



Telemedicine Protocol

INDEX

Telemedicine Protocol

1. Difficult exploration:

(young animals that are excited, nervous or fearful) when our presence can interfere with the real value of their constants, and aggressive patients.

2. Patients who become stressed in hospital but still need monitoring:

(patients who experience a high degree of stress being in hospital or pet-mates who cannot bear the cost of hospitalisation).

3. Pain control:

Patients with chronic pain or post-operative pain, we can follow-up from their home.

4. Behavior:

Animals that suffer behavioral alterations.

5. Diagnosis and monitoring diseases:

Monitoring the patient in their comfort zone can help us in the diagnosis of hidden or subclinical diseases. Being able to carry out an exhaustive monitoring of the progress of the disease and regulate the applied therapy.



When can we use Dinbeat UNO?

1. Difficult queries:

Routine examinations of unexplorable or hardly explorable animals.

Patients in whom our contact will influence the result of the examination.

- Young, nervous or fearful animals.
- Aggressive animals (whose exploration requires sedation).

Use of Dinbeat UNO in consultation, walk and even at home so we obtain objective data in real time without having to be present.

2. Patients who become stressed in hospital but still need monitoring:

- Control of pathologies from home
- Post-surgical control

Patients who suffer a high degree of stress when being in hospital or pet-mates who cannot bear the cost of hospitalisation.

3. Pain control:

Pain negatively affects our patient's life quality and directly influences in physiological functions such as cellular metabolism and immunity. For this reason, pain relief should be a clinical priority.

For the classification of pain there are visual scales of the patient's behavior. This categorization can be complemented with monitoring with Dinbeat UNO to detect changes in the physiological parameters that indicate pain (Table 1) and to adjust better the analgesic therapy.



When can we use Dinbeat UNO?

Pain classification in function of	
Time	Acute Chronic Intermittent
Intensity	Mild Moderate Severe
Anatomical region	Somatic Visceral Neuropathic

Table 1: Classification of pain according to Fan, 2014.

Physiological consequences of pain with Dinbeat UNO:
Tachycardia
Tachypnea
Hyperthermia
Continuous postural changes
Vocalisations

Table 2: Example of how pain can affect our physiological parameters.

When can we use Dinbeat UNO?

Example of situations that cause pain in our patients
Trauma
Surgery
Osteoarthritis
Tooth disease
Pancreatitis
Cancer
Degenerative joint disease
Polyarthritis immune-mediated
Congestive heart failure (breathing difficulty)
Disease pulmonary (respiratory distress)

Table 3: Procedures that can cause pain.

Analgesic drug recommendations		
Drugs	Dosage and route of administration	Dosage and route of administration
Animal	Cats	Dogs
Opioids		
Morphine	0.2-0.5 mg/kg PO every 6-8 hours	0.2-0.5 mg/kg PO every 6-8 hours
Buprenorphine	0.02 mg/kg SL, SL every 6-8h	----
Butorphanol	0.2–0.5 mg/kg po every 8 hours	0.2–1 mg/kg PO every 6 hours
Codeine	----	1–2 mg/kg PO every 8–24 hours
Tramadol	1-2 mg/kg PO every 12-24h	4-5mg/kg every 8h
Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)		
Meloxicam	0.1 mg/kg PO every 24 h day 1; then 0.05 mg/kg, PO, every 24h	0.1 mg/kg PO every 24 hours
Robenacoxib	1 mg/kg, PO, every 24h for 6 days	1 – 2 mg/kg, PO, every 24h
Ketoprofen	1 mg/kg PO every 24 h (max 5 days)	1 mg/kg PO every 24 hours
Piroxicam	0.3 mg/kg PO every 24 hours	0.3 mg/kg PO every 48 hours
Anticonvulsant		
Gabapentin	2-10 mg/kg PO every 24 hours	2-10 mg/kg PO every 24 hours

Table 4: Dose recommendations for the most common oral analgesic drugs in dogs and cats according to (Fan, 2014).

When can we use Dinbeat UNO?

4. Behavior:

Stress is the response to activation of the hypothalamic-sympathetic-adrenomedullary system axis and the hypothalamic-pituitary-adrenocortical axis . The release of glucocorticoids and catecholamines in response will cause an increase in HR and temperature changes monitorable with Dinbeat UNO.

Monitoring these parameters can help us detect when our patient may feel stressed and identify the situations that cause it.

For example, in cats, idiopathic cystitis can be caused by stress, but detecting the factor that causes it is not always easy. With the use of Dinbeat UNO we can detect fluctuations in the parameters by establishing ranges of HR and temperature, in that way the owner can write down in what situations it happens (introduction of a new cat, at feeding time, loud noises...).

