Royal Government of Bhutan
Department of Livestock
National Veterinary Hospital

Blood Pressure Measurement in Dogs and Cats

Why is Blood Pressure measurement so Important?

- Blood Pressure (BP) measurement should become integral part of veterinary medical care
- BP must be maintained to perfuse tissue thereby ensuring:
  - ❖Nutrient supply to organs and tissues
  - ❖Exchange and excretion of metabolic waste products
  - ❖Tissue oxygenation
  - ❖Maintaining GFR in kidney

BP = CO (cardiac output) x TPR (total peripheral resistance)

CO = HR (heart rate) x SV (stroke volume)

- **Why?**
  - ❖Early diagnosis of diseases
  - ❖Pain management
  - ❖Monitoring of ICU patients and during anesthesia
  - ❖Use of certain Medications

- **BP Measurements**
  - ❖Systolic Arterial Pressure (SAP)
  - ❖Diastolic AP (DAP)
  - ❖Mean AP (MAP)

What BP is normal for Dogs?

- Breed specific

Breed	SAP	DAP	Pusle
Labrador R	118±17	66±13	99±19
Golden R	122±14	70±11	95±15
GSD	132±13	75±10	108±23
Terrier	136±16	76±12	104±16
Pom	136±12	76±13	131±13

- Average BP=133/75 & MAP=85-120mmHg

What BP is normal for Cats?

- Not breed specific
- BP=124/84 & MAP=90-130 mmHg

What BP variations can occur?

1. Physiological – age, exercise

- *Take the average of 3-5 serial BP readings*

2. Stress-related

i. White-coat effect

- *Take measurement after patient had some time (=5mins) to become acclimatized but before clinical exam*

ii. Distracting noises/stressful environment

Indications for BP measurement

1. Routine screening
2. Screening in emergency medicine
3. Intensive-care monitoring
4. Treatment planning and assessment
5. Anesthesia monitoring

How important is Screening?

- Routine screening will help to detect hemodynamic changes in the early stages of the disease
  - ❖*Eg: GSD BP=130/75 to 145/90*
- How can we integrate it into our everyday practice?
  - ❖General health check
  - ❖Vaccination exam
  - ❖Clinical exam

How can BP measurement help to establish a Diagnosis?

- Elevated BP in an otherwise healthy patient may indicate an underlying pathological cause.
- This justifies additional investigations into diseases known to elevate BP.

Case discussion I

A 12-year-old cat Kalay is presented with an elevated blood pressure and inappetence. The owner states that cat spends a lot of time on its litter box. What is your tentative diagnosis? What further tests are required to confirm?

Case discussion II
9-year-old dog Domchu with sudden blindness

- The blood pressure of emergency patients (Eg: shock) should always be monitored
- BP measurement help monitor the course of therapy and disease
  - ❖BP status should be determined before administering any agents with hemodynamic effects- ACE inhibitors, diuretics, corticosteroids etc and also dose of the current medication is adjusted.

