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# *Feline Hypertension*

Hypertension in cats has been increasingly recognized as a disease process that can cause great morbidity and mortality if left untreated.

Secondary hypertension occurs most frequently and is commonly associated with acute and chronic renal failure and hyperthyroidism. Less often, it may be associated with hyperaldosteronism, pheochromocytoma, and erythropoietin administration. Other types of feline hypertension include essential or idiopathic hypertension and “white-coat” hypertension. The latter is an artifactual increase in blood pressure of generally less than 20 mmHg resulting from excitement or anxiety.

Sustained systemic hypertension can lead to target organ damage in 4 major organ systems: renal, ocular, nervous, and cardiovascular (**Table 1**, next page). The American College of Veterinary Internal Medicine Panel on Hypertension categorizes blood pressure into 4 categories based on the risk for future target organ damage, and these categories help determine whether the patient needs antihypertensive treatment (**Table 2**, next page).

## Measuring Blood Pressure

Blood pressure can be measured directly by intraarterial means or indirectly by Doppler or oscillometric devices. Indirect methods are more practical, and Doppler blood pressure devices appear to provide the most accurate and consistent readings in the conscious cat. To decrease the white-coat effect and machine and

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operator variability, use a standardized machine, an experienced operator, and a standard protocol for taking measurements.

The patient should be allowed to acclimate, preferably with the owner, in a quiet environment for 10 minutes before the reading. If possible, delay physical examination and other procedures until after the blood pressure is taken. Restrain the cat in a comfortable position that allows the blood pressure cuff to be placed at the level of the heart base. Place the cuff on a forelimb, a hindlimb, or the base of the tail. The cuff should be 30% to 40% of the circumference

of the chosen appendage and should fit snugly before inflation.

Gently inflate the cuff 40 mmHg above which the heart sound stops and then slowly deflate the cuff to obtain the reading. Fully deflate the cuff before taking another reading. The operator should discard the first reading and take the average of 5 to 7 consecutive systolic readings that vary by 10% to 20%.

After the session, record the position of the animal, the limb used, and the cuff size so that subsequent measurements can be done with the

same protocol. A diagnosis of hypertension in cats is based on systolic blood pressure and should ideally be made with repeated measurements over several days. However, a diagnosis can be based on a single measurement session in a patient with signs of a rapidly progressive target organ disease, such as hypertensive choroidopathy/retinopathy or encephalopathy.

### Levels of Care

The level of care given a hypertensive feline patient depends on the underlying cause, current target organ damage, progression of damage, and risk for developing further damage.

**Table 1. Evidence of Target Organ Damage**

	Hypertensive Injury	Clinical Findings	Diagnostic Tests
<b>Heart</b>	Left ventricular hypertrophy	<ul style="list-style-type: none"> <li>• Gallop rhythm</li> <li>• Systolic murmur</li> <li>• Arrhythmias</li> </ul>	<ul style="list-style-type: none"> <li>• Auscultation</li> <li>• Thoracic radiography</li> <li>• Echocardiography</li> <li>• Electrocardiography</li> </ul>
<b>Kidney</b>	Progression of chronic renal disease	Serial increase in serum creatinine, proteinuria	<ul style="list-style-type: none"> <li>• Serum creatinine</li> <li>• Urine protein–creatinine ratio</li> </ul>
<b>Eye</b>	Retinopathy/choroidopathy	<ul style="list-style-type: none"> <li>• Acute-onset blindness</li> <li>• Exudative retinal detachment</li> <li>• Retinal hemorrhage</li> <li>• Perivascular edema</li> <li>• Hyphema</li> <li>• Glaucoma</li> </ul>	<ul style="list-style-type: none"> <li>• Ophthalmic examination</li> <li>• Fundic examination</li> </ul>
<b>Brain</b>	Encephalopathy, stroke-like events*	Centrally localizing neurologic signs	<ul style="list-style-type: none"> <li>• Neurologic examination</li> <li>• Advanced imaging</li> </ul>

\* Cerebral vascular spasms can be secondary to hypertension and can result in ischemic events. Modified from *Guidelines for the identification, evaluation, and management of systemic hypertension in dogs and cats*; Brown S, Bagley R, Carr A, et al; J Vet Intern Med 21:542-558, 2007.

**Table 2. Classification of Blood Pressure Based on Future Risk for Target Organ Damage**

Risk Category	Systolic Blood Pressure (mmHg)	Risk for Target Organ Damage	Antihypertensive Treatment?
<b>I</b>	< 150	Minimal	Not recommended
<b>II</b>	150–159	Mild	Not recommended, but monitor blood pressure
<b>III</b>	160–179	Moderate	Recommended for animals with target organ damage or secondary hypertension
<b>IV</b>	> 180	Severe	Recommended for all

Modified from *Guidelines for the identification, evaluation, and management of systemic hypertension in dogs and cats*; Brown S, Bagley R, Carr A, et al; J Vet Intern Med 21:542-558, 2007.

