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## Staging for Common Cancers in Dogs & Cats

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## CANINE TUMORS

### CANINE LYMPHOMA

**1. CBC, Chemistry, Urinalysis** – Bloodwork and urine testing are essential and represent the minimum database for most cancers. These tests are important for a variety of reasons:

- **CBC (with manual differential)** - Some patients with lymphoma will have overt evidence of cancer cells in the bloodstream. It is also important to know whether or not cell counts are abnormal, as this may indicate bone marrow involvement. These patients may require a bone marrow aspirate to confirm this, which ultimately helps determine the treatment protocol that will be used. In addition, prior to administration of any chemotherapeutic agent, it is necessary to confirm that the patient has enough white/red blood cells and platelets to safely receive treatment.
- **Chemistry Panel** - Evaluation of internal organ function is essential prior to starting chemotherapy. Lymphoma commonly infiltrates the liver, and can also affect the kidneys and gastrointestinal tract. A chemistry panel may reveal specific abnormalities that are consistent with abdominal involvement. In addition, a variety of chemotherapeutic agents are metabolized and/or excreted by the liver or kidneys, so it is important to know if these organs are abnormal prior to giving certain drugs.
- **Urinalysis** - This is another way to confirm that the kidneys are concentrating urine appropriately. In patients with renal insufficiency, certain chemotherapeutic agents may require dose reductions. In addition, many lymphoma patients (or cancer patients in general) have a diminished immune system, and as a result, may have evidence of a urinary tract infection. This information is important to know prior to starting steroids and systemic chemotherapy.

**2. Three-View Thoracic Radiographs** – Imaging of the chest and lungs can reveal changes consistent with lymphoma, including a mediastinal mass, mediastinal/sternal lymphadenopathy, and a bronchointerstitial pattern indicative of infiltrative disease. This information is important to know prior to starting treatment, as patients with a mediastinal mass may need repeat thoracic radiographs to monitor remission status (ie response to therapy) and patients with infiltrative disease may need prolonged steroids during treatment.

**3. Full Abdominal Ultrasound** - Since lymphoma commonly affects the liver, spleen, and abdominal lymph nodes, imaging of the abdomen is recommended to get an overall baseline of the degree of abdominal involvement, which can affect prognosis in some cases, especially if other organs (such as the gastrointestinal tract, kidneys, or pancreas) are affected.

**4. Bone Marrow Aspirate** – In cases with an abnormal CBC, a bone marrow aspirate is recommended to check for bone marrow involvement. If bone marrow involvement is confirmed, adjustments in protocol may be recommended.

**5. Immunophenotyping** – Immunophenotyping reveals the type of lymphoma that is present: B-cell versus T-cell. This is important for prognostic information, but also to guide treatment recommendations. Immunophenotyping can be performed in one of three ways: 1) Flow cytometry of a lymph node aspirate, blood or other organ with lymphoma, 2) PCR for antigen receptor rearrangement (PARR) of a lymph node aspirate or other organ with lymphoma, or 3) immunohistochemistry (IHC) of a biopsy sample. If the patient was already diagnosed via biopsy, IHC would be the test of choice. This can be requested by calling the pathologist and asking for special stains (CD3 and CD79 staining). If the patient was diagnosed via cytology, than flow cytometry is recommended as this will reveal the correct phenotype roughly 90% of the time. A fresh sample is required for this test, and if this is not possible, then PARR can be performed on previous lymph node aspirate slides. It is important to note that roughly 25% of lymphoma cases will be negative with PARR, so immunophenotype will be revealed in 75% of cases with this test.



# Staging for Cancer

For more information on staging or to schedule an onsite educational session and learn how staging can benefit you and your patients contact The VCC at (203) 838-6626 or [info@vcchope.com](mailto:info@vcchope.com).



## CANINE TUMORS

### CANINE HEMANGIOSARCOMA

**1. CBC, Chemistry, Urinalysis** – Various changes can be seen on bloodwork that are important to know prior to initiation of treatment, such as anemia, thrombocytopenia, and internal organ dysfunction that may be indicative of metastatic disease. Red blood cell morphology may be supportive of hemangiosarcoma in certain cases. Patients that are severely anemic will likely require a blood transfusion before, during, or after surgery. These tests are required prior to administration of systemic chemotherapy for the reasons listed above (see lymphoma).