Heart rate fluctuation	
Sympathetic stimulation	HR increase
Parasympathetic stimulation	HR decrease

Table 5: Heart rate variability as a function of SN stimulation.

When can we use Dinbeat UNO?

5. 1. Disease diagnosis and monitoring:

A complete collection of information can help us in the accurate diagnosis of hidden/subclinical diseases. For example, those that only manifest clinical signs at specific times or in patients who show a normal physical examination in the hospital and/or the anamnesis is scarce.

Dinbeat UNO can help us guide our diagnosis through the collection of data on heart diseases, respiratory diseases, neurological diseases, metabolic diseases, diseases of the musculoskeletal system...

An increased respiratory rate may be a clinical sign of subclinical pathology, for example heart disease.

Stress can also increase HR. Therefore, if we monitor this parameter in the query, it is possible that we have acquired a false elevation.

One way to objectively monitor BR is to obtain the mean BR while the animal sleeps. The BR, both sleeping and during the day, in cats shows high variability, however, according to the ACVIM 2020 consensus, it should not exceed 30 bpm.

If this tachypnea is detected, the underlying cause should be investigated.

(Table 6).

Alterations that can cause tachypnea	
Heart disease	Pneumonia
Asthma	Heatstroke
Acidosis	Anemia

Table 6. Example of diseases that cause an increase in the respiratory rate.



When can we use Dinbeat UNO?

The ECG recording made in 2 minutes only comprises 0.14% of the daily heart rate at 100 beats per minute. If we register for 24 hours we get 100%.

Another example of the use of Dinbeat UNO, especially Holter monitoring (Table 7), is going to be in those patients in whom:

1.We can listen a heart murmur.

2.Have had any isolated episode or history of:

- Respiratory distress.
- Cough.
- Syncope.
- Exercise intolerance.
- Limb paresis (in cats).
- Breeds predisposed to heart disease it is recommended to use Dinbeat UNO for physical examination to obtain an ECG record.

3.Patients with diseases related to detectable complications, such as arrhythmias (hypoadrenocorticism, hyperthyroidism, kidney failure...):

As arrhythmias (hypoadrenocorticism, hyperthyroidism, kidney failure...).

4.In patients with seizures:

Correct use of the harness can help us detect a possible attack due to an increase in HR as well as monitor their constants.

5.In patients who limp or have discomfort when they perform a specific movement that we cannot detect in the consultation:

In these cases, the use of the harness with the collaboration of the pet-mate is recommended , if it is noted at what time the "episode" or lameness occurs, then we can check its correspondence with the physiological parameters. In the same way, we can use it inversely, detecting a change in the parameters and observing in what situation happens.



Holter monitoring
Indications:
1. Detection of intermittent arrhythmias. Arrhythmias are early markers for heart disease in the hidden phase that have not been diagnosed.
2. Correlation of clinical signs with arrhythmias.
3. Prevention of sudden death due to previously undetected arrhythmias.
4. Support in antiarrhythmic treatments
5. Detect hidden cardiomyopathies. The early detection of heart diseases is very important to establish an adequate therapy and is very useful for breeding programs.
Keep in mind to interpret the results:
1. There are differences in daily and nocturnal HR. During the night, it is normal to find prolonged bradycardia or sinus blockage, however, it would be relevant if they were found during daily activity.
2. Arrhythmias accompanied by clinical signs (weakness, lethargy, or syncope, indicative of sinus node or atrioventricular disease) or arrhythmias without clinical signs (such as ventricular arrhythmias) may be detected.
3. In times of excitement, the HR can reach 250-290 pm.
4. It is important to note situations that may interfere with the results.

Table 7: Indications and recommendations for the use of Holter monitoring.

Example of situations we can use Dinbeat UNO for diagnosis and monitor diseases

Disease	Diagnosis	Follow up
Heart disease	HR, BR, ECG, T: an alteration in these parameters can help us suspect subclinical heart disease.	HR, RF, ECG: control of arrhythmias and treatment.
Respiratory disease	BR: assess whether the patient has real tachypnea during the sleep period. T: possible oscillations and increases in temperature can indicate an infection.	In the control of airway treatments, for example, asthma, the monitoring of these parameters at rest will indicate if the therapy is being effective.
Systemic disease	T: temperature changes. HR: tachycardia.	Evaluate if the parameters improve.
Nervous system disease	Tachycardia and tachypnea in a patient with a history of seizures can help us detect a new episode.	In epileptic patients who cannot be controlled for 24 hours, we will be able to detect a possible attack by means of alarms and better adjust the medication.
Musculoskeletal disease	In intermittent lameness, hard to diagnosticate, an increase in HR and BR will indicate pain.	In doubtful cases of the effectiveness of our treatment, we will be able to assess objectively and from home if there is pain.

