



veteducation

VET NURSE SERIES

Take the Pressure Down!

**What is Hypertension
& How Can You Help?**



Take the Pressure Down – Feline Hypertension

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INTRODUCTION – WHAT IS BP MEASUREMENT AND WHY SHOULD WE MEASURE IT?

- Blood pressure infrequently measured (1.3% of all cats examined and in 4.4% of cats ≥ 9 years of age)
- Hypertension diagnosed in more than 5% of apparently healthy older cats, in one study up to 19.5%!

CKD: How common is kidney disease in cats?

CKD can be seen in cats of any age but is most commonly seen in middle to old-aged cats (those over 7 years), and it becomes increasingly common with age. It has been estimated that around **20-50% of cats over 15 years of age will have some degree of CKD present.**

CKD is seen about three times more frequently in cats than in dogs.

Studies suggest between 20-35% of cats with CKD may have hypertension, other studies state the figure is higher at the 65% mark.

HYPERTHYROIDISM: How many older cats present with hyperthyroidism? How many of these cats have hypertension?

It is estimated that up to **one in ten cats older than ten years** old have this.

Nearly a quarter of cats with hyperthyroidism have hypertension at the time of diagnosis. Additionally, nearly 25% of hyperthyroid cats are normotensive at the time of diagnosis and they may go on to develop hypertension after control of their hyperthyroidism!

And sometimes, because cats are cats, there may not be any discernible cause for the hypertension – it is just there! This is classed as idiopathic hypertension and can account for 20% of cats you will diagnose with high blood pressure.

If we don't look, we don't see!

MEASURING BLOOD PRESSURE – How Do We Do It?

In a study by Jessica Quimby **57% of vets said it was too difficult**, in 40% of case the nurses didn't know how and it was only 10% of the time it couldn't be done because the owners declined – these cases can be turned around with education being the key!

TARGET ORGAN DAMAGE

What happens to these cats with undiagnosed or untreated hypertension?

Target organ damage – high BP can affect the eyes, the heart, the brain and the kidneys. Sometimes the damage may be irreversible.

Have you had owners complain of their cats yowling at night, cats exhibiting odd behaviour?

Retinal detachment is the dramatic and debilitating result of hypertension in cats. If you only look for hypertension when cats are presented for retinal detachment you will miss hypertensive cats. Anisocoria can occur when one retina detaches or the other doesn't or haemorrhage in one eye.

Can get hyphaema, strokes when distended arteries in brain rupture, or hypertensive encephalopathy, seizures, gallop rhythms and heart murmur due to LV hypertrophy associated with hypertension.

Epistaxis due to small arteries associated with the turbinate bones rupture.

HYPERTENSION – WHAT CAN GO WRONG

These cats with TOD can present with:

- Over time, hypertension also leads to the overworking of the heart, which eventually becomes muscled, leading to heart failure.
- It can also cause the rupturing of the blood vessels in your pet's brain. Following this, the cat can develop neurologic problems, suffer from dementia or experience seizures.
- Hyphaemia
- Sudden onset blindness (retinal detachment)
- Hypertensive retinopathy
- 60-80% of hypertensive cats have ophthalmic disease

Ideally, you can see how we would like to diagnose hypertension before these occur!

This is why blood pressure measurements of at-risk cats is strongly recommended on the routine basis.

TYPES OF WAYS TO MEASURE BP

Setting the cat up for success:

- Light restraint in sternal or lateral recumbency.
- Keep the measurement site at the same horizontal plane as the animal's heart.
- Have the owner present unless they are stressing the cat!
- Take a bit of time to acclimatise – white coat syndrome is real! Usually 5-10 minutes, I usually collect the history in this time (talking quietly) with the cat in the base of the carrier, with a feliway towel draped over.
- Try to schedule cat-only times or non-busy times
- Use minimal feline-friendly handling wherever possible.
- Avoid measuring BP when the cat is moving
- Keep the environment as quiet as possible
- Delay physical examination until blood pressure is taken. Don't stick a thermometer up the cat and then expect the BP to be normal, it will not.

CAT FRIENDLY HANDLING

[Cat Friendly Veterinary Professional \(CFVP\) | American Association of Feline Practitioners \(pathlms.com\)](http://pathlms.com)

[ISFM Certificate in Feline Nursing \(icatcare.org\)](http://icatcare.org)

THE CUFF

Positioning the cuff: so regardless of which type of machine you use, you will need to place a cuff on the cat.