**2. Coagulation Profile** – The majority of patients with hemangiosarcoma show one or more coagulation parameter abnormality(ies), and roughly 50% meet the criteria for disseminated intravascular coagulation (DIC). Certain patients may require treatment with various blood products (fresh whole blood, plasma, packed RBCs) depending on the severity of abnormalities present and stability of the patient.

**3. Three-View Thoracic Radiographs** – Three views are essential for all solid tumors, as a moderate percentage of pulmonary nodules will not be detected on one or two view films. Hemangiosarcoma has a high metastatic rate, and often spreads to the lungs.

**4. Full Abdominal Ultrasound** – Hemangiosarcoma commonly arises from the spleen or liver, and has a high metastatic rate. This test can give an overall idea of whether or not obvious metastatic disease is present, and/or abdominal effusion (which is indicative of tumor rupture/bleeding). It is important to note that even if non-specific nodules/masses are present in certain organs (like liver or spleen), this does not automatically indicate metastatic disease. Suspicious lesions can be discussed with the owner and can be biopsied at the time of surgery (if possible).

**5. Echocardiogram** – This test is not always indicated, but certainly is if cardiac hemangiosarcoma is suspected in your patient. This test can give the clinician more information if a patient presents with possible splenic hemangiosarcoma, as studies have shown concurrent right atrial involvement in 9-25% of cases. If the owner is interested in following up with Adriamycin post-operatively (which is always recommended in dogs with hemangiosarcoma), an echo can show any concerning changes that would preclude the patient from getting this specific chemotherapeutic agent.

### CANINE OSTEOSARCOMA

**1. CBC, Chemistry, Urinalysis** – Patients with osteosarcoma may not have any bloodwork abnormalities, although an elevated ALP is commonly seen. These tests are important prior to surgery to ensure that the patient is otherwise healthy and can tolerate anesthesia. In addition, these tests are required

prior to administration of systemic chemotherapy (which is generally recommended for patients with osteosarcoma) for the reasons listed above (see lymphoma).

**2. Three-View Thoracic Radiographs** – Three views are essential for all solid tumors, as a moderate percentage of pulmonary nodules will not be detected on one or two view films. Osteosarcoma has a high metastatic rate (>90%), and often spreads to the lungs.

**3. Regional Lymph Node Aspirate** – While spread to the regional lymph nodes is not commonly seen in dogs with osteosarcoma (roughly 5% of cases), the prognosis for patients with locoregional nodal spread is worse compared to patients without nodal involvement.

### CANINE SOFT TISSUE SARCOMA

**1. CBC, Chemistry, Urinalysis** – Patients with a soft tissue sarcoma may not have any bloodwork abnormalities, although these tests are important prior to surgery or other local therapies (ie definitive radiation) to ensure that the patient is otherwise healthy and can tolerate anesthesia. In addition, these tests are required prior to administration of systemic or metronomic chemotherapy (which may be recommended for patients with high grade STSs or in patients with incomplete margins) for the reasons listed above (see lymphoma).

**2. Three-View Thoracic Radiographs** – Three views are essential for all solid tumors, as a moderate percentage of pulmonary nodules will not be detected on one or two view films. STSs have a low to moderate metastatic rate (<15% for low grade tumors, roughly 40% for high grade tumors), although it is important to know if metastatic disease is present prior to recommending aggressive local therapy (such as definitive radiation).

**3. Regional Lymph Node Aspirate** – Knowing if regional lymph node spread is present is important prior to making treatment recommendations. If metastatic disease to the regional lymph node is documented, then treatment may be altered (ie surgical removal of LN and including the lymph node in the radiation field).

**4. Abdominal Ultrasound** – In some cases STSs are located over the caudal abdomen or hind limbs, and an abdominal ultrasound is recommended to evaluate the patient for internal metastatic disease (regional lymph nodes, internal organs) prior to recommending aggressive local therapy in patients with high grade tumors.