Because most hypertensive cats have secondary hypertension, it is essential to diagnose and manage any underlying disease process.

In some cases, once the underlying disease is addressed, secondary hypertension may resolve. However, some cats will continue to have hypertension due to small-vessel disease that persists after the underlying condition resolves. Despite treatment of the primary disease, if hypertension persists or if there is evidence of target organ damage, antihypertensive therapy is warranted.

Most hypertensive cats will not require emergency management, and the patient's blood pressure can be reduced gradually. However, in cases of hypertensive choroidopathy/retinopathy or encephalopathy, more immediate and aggressive measures to reduce blood pressure may be needed.

### When to Consider Referring

Consider referring when you do not have the equipment or experience to accurately diagnose or manage hypertension in a patient that has signs of target organ damage or an underlying disease associated with hypertension. This consideration is particularly important in a patient presenting with vision loss or neurologic abnormalities that may progress rapidly.

In addition, referral is indicated in a hypertensive patient when management of an underlying disease may benefit from another's opinion or

expertise, when an underlying cause for the hypertension cannot be identified, when a patient does not respond to antihypertensive therapy, and when signs of target organ damage progress or do not improve despite appropriate therapy.

### The Referral Process

When referring a patient for the diagnosis or management of hypertension, it is important to forward pertinent medical records, current medications, laboratory data, and imaging studies. Include any blood pressure readings that were attained, how they were attained (ie, type of device, size of cuff, position of animal, and limb used) and what therapy, if any, was instituted. In addition, when scheduling a referral it is important to assess signs of target organ damage and whether the animal's condition is emergent.

### When Referral Is Not an Option

Hypertension in cats can generally be controlled through pharmacologic means. The goal of therapy is to maximally reduce the risk for target organ damage and to maintain systolic blood pressure between 120 and 150 mmHg.

### Medications

Calcium-channel blockers and ACE inhibitors are 2 of the more common means of controlling hypertension, while beta-blockers and alpha-blockers may also be used (**Table 3**).



To read more about blood pressure monitors and measuring blood pressure, see

**Procedures Pro: Measuring Blood Pressure** (November 2004)

**Devices: Blood Pressure Monitors** (September 2005)

available at [cliniciansbrief.com](http://cliniciansbrief.com).

*Amlodipine* is a rapidly acting, effective calcium-channel blocker and generally should be the first choice for antihypertensive treatment in moderately to severely hypertensive cats. On average, systolic blood pressure declines by 40 to 55 mmHg with amlodipine monotherapy.

In some cases it may be appropriate or necessary to treat the patient with adjunctive medication that may address a primary disease process and also help reduce blood pressure. For

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**Table 3. Oral Antihypertensive Agents for Cats**

Class	Drug	Dosage
Calcium-channel blocker	Amlodipine	0.625–1.25 mg/cat Q 12–24 H
Angiotensin-converting enzyme inhibitor	Benazepril	0.25–0.5 mg/kg Q 12–24 H
	Enalapril	0.25–0.5 mg/kg Q 12–24 H
Beta-blocker	Atenolol	6.25–12.5 mg/cat Q 12–24 H
	Propranolol	2.5–5 mg/cat Q 8 H
Alpha-blocker	Prazosin	0.25–0.5 mg/cat Q 24 H
	Phenoxybenzamine	2.5 mg/cat Q 8–12 H





## Measuring Feline Blood Pressure

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example, adjunctive therapy for hyperthyroid-associated hypertension may include *beta-blockers*, and adjunctive therapy for hypertension associated with proteinuric renal disease may include *ACE inhibitors*.

In an emergency situation in which the patient needs an aggressive approach for reducing blood pressure, amlodipine may be given orally; a parenteral agent, such as nitroprusside or hydralazine, may also be used.

### Monitoring

Once antihypertensive therapy is begun, close follow-up is needed. In nonemergency situa-

tions, a patient's blood pressure should be reassessed 5 to 7 days after therapy begins or after the dose or dosing frequency is changed, and then every 1 to 4 months depending on the patient's status.

In emergency situations, blood pressure should be checked within 1 to 3 days after drug initiation and after a change in dose or dosing frequency until the patient is stable, and then every 1 to 4 months as above.

Follow-up visits should also include monitoring of the underlying disease process through appropriate laboratory tests, fundic examina-

tion, auscultation of the heart, and assessment of neurologic status. If blood pressure is unstable or begins to increase, or signs of target organ damage are noted, adjustment in the treatment protocol is needed. ■

**See Aids & Resources, back page, for references, contacts, and appendices.**

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ACE = angiotensin-converting enzyme