- If the cuff has been placed too proximally (high up) on the limb, it may slide down and loosen.
- A good rule of thumb is to take the circumference of the little leg or tail, and you want the cuff to be 40% of that length. Most cats will be a size 2.5 to 3 cuffs.
- The optimal site for measurement of BP varies with the experience of the operator, the tolerance of the patient and the type of device.
- Fully deflate the cuff before taking another reading
- Remember, it doesn't really matter what you do, just compare it to the same location and device in that animal – we are looking for TRENDS in medicine.
- Discard the first few readings and take the average of about 5-10 thereafter that are about the same.
- Document it on a formal sheet – see ISFM! So, who took it, which limb was used, cuff size, position of cat, who was there and what room, how relaxed kitty was etc.

There are two non-invasive ways to measure BP for the awake cat and dog in a clinical setting.

OSCILLOMETRIC

Records the motion (oscillations) of the artery under a pressurised cuff to measure BP.

Some examples are e.g., PetMap brand

- Oscillometric: need to be still! Often, we use handheld machinery, so we don't attach it to a tablet, but it's a similar thing, put the cuff on, if you're using the tail, it's the coccygeal artery.
- Then turn it on, either it automatically inflates and deflates for you, or you have to manually do so by pressing a button to start, depending on the model you have. And it will give you a reading.

Disadvantages:

- Tend to underestimate
- Devices vary considerably in their reliability and accuracy
- Can't use if shivering or moving
- They are more sensitive to patient movement, so you get more false readings. It provides diastolic and mean BP as well as systolic, but you really only need systolic BP as diastolic hypertension has not been described in animals. MAP is more useful in hypotensive or anaesthetised animals.

Advantages:

- Super easy to use "hands free!"
- Provides systolic, mean and diastolic readings
- If the HR matches what you get manually, more likely the BP is accurate
- Automatic readings These are automated, so the cuff inflates and deflates itself.
- Minimal noise
- Good for very compliant still patients or during sedated procedures.

DOPPLER

Doppler ultrasound unit converts ultrasound waves reflected by the **pulsation** of blood into a **sound**.

In the cat has been shown to be more accurate than oscillometric measurements.

So, like the oscillometric, you place the cuff just like we discussed, however, with the doppler we have to manually inflate and deflate the cuff.

- [ISFM hypertension resources - English - YouTube – watch the video](#)
- hair between carpal and metacarpal pad is dampened with an alcohol swab if awake
- Put some ultrasound gel to this spot and massage it in for best contact and put some on the head of the probe
- Place the ultrasound coupling gel on the contact surface of the Doppler crystal which is then placed distal to the cuff over the artery.
- Place the probe on the common digital artery and you will hear a whoosh whoosh, move it about until you find it, you have to use a bit of pressure
- When you inflate a cuff so it is beyond the systolic arterial blood pressure i.e., you can't hear the sound anymore you gradually release air from the cuff until you can hear the whooshing again. This is the closest to MAP for the cat.
- Hold it there whooshing away then with your other hand inflate the cuff, usually to 200 so you don't hear the blood flow then press to release air opens the valve at the back of the sphygmomanometer
- When you hear the blood flow again is the systolic blood pressure

Advantages:

- Fast to do when you get practice
- Accurate

Disadvantages:

- If the cuff is too large it underestimates the BP, if it is too small it overestimates BP
- Manual
- Occasionally you may need to clip the fur
- Not accurate for diastolic measurements
- Difficult if you have a weak signal – usually due to not enough gel, hair or the crystal not being in the right place over the artery

Headphones attached to the Doppler unit are useful to block out the noise stressing the cat.

Repeat this 5-10 times until you get a consistent value.

You need to set your normal for your practice, same machine, cuff size and procedure. Note this on the cat's file. Look for evidence of TOD eyes etc

TROUBLESHOOTING

Consequences of Common Errors and Artifacts	
Error or Artifact	Consequence
Cuff too wide	Falsely low reading
Cuff too small or narrow	Falsely high reading
Cuff too loose	Falsely elevated reading
Cuff over a joint	Less likely to compress artery
Hole in cuff	Pressure leaks too fast to reliably record
Cardiac arrhythmias	Erratic readings
Heavy respiration	Can be mistaken for flow with Doppler
Motion	Interferes with obtaining a Doppler signal and oscillometer devices

THE READING IS HIGH, NOW WHAT?

What is normal?

BP in cats generally ranges from 120-140 mmHg systolic

Dogs 133Hg is average for systolic.

Usually in a clinic setting we are looking > 180mmHg; > 160mmHg is high, but we need to look for other related factors.