# Benefits of Staging

Provides better patient care and gives more complete medical information to The VCC doctors so that your clients are able to have a more comprehensive consult.



## CANINE TUMORS

### CANINE TRANSITIONAL CELL CARCINOMA

**1. CBC, Chemistry, Urinalysis** (free catch) – Patients with TCC may not have any bloodwork abnormalities, although some patients will have evidence of renal failure due to ureteral obstruction secondary to tumor growth. The urinalysis can be helpful in obtaining a definitive diagnosis, as cancer cells can be seen in up to 30% of cases. Patients with TCC have a higher incidence of urinary tract infections (due to compromised urogenital structures), and bacteria can be seen on the UA. It is ideal to collect the urine sample by using a sterile “free catch” method or catheterization, to avoid hitting the tumor with a needle and causing “seeding” of tumor cells along the needle tract (although this is very uncommon). These tests are also required prior to administration of systemic chemotherapy (which is generally recommended for patients with TCC) for the reasons listed above (see lymphoma).

**2. Three-View Thoracic Radiographs** – Three views are essential for all solid tumors, as a moderate percentage of pulmonary nodules will not be detected on one or two view films. Although it is not exceedingly common for patients to have documented distant metastatic disease at the time of diagnosis (roughly 15% in one study), patients have a higher likelihood of spread to the lungs as the disease progresses.

**3. Full Abdominal Ultrasound** – This test is very important for staging, as it is common to see involvement of other urogenital sites (ureters, urethra, prostate). In addition, uni- or bilateral ureteral obstruction should be ruled out in every patient. Regional lymph nodes (such as the medial iliac nodes) can also be evaluated for metastasis, in addition to distant sites such as liver and/or spleen. It is also important to know where the bladder mass is located, since some oncologists will recommend surgical debulking if the tumor is not arising from the trigone prior to radiation and/or systemic chemotherapy.

### CANINE MAST CELL TUMOR

**1. CBC, Chemistry, Urinalysis** – Patients with a MCT may not have any bloodwork abnormalities, although some patients will have evidence of anemia and/or an elevated BUN (usually from GI bleeding secondary to GI ulceration from continued histamine release from the tumor). Rarely cases will have cytopenias and/or circulating mast cells along with an eosinophilia and/or basophilia, which is indicative of bone marrow involvement and systemic mastocytosis. These tests are also required prior to administration of

systemic chemotherapy or targeted therapy, such as Palladia or Masivet (which may be recommended for certain patients with a MCT), for the reasons listed above (see lymphoma).

**2. Regional Lymph Node Aspirate** – It is common for MCTs to spread to regional lymph nodes, so it is always important to aspirate them, even if they are normal on palpation. Although regional lymph node metastasis doesn't uniformly indicate a worse prognosis for the patient, this may alter the patient's treatment plan. It is important to note that mast cells may infiltrate a lymph node as an inflammatory response (secondary to a tumor), so concerning cytology should be confirmed with a lymph node biopsy (or LN removal at the time of surgery).

**3. Bone Marrow Aspirate** (HIGH GRADE TUMORS ONLY) – This test is generally recommended only for patients with high grade tumors (including clinically aggressive grade II or grade III MCTs), as a small percentage of cases (<5%) will have bone marrow involvement. It is especially important for patients that may be treated with aggressive local therapies (an aggressive surgery or definitive radiation therapy), as these treatments would not be recommended if gross disease is also present in the bone marrow.

**4. Full Abdominal Ultrasound** – This test is very important for staging, as MCTs can spread to liver and/or spleen, in addition to abdominal lymph nodes if the tumor is on the trunk (or medial iliac lymph nodes if the tumor is on a hind limb). For any grade MCT, if the liver or spleen appear abnormal, then cytology is warranted to rule out the presence of metastatic disease. For grade III or clinically aggressive grade II MCTs, cytology of the liver and spleen are always recommended. One recent study showed that the sensitivity of ultrasound in detecting mast cell infiltration in the spleen and liver was low (43% and 0% respectively), so fine needle aspiration of these organs should always be performed in patients with higher grade tumors, even if they appear normal on ultrasound.