Table 8: summary of examples when we can use Dinbeat UNO.

References

Acierno, M. J., Brown, S., Coleman, A. E., Jepson, R. E., Papich, M., Stepien, R. L., & Syme, H. M. (2018). ACVIM consensus statement: Guidelines for the identification, evaluation, and management of systemic hypertension in dogs and cats. *Journal of Veterinary Internal Medicine*, 32(6), 1803–1822. <https://doi.org/10.1111/jvim.15331>

Bálint, A., Eleőd, H., Körmendi, J., Bódizs, R., Reicher, V., & Gácsi, M. (2019). Potential Physiological Parameters to Indicate Inner States in Dogs: The Analysis of ECG, and Respiratory Signal During Different Sleep Phases. *Frontiers in Behavioral Neuroscience*, 13. <https://doi.org/10.3389/fnbeh.2019.00207>

Beckman, B. (2013). Anesthesia and Pain Management for Small Animals. In *Veterinary Clinics of North America - Small Animal Practice* (Vol. 43, Issue 3, pp. 669–688). <https://doi.org/10.1016/j.cvsm.2013.02.006>

Blades Golubovic, S., & Rossmesl Jr, J. H. (2017). Status epilepticus in dogs and cats, part 1: etiopathogenesis, epidemiology, and diagnosis. *Journal of Veterinary Emergency and Critical Care*, 27(3), 278–287.

Blades Golubovic, S., & Rossmesl, J. H. (2017). Status epilepticus in dogs and cats, part 2: treatment, monitoring, and prognosis. *Journal of Veterinary Emergency and Critical Care*, 27(3), 288–300. <https://doi.org/10.1111/vec.12604>

Brambilla, P. G., Polli, M., Pradelli, D., Papa, M., Rizzi, R., Bagardi, M., & Bussadori, C. (2020). Epidemiological study of congenital heart diseases in dogs: Prevalence, popularity, and volatility throughout twenty years of clinical practice. *PLoS ONE*, 15(7 July). <https://doi.org/10.1371/journal.pone.0230160>

Bruno, E. A., Guthrie, J. W., Ellwood, S. A., Mellanby, R. J., & Clements, D. N. (2015). Global positioning System derived performance measures are responsive indicators of physical activity, disease, and the success of clinical treatments in domestic dogs. *PLoS ONE*, 10(2). <https://doi.org/10.1371/journal.pone.0117094>

Camps, T., Amat, M., & Manteca, X. (2019). A review of medical conditions and behavioral problems in dogs and cats. In *Animals* (Vol. 9, Issue 12). MDPI AG. <https://doi.org/10.3390/ani9121133>

Chalifoux, N. v., Drobatz, K. J., & Reineke, E. L. (2021). Predictors of inflammatory lower airway disease in cats presented to the emergency room in respiratory distress: a case-control study. *Journal of Feline Medicine and Surgery*, 23(12), 1098–1108. <https://doi.org/10.1177/1098612X21996145>

Dijkstra, E., Teske, E., & Szatmári, V. (2018). Respiratory rate of clinically healthy cats measured in veterinary consultation rooms. *Veterinary Journal*, 234, 96–101. <https://doi.org/10.1016/j.tvjl.2018.02.014>

Downing s, R. (2011). Pain management for veterinary palliative care and hospice patients. In *Veterinary Clinics of North America - Small Animal Practice* (Vol. 41, Issue 3, pp. 531–550). <https://doi.org/10.1016/j.cvsm.2011.03.010>



References

Dyson, D. H. (2008). Perioperative Pain Management in Veterinary Patients. In *Veterinary Clinics of North America - Small Animal Practice* (Vol. 38, Issue 6, pp. 1309–1327). <https://doi.org/10.1016/j.cvsm.2008.06.006>

Fan, T. M. (2014). Pain management in veterinary patients with cancer. In *The Veterinary clinics of North America. Small animal practice* (Vol. 44, Issue 5, pp. 989–1001). <https://doi.org/10.1016/j.cvsm.2014.05.005>

Fuentes, L., Johnson, L. R., & Dennis, S. (2010). *BSAVA Manual of canine and feline cardiorespiratory medicine*. British Small Animal Veterinary Association.