Techniques of BP Measurement

1. Direct (Invasive)

- Inserting a catheter equipped with an electronic pressure sensor

2. Indirect (Non-invasive)

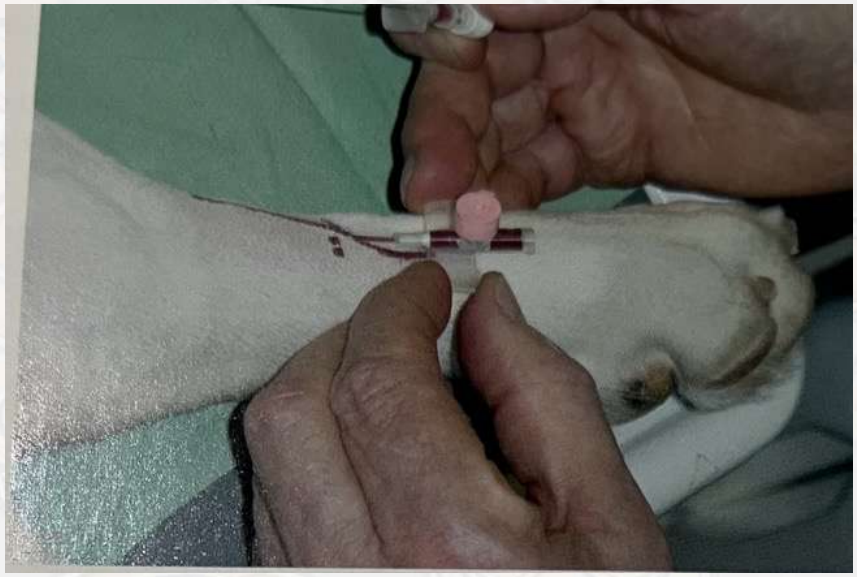
- Using external devices

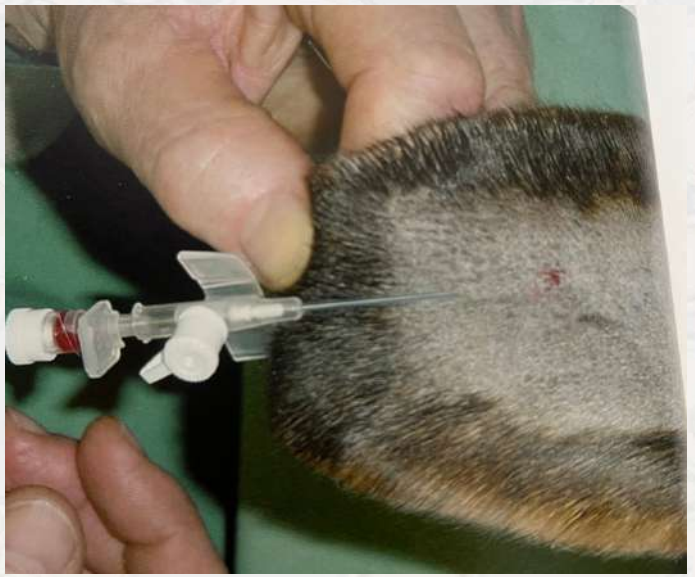
i. Doppler ultrasound
ii. Oscillometry
iii. High definition Oscillometry (HDO)

Allow the animal to get acquainted with the examiner and equipment
Position- lateral recumbency (preferred) or standing (legs cannot be used)

Invasive Techniques

- Site: Metatarsal artery/Central ear artery





Non-invasive technique

1. Doppler ultrasound

- Two devices – a sphygmomanometer and ultrasound transducer

Procedure

1. Prepare the Animal:

Choose a peripheral artery, such as the **dorsal pedal artery or common digital artery in the limb**, or the **coccygeal artery in the tai**l. The hair is typically clipped or parted and wet with alcohol to improve conductivity.

2. Apply the Probe:

Apply ultrasound gel to the probe and place the Doppler probe directly over the artery. The goal is to detect a clear, pulsatile "whooshing" sound, indicating blood flow.

3. Inflate the Cuff:

Place a blood pressure cuff on the limb, proximal (above) the Doppler probe. Inflate the cuff until the Doppler signal is no longer audible, meaning the artery is occluded.

4. Detect Systolic Pressure:

Slowly deflate the cuff while monitoring the sphygmomanometer. The point at which the audible pulse sound returns is the systolic blood pressure.

5. Record Readings:

Obtain several consecutive measurements, average the middle three, and record this as the systolic pressure.

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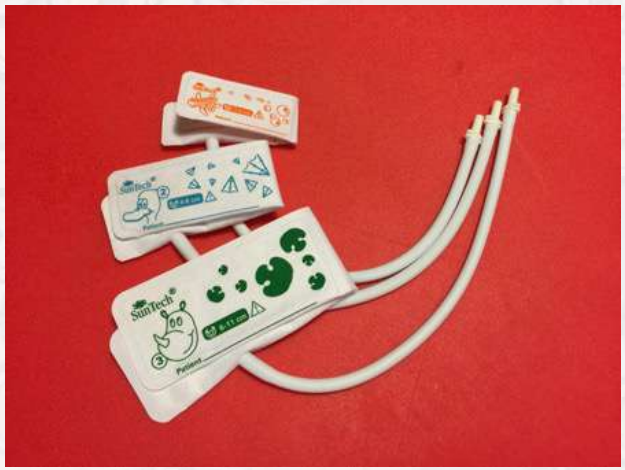
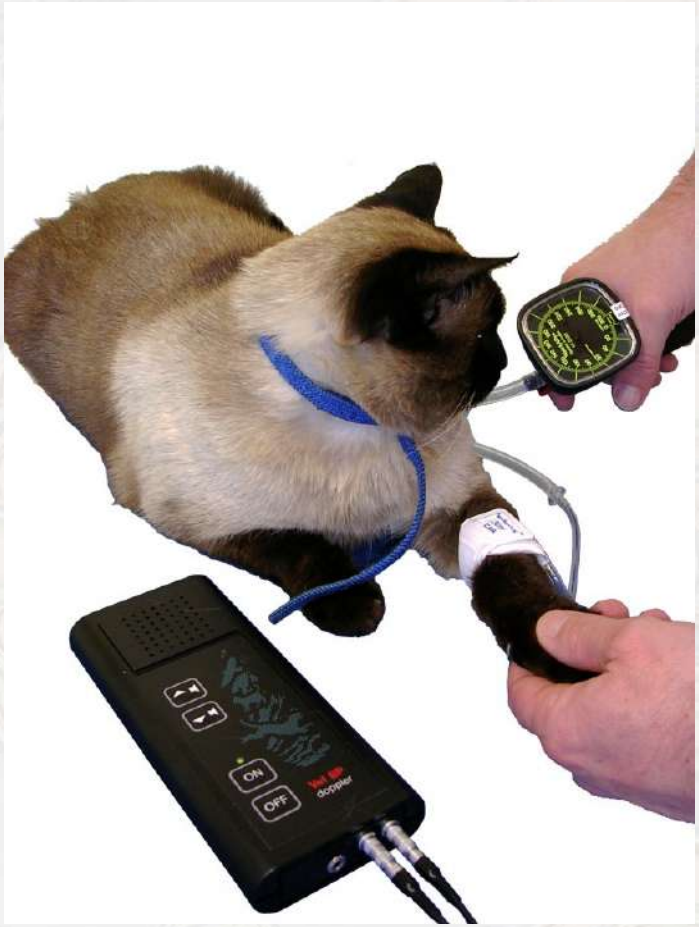