**5. Three-View Thoracic Radiographs** – Thoracic radiographs are not generally recommended, as it is uncommon for MCTs to spread to the lungs. In some cases this can be performed if there is concern for spread to the sternal lymph node, if the patient is having difficulty breathing, or if the owners want to rule out any major abnormalities (like pulmonary disease) prior to proceeding with aggressive local therapy (such as surgery or definitive radiation).

# Increases Revenue

Staging for cancer is another way for general practices to increase revenue while providing better customer service.



## CANINE TUMORS

### CANINE MELANOMA

**1. CBC, Chemistry, Urinalysis** – Patients with a melanoma may not have any bloodwork abnormalities, although these tests are important prior to surgery to ensure that the patient is otherwise healthy and can tolerate anesthesia. In addition, these tests are required prior to administration of systemic or metronomic chemotherapy (which may be recommended for certain patients) for the reasons listed above (see lymphoma).

**2. Three-View Thoracic Radiographs** – Three views are essential for all solid tumors, as a moderate percentage of pulmonary nodules will not be detected on one or two view films. Melanomas have a moderate to high metastatic rate, and it is important to know if metastatic disease is present prior to recommending aggressive local therapy (such as a large surgery or definitive radiation).

**3. Regional Lymph Node Aspirate** – Knowing if regional lymph node spread is present is important prior to making treatment recommendations. As a result regional lymph nodes should always be aspirated even if they are normal on palpation. In one study, regional lymph node spread was documented on cytology in 40% of normal-sized lymph nodes. If metastatic disease to the regional lymph node is documented, then treatment may be altered (ie surgical removal of LN and including the lymph node in the radiation field).



## FELINE TUMORS

### FELINE LYMPHOMA

**1. CBC, Chemistry, Urinalysis** – Bloodwork and urine testing are essential and represent the minimum database for most cancers. These tests are important for a variety of reasons:

- **CBC (with manual differential)** - Some patients with lymphoma will have overt evidence of cancer cells in the bloodstream. It is also important to know whether or not cell counts are abnormal, as this may indicate bone marrow involvement. These patients may require a bone marrow aspirate to confirm this, which ultimately helps determine the treatment protocol that will be used. In addition, prior to administration of any chemotherapeutic agent it is essential to confirm that the patient has enough white/red blood cells and platelets to receive treatment.
- **Chemistry Panel** - Evaluation of internal organ function is essential prior to starting chemotherapy. Lymphoma commonly infiltrates the liver, and can also affect the kidneys and gastrointestinal tract. A chemistry panel may reveal specific abnormalities that are consistent with abdominal involvement. In addition, a variety of chemotherapeutic agents are metabolized and/or excreted by the liver or kidneys, so it is important to know if these organs are abnormal prior to giving certain drugs.
- **Urinalysis** - This is another way to confirm that the kidneys are concentrating urine appropriately. In patients with renal insufficiency, certain chemotherapeutic agents require dose reductions. In addition, many lymphoma patients (or cancer patients in general) have a diminished immune system, and as a result, may have evidence of a urinary tract infection. This information is important to know prior to starting steroids and systemic chemotherapy.

**2. Three-View Thoracic Radiographs** – Imaging of the chest and lungs can reveal changes consistent with lymphoma, including a mediastinal mass, mediastinal/sternal lymphadenopathy, and a bronchointerstitial pattern indicative of infiltrative disease. This information is important to know prior to starting treatment, as patients with a mediastinal mass may need repeat thoracic radiographs to monitor remission status (ie response to therapy) and patients with infiltrative disease may need prolonged steroids during treatment.

**3. Full Abdominal Ultrasound** - Since lymphoma commonly affects the liver, spleen, abdominal lymph nodes, and gastrointestinal tract in cats, imaging of the abdomen is recommended to get an overall baseline of the degree of abdominal involvement. This affects prognosis in some cases, especially if other organs (such as the kidneys or pancreas) are affected.

Continued on next page...



