



# Veterinary Telemedicine in Portugal: Potential Clients Perspective

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## **Abstract**

**Title:** Veterinary Telemedicine in Portugal: potential Clients Perspective

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In Portugal, veterinary telemedicine is only recently considered an acceptable practice and although there is some research on the opinion of Portuguese veterinary surgeons, the opinion of the potential clients is mostly unknown. This research aims to better understand if there is an interest in a veterinary telemedicine service in Portugal. An online survey was used to better understand the opinion of potential clients. Most of the participants agreed that they would be more interested in the service with their regular veterinarian versus a new veterinarian. It was also observed that the main benefits of telemedicine in the eye of the participants are less stress to the animal, advice if hospitalization is necessary and allowing access to veterinary care for hard-to-reach groups and that main drawbacks are risk of missed diagnoses, lack of physical exams and the need for hospitalization anyway. A narrow majority agreed that they would only use a veterinary telemedicine service for follow-up consults. The participants mostly agreed that they would be interested in using wearable devices and smartphone applications for veterinary care. Half price was how much most of the participants were willing to pay for a veterinary telemedicine consult compared with a regular hospital visit. If covered by a pet insurance, the participants, would be more inclined to use the service. When asked if they have more confidence in Human telemedicine compared with veterinary telemedicine, most of the participants disagreed. Overall, the results showed that there is an interest in veterinary telemedicine in Portugal.

**Keywords:** Telemedicine, Veterinary, Survey, interest, client opinion, Portugal

## **Resumo**

**Título:** Telemedicina veterinária em Portugal: Perspetiva de potenciais clientes

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Em Portugal, a telemedicina veterinária só recentemente é considerada uma prática aceitável e embora haja alguma investigação sobre a opinião de veterinários, a opinião de potenciais clientes é na maioritariamente desconhecida. Esta investigação visa compreender melhor se existe interesse num serviço de telemedicina veterinária em Portugal. Foi usado um questionário online para averiguar a opinião de potenciais clientes. A maioria dos participantes concordou que estariam mais interessados num serviço com seu veterinário habitual do que com um veterinário novo. Observou-se que os principais benefícios da telemedicina no ponto de vista dos participantes são, aconselhamento se é necessário o animal ser visto no hospital, menos stress para o animal e permitir o acesso a cuidados veterinários para grupos de difícil acesso. As principais desvantagens são, risco de diagnósticos errados, ausência de exames físicos e a necessidade de o animal ser hospitalizado após teleconsulta. Uma pequena maioria concordou que apenas usaria um serviço de telemedicina para consultas de seguimento. A maioria dos participantes concordou que estariam interessados em usar dispositivos wearable e aplicações de smartphone para cuidados veterinários. Metade do preço foi quanto a maioria dos participantes estavam dispostos a pagar por uma consulta de telemedicina em comparação com uma consulta tradicional. Se cobertos por um seguro para animais de estimação, os participantes estariam mais inclinados a usar o serviço. Quando questionados se confiavam mais na telemedicina humana em comparação com a telemedicina veterinária, a maioria dos participantes discordou. Em geral, os resultados mostraram que existe interesse pela telemedicina veterinária em Portugal.

**Palavras-chave:** Telemedicina, Veterinária, questionário, interesse, opinião de clientes, Portugal

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## **List of abbreviations**

RCVS: Royal College of Veterinary Surgeons

AVMA: American Veterinary Medical Association

UK: United Kingdom of Great Britain

US: United States of America

VCPR: Veterinarian-client-patient relationship

OMV: Portuguese Veterinary Order

M: Mean

SD: Standard deviation

IT: Information Technology

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# **1. Chapter I - Introduction**

## **1.1. Background trends**

Veterinary telemedicine is following along the same path as human telemedicine although it has challenges associated with the inability of patients to describe their ailment (Gyles, 2019). Frequent comparisons are made to pediatrics, especially to the care of infants and toddlers because neither they nor animals can reliably communicate their feelings or complaints. Both for non-communicative humans and animal patients, the ability to intervene early and leverage the continuum of care afforded by telehealth are benefits which we would encourage all healthcare fields to consider (Massin Teller & Moberly, 2020).

Telemedicine has been fostered in human medicine as a part of a future oriented digitalization for the past two decades, but veterinary telemedicine still lags behind. However, Covid-19 pandemic crisis has brought momentum into the veterinary profession's adoption of telemedicine (Massin Teller & Moberly, 2020).

In Portugal, veterinary telemedicine is only considered an acceptable practice by the profession regulator since September of 2021 and can only be used in certain situations (OMV, 2021).

## **1.2. Problem Statement and Research Questions**

Although there is some research on the opinion of Portuguese veterinary surgeons regarding veterinary telemedicine, the opinion of the potential clients is mostly unknown. This research aims to better understand if there is an interest in a veterinary telemedicine service in Portugal. The purpose is also to have more information regarding client's opinion on multiple topics related with telemedicine, such as, regular veterinary surgeon versus a new veterinary surgeon, main benefits and drawbacks, the use of wearables and smartphone applications and how much they would pay for this service.