The circumference of the limb or the tail at the site where the cuff is to be placed should be measured. The ideal width of the inflatable cuff used should be 30-40% of the measured circumference.



2. High Definition Oscillometry (HDO)

- Newest generation
- HDO directly analyzes the detailed waveforms of pulse-related oscillations in the artery wall
- The system uses these visualized waveforms to directly calculate systolic (SAP), diastolic (DAP), and mean arterial pressures (MAP).
- Cuff positions: Radial artery, Saphenous artery, medial caudal artery, coccygeal artery

Procedure

1. Start the unit.
2. Select the cuff (c1=cat cuff, d1=small dog cuff, d2=large dog cuff) with the arrow buttons and confirm with ‘Enter’
3. Apply the cuff tightly, but loose enough to allow the small finger to just fit under the cuff
4. Press ‘Start’
5. The cuff is automatically inflated and deflated
6. The blood pressure (SBP, MAP and DBP) will subsequently be shown on the display along with the heart rate. This will also be shown on the PC along with a visual trace.

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Interpretation of Results

Hypertension or Hypotension

Values should be compared to species-specific normal values or to earlier blood pressure measurements in same patient to determine whether hypertension or hypotension

Decision to Treat Hypertension

- Based on multiple BP measurements as well as a thorough search for end-organ damage.
- Conditions that may cause secondary hypertension should be considered before establishing a diagnosis.
- Categorization of BP based on risk of developing subsequent end-organ damage:

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Particulars	Minimal risk of End-organ damage (EOD)	Mild risk of EOD	Moderate risk	Severe Risk
BP (mmHg)	<150/95	150/95 to 159/99	160/100 to 179/119	>180/120
Antihypertensive therapy	Not recommended	Recommended if end-organ injury is present.	Recommended if end-organ injury or a concurrent disease known to cause secondary hypertension is present.	Highly recommended.

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Hypertension

- Persistent elevation of BP above that which is normal for an individual.
- Damage a variety of organs – eye, heart, kidney and CNS
- Classification

i. Systolic
ii. Diastolic
iii. Mixed

- Mild and sometimes moderate elevated BP (150/95& :160/100) – treat the underlying disease while continue monitoring BP
- Treatment of severe hypertension (180/120) is mandatory to prevent end organ damage.

Secondary hypertension is the most common in dogs and cats - due to underlying primary disease

Diseases associated with Hypertension

i. Renal disease (chronic renal failure, glomerulonephritis)
ii. Hyperadrenocorticism
iii. Hyperthyroidism
iv. Diabetes mellitus
v. Heart failure
vi. Obesity

Clinical signs

- Sudden blindness, glaucoma, retinal changes
- Depression, seizures, vocalizing
- Epistaxis, sudden onset of heart murmurs
- PU/PD

Treatment

1. Enalapril @0.25-0.5mg/kg PO sid or bid
2. Amlodipine
   - Dogs: 0.05-0.25mg/kg PO sid
   - Cats: 0.1-0.5mg/kg PO sid

Hypotension

- Pathological reduction of BP

Types	Awake	Inhalation anesthesia
Mild	<100/60	<90/60
Moderate	<90/50	<80/50
Severe	<70/50	<60/40

Clinical signs

- CRT>2 secs, cold extremities, pale mm, weak pulse, decreased or absent urine output

Treatment

1. Fluid therapy
2. Dopamine: 0.03-0.005mg/kg/min
3. Adrenaline: 0.0005-0.001mg/kg/min (maximum total dose 0.1mg/kg)

Case discussion III

A 5-year-old Labrador Retriever Dawamo, is presented for spaying. She appears clinically normal with a good appetite and normal activity. When you measure her BP, it shows 160/100. How should this finding influence your decision to proceed with surgery?

Case discussion IV

Dawamo is now presented for GDV. How would you manage?

Summary

- BP monitoring is essential for dogs and cats
- Choose correct method and cuff size
- Minimize stress
- Interpret values in clinical context
- Early detection and management improves outcomes

THANK YOU