## FELINE TUMORS

**4. Bone Marrow Aspirate** – In cases with an abnormal CBC, a bone marrow aspirate is recommended to check for bone marrow involvement. If bone marrow involvement is confirmed, then a different treatment protocol may be recommended.

### FELINE INJECTION SITE (OR OTHER SOFT TISSUE) SARCOMA

**1. CBC, Chemistry, Urinalysis** – Patients with an ISS may not have any bloodwork abnormalities, although these tests are important prior to surgery or radiation therapy to ensure that the patient is otherwise healthy and can tolerate anesthesia. In addition, these tests are required prior to administration of systemic or metronomic chemotherapy (which is commonly recommended for patients with this tumor type) for the reasons listed above (see lymphoma).

**2. Three-View Thoracic Radiographs** – Three views are essential for all solid tumors, as a moderate percentage of pulmonary nodules will not be detected on one or two view films. ISSs have a low to moderate metastatic rate (10-25%), although it is important to know if metastatic disease is present prior to recommending aggressive local therapy (such as definitive radiation).

**3. Abdominal Ultrasound** – In some cases ISSs are located over the caudal abdomen or hind limbs, and an abdominal ultrasound is recommended to evaluate the patient for internal metastatic disease (regional lymph nodes, internal organs) prior to recommending aggressive local therapy.

**4. Regional Lymph Node Aspirate** – Knowing if regional lymph node spread is present is important prior to making treatment recommendations. If metastatic disease to the regional lymph node is documented, then treatment recommendations will likely be altered.

### FELINE SQUAMOUS CELL CARCINOMA

**1. CBC, Chemistry, Urinalysis** – Patients with a SCC may not have any bloodwork abnormalities, although these tests are important prior to recommending treatment that may require anesthesia or chemotherapy (see lymphoma above).

**2. Three-View Thoracic Radiographs** – Three views are essential for all solid tumors, as a moderate percentage of pulmonary nodules will not be detected on one or two view films. SCCs have a low metastatic rate, although it is important to know if metastatic disease is present prior to recommending aggressive local therapy (such as surgery or definitive radiation therapy).

**3. Regional Lymph Node Aspirate** – Knowing if regional lymph node spread is present is important prior to making treatment recommendations. If metastatic disease to the regional lymph node is documented, then treatment recommendations may be altered.

### FELINE MAMMARY GLAND CARCINOMA

**1. CBC, Chemistry, urinalysis** – Patients with a mammary carcinoma may not have any bloodwork abnormalities, although these tests are important prior to surgery to ensure that the patient is otherwise healthy and can tolerate anesthesia. In addition, these tests are required prior to administration of systemic or metronomic chemotherapy (which is commonly recommended for patients with this tumor type) for the reasons listed above (see lymphoma).

**2. Three-View Thoracic Radiographs** – Three views are essential for all solid tumors, as a moderate percentage of pulmonary nodules will not be detected on one or two view films. Mammary carcinomas have a moderate to high metastatic rate, and it is important to know if distant metastatic disease is present prior to recommending aggressive local therapy.

**3. Abdominal Ultrasound** – Over 25% of patients will have evidence of lymph node metastasis at diagnosis, and thus, evaluation of abdominal and inguinal nodes with ultrasound is indicated (+/- cytology if abnormal). It is also important to evaluate the patient for other sites of metastatic disease prior to recommending aggressive local therapy.

**4. Regional Lymph Node Aspirate** – Knowing if regional lymph node spread is present is important prior to making treatment recommendations. If metastatic disease to the regional lymph node is documented, then treatment recommendations will likely be altered.

### WHY STAGE?

The Veterinary Cancer Center strongly believes the best patient care results from the strong relationship between general practitioners and specialists. The core competencies of both are needed to provide the client and pet with the best care possible. This requires creating a sustainable financial model for both parties. These are the reasons why we have created this staging guide-- to help our partners prepare their clients and patients for the most complete and comprehensive oncology consult possible.