Harper, T. A. M. (2017). Conservative Management of Hip Dysplasia. In *Veterinary Clinics of North America - Small Animal Practice* (Vol. 47, Issue 4, pp. 807–821). W.B. Saunders. <https://doi.org/10.1016/j.cvsm.2017.02.007>

Höglund, K., Hanås, S., Carnabuci, C., Ljungvall, I., Tidholm, A., & Häggström, J. (2012). Blood Pressure, Heart Rate, and Urinary Catecholamines in Healthy Dogs Subjected to Different Clinical Settings. *Journal of Veterinary Internal Medicine*, 26(6), 1300–1308. <https://doi.org/10.1111/j.1939-1676.2012.00999.x>

Ljungvall, I., Rishniw, M., Porciello, F., Häggström, J., & Ohad, D. (2014). Sleeping and resting respiratory rates in healthy adult cats and cats with subclinical heart disease. *Journal of Feline Medicine and Surgery*, 16(4), 281–290. <https://doi.org/10.1177/1098612X13508940>

Loewen, J. M., & Bach, J. F. (2022). Respiratory distress in small animals: Pathophysiology and clinical approach. *Journal of Veterinary Emergency and Critical Care*, 32, 3–15. <https://doi.org/10.1111/vec.13121>

Looney, A. (2010). Oncology Pain in Veterinary Patients. In *Topics in Companion Animal Medicine* (Vol. 25, Issue 1, pp. 32–44). <https://doi.org/10.1053/j.tcam.2009.10.008>

Mandese, W. W., Griffin, F. C., Reynolds, P. S., Blew, A. C., Deriberprey, A. S., & Estrada, A. H. (2021). Stress in client-owned dogs related to clinical exam location: a randomised crossover trial. *Journal of Small Animal Practice*, 62(2), 82–88. <https://doi.org/10.1111/jsap.13248>

Moore, S. A. (2016). Managing neuropathic pain in dogs. In *Frontiers in Veterinary Science* (Vol. 3, Issue FEB). *Frontiers Media S.A.* <https://doi.org/10.3389/fvets.2016.00012>

Petrie, J. P. (2005). Practical application of holter monitoring in dogs and cats. *Clinical Techniques in Small Animal Practice*, 20(3 SPEC. ISS.), 173–181. <https://doi.org/10.1053/j.ctsap.2005.05.006>



References

Porciello, F., Rishniw, M., Ljungvall, I., Ferasin, L., Haggstrom, J., & Ohad, D. G. (2016). Sleeping and resting respiratory rates in dogs and cats with medically-controlled left-sided congestive heart failure. *Veterinary Journal*, 207, 164–168. <https://doi.org/10.1016/j.tvjl.2015.08.017>

Rae, L., MacNab, N., Bidner, S., Davidson, C., & McDonagh, P. (2021). Attitudes and practices of veterinarians in Australia to acute pain management in cats. *Journal of Feline Medicine and Surgery*. <https://doi.org/10.1177/1098612X211043086>

Reinero, C., Visser, L. C., Kellihan, H. B., Masseau, I., Rozanski, E., Clercx, C., ... & Scansen, B. A. (2020). ACVIM consensus statement guidelines for the diagnosis, classification, treatment, and monitoring of pulmonary hypertension in dogs. *Journal of veterinary internal medicine*, 34(2), 549-573.

Rishniw, M., Ljungvall, I., Porciello, F., Häggström, J., & Ohad, D. G. (2012). Sleeping respiratory rates in apparently healthy adult dogs. *Research in Veterinary Science*, 93(2), 965–969. <https://doi.org/10.1016/j.rvsc.2011.12.014>

Sigrist, N. E., Adamik, K. N., Doherr, M. G., & Spreng, D. E. (2011). Evaluation of respiratory parameters at presentation as clinical indicators of the respiratory localization in dogs and cats with respiratory distress. *Journal of Veterinary Emergency and Critical Care*, 21(1), 13–23. <https://doi.org/10.1111/j.1476-4431.2010.00589.x>

Srithunyarat, T., Höglund, O. v., Hagman, R., Olsson, U., Stridsberg, M., Lagerstedt, A. S., & Pettersson, A. (2016). Catestatin, vasostatin, cortisol, temperature, heart rate, respiratory rate, scores of the short form of the Glasgow composite measure pain scale and visual analog scale for stress and pain behavior in dogs before and after ovariohysterectomy. *BMC Research Notes*, 9(1). <https://doi.org/10.1186/s13104-016-2193-1>

Steagall, P. v., Robertson, S., Simon, B., Warne, L. N., Shilo-Benjamini, Y., & Taylor, S. (2022). 2022 ISFM Consensus Guidelines on the Management of Acute Pain in Cats. *Journal of Feline Medicine and Surgery*, 24(1), 4–30. <https://doi.org/10.1177/1098612X211066268>

Talavera, J., Escobar, M., & Cascales, M. (2021). Valoración de la fiabilidad clínica de un sistema inalámbrico de monitorización multiparamétrica en perros.

Willis, R., Oliveira, P., & Mavropoulou, A. (Eds.). (2018). *Guide to Canine and Feline Electrocardiography*. John Wiley & Sons.

