%)	14/80 (17.5%)	1/12 (8.3%)	0.68	–13.1%-31.5%
Survival to day 15 (%)	66/80 (82.5%)	11/12 (91.7%)	0.68	–31.5%-13.1%

with closed-cervix cases carrying a five-fold higher risk of severe azotaemia (creatinine > 500 µmol/L) and a significantly higher mortality (OR = 12.3 for death) compared to open-cervix cases. Based on these findings, we recommend that (1) cervical status should guide immediate triage and surgical decision-making; (2) medical management should be reserved for strictly selected open-cervix cases, as our results suggest a 41.7% failure rate (defined as the need for secondary OHE due to lack of clinical improvement or worsening of the condition within 5-7 days); and (3) systematic renal assessment and post-discharge monitoring are essential, particularly in closed-cervix cases. Abdominal ultrasonography had a 100% sensitivity for identifying characteristic uterine changes (fluid-filled, enlarged uterus with echogenic content) in this cohort, which, combined with clinical signs and laboratory findings, confirmed the diagnosis of pyometra. To our knowledge, this is the first study to quantify the mortality differential associated with cervical status in feline pyometra using odds ratios, and our findings underscore the need for prospective multicentre studies to validate these results.

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