It could also be used to further the conversation on the topic of veterinary telemedicine and maybe in the future bring a wider adoption.

This dissertation aims to answer the following research questions:

RQ1: Are the potential clients interested in a veterinary telemedicine service?

RQ2: Do potential clients accept telemedicine with a new veterinary surgeon, or do they prefer telemedicine with their regular veterinary surgeon?

RQ3: In the potential client's opinion, what are the main benefits and drawbacks of veterinary telemedicine?

RQ4: Is veterinary telemedicine only viable for follow-up consults?

RQ5: Are the potential clients interested in using wearable devices and smartphone applications in Veterinary care?

RQ6: How much are the potential clients willing to pay for a veterinary telemedicine service?

RQ7: Are the potential clients more interested in using veterinary telemedicine if it is covered by pet insurance?

RQ8: Are the potential clients more confident in Human telemedicine when compared with veterinary telemedicine?

### **1.3. Academic and Managerial Relevance**

In practice, this master dissertation provides preliminary evidence of the demand for a veterinary telemedicine service in Portugal.

Moreover, our conclusions will contribute with empirical evidence that allow the Veterinary medicine sector to adapt and evolve to a more digital future.

### **1.4. Dissertation outline**

Regarding the outline of the dissertation, the second chapter is focused on a literature review, which is divided into seven topics: Human telemedicine, veterinary telemedicine in Europe the US and Canada, veterinary telemedicine in Portugal, impact of the Covid-19 pandemic, main benefits and drawback of veterinary telemedicine, wearables and smartphone applications, and, finally, willingness to pay and financial benefits. The third chapter defines the research approach used, the data collection method, the online questionnaire, the sample, the measurement scales as well as the data analysis. Next, chapter four presents and discusses the obtained results and its analysis to answer the research questions stated previously. A discussion of the results with comparisons with the existing literature and hypothesis testing will also be presented. Lastly, the fifth chapter is about the conclusions of the research, as well as the limitations and the recommendations for future research.

## **2. Chapter II - Literature review**

### **2.1. Definition**

Telemedicine has had many definitions, this highlights the fact that it's a science that is constantly evolving and adapting to new technologies, the health care needs and contexts of societies (Ryu, 2012).

The World Health Organization has broadly described telemedicine as:

“The delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities” (WHO, 1998).

More specifically for veterinary medicine, the definition given by the Royal College of Veterinary Surgeons (RCVS) is as follows:

“The use of electronic communication and information technologies to provide clinical healthcare remotely – is one of these emerging areas of practice in the veterinary sector. Telemedicine extends to the provision of veterinary services by video-link, text, instant messaging or telephone, or by any other remote means” (RCVS, 2018).

Lastly, the American Veterinary Medical Association (AVMA) provides the following definition:

“Telehealth is the overarching term that encompasses all uses of technology geared to remotely deliver health information or education. Telemedicine is the use of medical information exchanged from one site to another via electronic communications regarding a patient's clinical health status.

Telemedicine is a tool that may be utilized to augment the practice of veterinary medicine. The AVMA is committed to ensuring access to the convenience and benefits afforded by telemedicine, while promoting the responsible provision of high quality veterinary medical care. Veterinary care, whether delivered through electronic or other means, should be provided with professionalism.” (AVMA, 2022)

### **2.2. Types of telehealth**

Telehealth can be divided in two main areas, teleconsulting and telemedicine (Massin Teller & Moberly, 2020).

Teleconsulting (veterinarian to veterinarian) refers to communication between providers such as between a veterinary specialist and primary care provider regarding a particular patient. It

can also refer to a process that is usually referred to as store-and-forward in which a diagnostic test such as an X-ray or echocardiogram is sent to a remote specialist for interpretation. This is usually asynchronous since the interpreter does not need to be available when the test is done (Waller & Stotler, 2018).

Telemedicine (veterinarian-to-client) refers to the use of video-link, text, instant messaging or telephone, or by any other remote means, for diagnosis and treatment of patients (Magalhães-Sant'Ana, Peleteiro, & Stilwell, 2020; Massin Teller & Moberly, 2020).

In this master dissertation we will mainly focus on telemedicine from veterinarians to clients.

### **2.3. Human telemedicine**

Telemedicine has been around for thousands of years, one of the earliest reported uses of telemedicine was the use of smoke signals to warn other neighboring settlements of a contagious illness outbreak (Hurst, 2016).

Technology has obviously come very far since the ancient times of smoke signals, one of the most famous examples of telemedicine happened in 1999 when J. Nielsen, a physician herself, noticed a lump in one of her breasts while she was posted on a research assignment in Antarctica. Poor weather conditions meant that the diagnosis and treatment of the breast cancer had to be done over satellite communication and the video equipment and chemotherapy dropped by United States Air Force Pilots (Hevesi, 2009).