## Trusted Resources

### VETERINARY – CANCER

**Animal Cancer Foundation** - [www.animalcancer.org](http://www.animalcancer.org)

As the foundation has evolved, so has the collaboration of veterinary and human oncologists, as they work to discover more effective and less toxic treatments that will decrease cancer-related mortality in people and pets.

### FINANCIAL AID FOR PETS WITH CANCER

**The Riedel & Cody Fund** - [www.riedelcody.org](http://www.riedelcody.org)

A community of caregivers that provides support for people whose beloved pets are suffering with cancer. They provide support, resources and treatment funding for people whose pets have cancer.

**Paws 4 A Cure** - [www.paws4acure.org/](http://www.paws4acure.org/)

The mission is to provide financial assistance for canine and feline owners who cannot afford veterinary care for their beloved furry family members otherwise.

**The Magic Bullet Fund** - [www.themagicbulletfund.org/](http://www.themagicbulletfund.org/)

Magic Bullet Fund (MBF) provides financial assistance for canine cancer treatment only when the family is financially unable to provide treatment.

**Brown Dog Foundation** - [www.browndogfoundation.org/](http://www.browndogfoundation.org/)

Offers pet owners in temporary financial crisis an alternative to euthanasia when their pet faces a treatable but life-threatening condition or illness in order to restore quality of life for pet and owner

**CanineCancerAwareness** - <http://caninecancerawareness.org/>

If you are struggling and need assistance to provide your dog with cancer treatment you are encouraged to download an application for financial assistance

**Fetch A Cure** - [www.fetchacure.com/cancer](http://www.fetchacure.com/cancer)

Through the establishment of our Companions in Crisis program, FETCH is working to provide financial aid to families unable to bear the high costs of cancer treatment and rehabilitation. \*\* Application available online for download.

**Dog and Cat Cancer Fund** - [www.dccfund.org/](http://www.dccfund.org/)

Helping underprivileged owners get treatment for cats and dogs suffering from cancer. \*\* Click on "Treatment" and then Application Policies. Simple online applications; however, they will follow-up via email for you to fax or email your dog's records.

**Land of PureGold 'Working Dog' Cancer Treatment Grants**

[www.grants.landofpuregold.com/](http://www.grants.landofpuregold.com/)

Grants are \$500 per individual working dog, the reimbursements provided directly to respective veterinary personnel for oncology related expenses in the United States and Canada. Applicants MUST BE active working dogs, that is, in the areas of assistance, detection, search & rescue, enforcement, military work, or animal-assisted therapy.

**Pet Fund** - [www.thepetfund.com/](http://www.thepetfund.com/)

While costs are an inevitable part of the responsibility of owning companion animals, The Pet Fund assists owners in covering medical costs beyond the normal expenses of vaccination, spay and neuter surgeries, food and routine veterinary care.

**Angels 4 Animals** - <http://www.angels4animals.org/>

A non-profit organization and a program of Inner Voice Community Services, has a mission to serve as the guardian angel of animals whose caretakers find themselves in difficult financial situations.





## Staging Common Cancers

DOGS	CBC/Chem/UA	3 view Chest Radiographs	AUS	Bone Marrow aspirate	Regional lymph node aspirate	Other
Lymphoma	yes	yes	yes	yes	yes	immunophenotyping
Hemangiosarcoma	yes	yes	yes	no	no	coagulation profile, echocardiogram
Osteosarcoma	yes	yes	no	no	yes	
Melanoma	yes	yes	maybe	no	yes	radiographs of pelvis
Soft Tissue Sarcoma	yes	yes	maybe	no	yes	
Transitional Cell Carcinoma	yes	yes	yes	no	no	
Mast Cell Tumor	yes	maybe	yes	maybe	yes	

CATS	CBC/Chem/UA	3 view Chest Radiographs	AUS	Bone Marrow aspirate	Regional lymph node aspirate	Other
Lymphoma	yes	yes	yes	maybe	yes	
Injection Site (or other Soft Tissue) Sarcoma	yes	yes	maybe	no	yes	
Squamous Cell Carcinoma	yes	yes	no	no	yes	
Mammary Gland Carcinoma	yes	yes	yes	no	yes	