Category	SBP (mmHg)	Risk of future TOD
Normotensive	<140	Minimal
Pre-hypertensive	140 to 159	Mild
Hypertension	160 to 179	Moderate
Severe hypertension	≥180	Severe

TABLE 1 ACVIM classification for severity of SH and risk of future TOD

Ensure it is repeatable and you have addressed any issues we just discussed with cuff size.

Look at the previous information, is there an upward trend?

What is the patient's anxiety level like? White coat hypertension – is the HR high also? Was there a dog in the waiting room? Let them settle and try again.

You can also try measuring with another limb if it is high on all your readings it's not likely to be an error.

It is recommended that elevated BP be confirmed on two separate occasions, unless it is > 200mmHg at which point treatment needs to be started!

TREATMENT

Amlodipine:

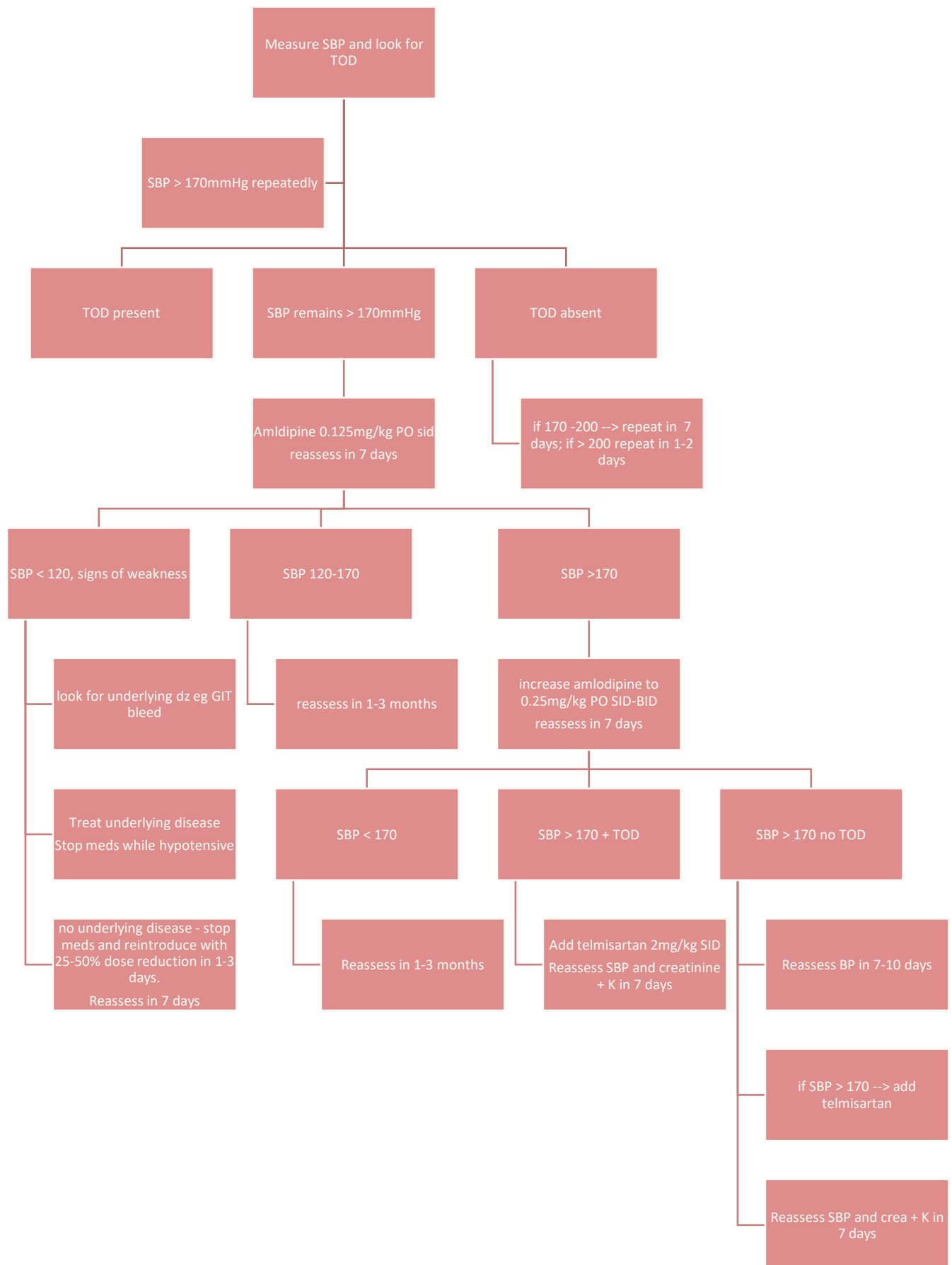
- The older drug we have for this condition – the human form of it is called Norvasc and you cut these teeny tablets into eights (or you give that job to someone you wish great pain on)
- Ceva have more recently made a formulation for cats called Amodip – also a tablet, but you either give a half or a whole
- Reduces SBP by 30-55mmHg
- Affects cat within 4 hours – can crush tablets

Telmisartan (Semintra):

- The first angiotensin receptor blocker registered for veterinary use
- Can be used to reduce proteinuria in cats with CKD – drug of choice for proteinuric cats
- Once daily liquid formulation with a weight calibrated syringe
- Give with or without food
- Typically reduces BP by 20mmHg
- Can be used in combination with amlodipine at a lower dose
- Check again in 3-5 days of starting in severe CKD cats, or up to 2 weeks in early cases
- Takes longer to work than amlodipine and a longer timescale so dose decrease down the line – check in 2-6 months for dose reduction. A study by Glaus et al in JVIM showed in 285 cats, around 22% required a dose reduction eventually
- Older 4mg/ml dose, and now we have the more concentrated 10mg/ml dose

TOOLKIT

- AAFP/ISFM have a great hypertension tool kit: [Hypertension \(High Blood Pressure\) | International Cat Care \(icatcare.org\)](#)
- [ISFM-BP-recommendations.pdf \(icatcare.org\)](#)
- Videos: [\(183\) ISFM hypertension resources - English - YouTube](#)



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6. Cerna, P et al, Comparison of Doppler Ultrasonic and Oscillometric Devices (with or without proprietary optimisations) for Non-Invasive Blood Pressure Measurement in Conscious Cats. JFMS 2020.
7. American Association of Feline Practitioners 2020 Virtual Conference • October 3 & 4 and 24 & 25, 2020
8. CKD: Prediction of Future Diagnosis, Early Diagnosis, Staging, & Management Strategies Dennis Chew, DVM, DACVIM
9. The Pressure is On: Investigating Feline Hypertension – Rachel Korman

Blood Pressure Measurement Record

Date/Time:	Age:	Sex:	Clinician:
Patient:		Med Rec #:	BP Performed by:
Current Medications:			Time Since Last Dose:

Equipment:			Cuff Size:						
Doppler	Oscillometric	Other:	#1	#2	#3	#4	#5	#6	#7
Direct	High-Def Oscillometric								

Site of Measurement:		Patient Position:	
Rt. Forelimb	Lt. Forelimb	Right Lateral	Left Lateral
Rt. Hindlimb	Lt. Hindlimb	Sternal	Sitting
Tail		Standing (tail cuff only)	

Stress Level of Patient:				
Relaxed	Tense	Nervous	Panting/Vocalizing	Agitated
Heart Rate:				

Measurements (mmHg):			
	Systolic	Diastolic	Mean
1.			
2.			
3.			
4.			
5.			
6.			
7.			
Avg:			


Notes:

[illegible]


Blood pressure evaluation form

Date:	Cat's name:	Owner:	Clinician:
Age:	Sex:	Breed:	Time:


Position of the cat:




☐ Sitting



☐ Standing



☐ Sternal



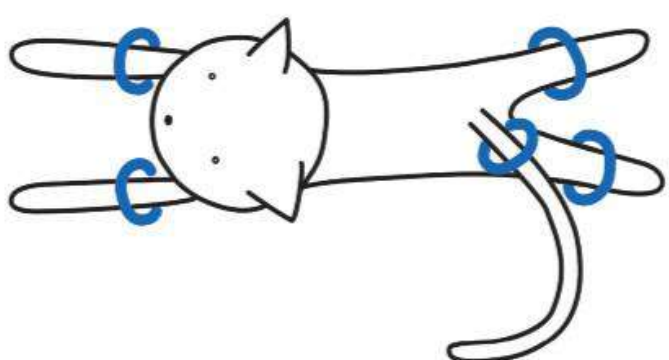
☐ Lateral

☐ Other (specify):

Site of the cuff:

☐ Right forelimb

☐ Left forelimb



☐ Right hindlimb

☐ Tail

☐ Left hindlimb

Equipment used:	Size of cuff:
Location (room):	Others present:
Performed by:	

Subjective assessment of stress:

☐ Relaxed

☐ Slightly tense

☐ Nervous

☐ Very nervous

☐ Agitated

Record of all SBPs measured (mmHg):

1.	2.	3.	4.	5.
6.	7.	8.	9.	10.

Mean Systolic Blood Pressure (mmHg):
Mean of stable values above (ignore outliers)