Although the need to provide medical care to distant and underserved patients has always existed, only in the last few decades has the pace of adoption of telemedicine rapidly increased to meet this need. This is largely due to the improvements in the underlying enabling digital technology (Waller & Stotler, 2018). Biometric measuring devices for monitoring blood pressure, heart rate and blood glucose levels are increasingly used to manage and remotely monitor patients with acute and chronic illnesses. Some believe that telemedicine will have a profound impact in the way health services are delivered by transitioning health care away from hospitals and clinics into homes (Heinzelmann, Lugn, & Kvedar, 2005).

Telemedicine services, most of which focus on diagnosis and clinical management, are for the most part routinely offered in industrialised regions including, but not limited to North America, United Kingdom of Great Britain (UK), Australia and Scandinavia (Craig & Patterson, 2005; Wootton, 2000).

Whether an individual physician is in a practice that uses telemedicine to interact with patients depends greatly on his specialty. A 2019 study found that, in the United States of America (US), a little more than 15 percent of physicians worked in a practice that uses telemedicine and that radiologists, psychiatrists and cardiologists were among the specialties that used telemedicine the most and that immunologists, gastroenterologists and ob-gyns were the ones that used telemedicine the least (Robeznieks, 2019).

There are multiple ways in which differing specialties may incorporate telemedicine into their practice but research looking for proof of the benefits of telemedicine can be difficult to interpret. There is, however, a wealth of information regarding patients' satisfaction with this method of healthcare delivery and there is no doubting that patients and families appreciate this method of healthcare delivery (Waller & Stotler, 2018).

## **2.4. Veterinary telemedicine**

### **2.4.1. Veterinary telemedicine in Europe, US and Canada**

A stark contrast with human telemedicine is that legal and ethical constraints are still impeding its full implementation in veterinary medicine. In many European countries, telehealth and telemedicine fall outside of what is considered acceptable veterinary practice by the professional regulator (Magalhães-Sant'Ana et al., 2020).

One of the main arguments against regulatory approval is whether a veterinarian-client-patient relationship (VCPR) exists or not when only communicating via telemedicine (Gyles, 2019). But a recent study showed that an addition of telemedicine to the traditional VCPR may be beneficial and positively viewed by owners (Roca & McCarthy, 2019). Many also accept that virtual care is part of veterinary medicine, as such, they are ready to incorporate new technologies into their practice, and want regulatory bodies to keep pace (Nelson-Pratt, 2018). Contrary to many countries in Europe, in Canada and the US there are now several opportunities for clients to access telemedicine services for their pets. Ontario Veterinary TeleHealth Services started in 2016 and claims to be the first in this field in Canada. This company has established digital communication platforms that allow veterinarians to connect with pet owners to provide consultation on health issues. The business started as a simple one in which pet owners could call a number and reach Dr. Graham who would listen to the owner's description and offer advice (Gyles, 2019).



### **2.4.2. Veterinary telemedicine in Portugal**

In Portugal specifically, until very recently, telemedicine had fallen outside of what was considered an acceptable practice by the profession regulator, the Portuguese Veterinary Order (OMV). Even with strict regulations, in recent years, multiple companies have introduced innovative business models by offering remote veterinary advice to pet owners through online chat (e.g., petappoint.com), video calls (e.g., veton.pt), or telephone calls (e.g., Linha Saúde Animal 24), but success has so far been poor. These telehealth services provide animal owners with first line general health advice and, if needed, refer cases to local veterinary clinics and hospitals. Concerns about the legality of such services have reached the OMV Ethics Council and ignited debate about the acceptable limits of veterinary telemedicine (Magalhães-Sant'Ana et al., 2020).

In September of 2021 the OMV introduced a new deontological code and one of the changes was regarding telemedicine. The new rules now allow the practice of telemedicine in a situation of justified urgency; In cases that the animal, or group of animals, have already been examined in person by a veterinary surgeon from the clinical team about the same affliction; In cases of a specialist consultation where the distant evaluation of the animal, or group of animals, proves to be beneficial and finally, in the other cases foreseen in its own regulation (OMV, 2021).

By the new regulation, a veterinary surgeon that practices telemedicine must also make sure that the client understands the inherent limitations of the service and agrees to it; Make sure that its implementation guarantees a sufficiently high level of technical quality and that it works properly to ensure quality in the exchange of information; Have support and registration systems that ensure the traceability of information received and transmitted; Only use telemedicine after making sure that the system used and its users guarantee professional secrecy and lastly, try to observe the animal in person in the shortest possible time and within a period compatible with the urgency of the situation (OMV, 2021).

### **2.4.3. Impact of the Covid-19 pandemic**

The Covid-19 pandemic has accelerated the worldwide implementation of telemedicine, and veterinary medicine is no exception. The US, UK, French and Portuguese veterinary profession regulators have all loosen restrictions on telemedicine, allowing remote consultation and medication prescribing. Similar actions are known to have been taken by regulators at other European countries (Magalhães-Sant'Ana et al., 2020).

Not all veterinary businesses are suffering a downturn in demand or revenue during the Covid-19 pandemic. Quite the reverse for those offering the public access to telemedicine or remote first-line advice services, they appear to be positively thriving and competing for customers (Waters, 2020).

The pandemic crisis did not create a situation calling for a decision for or against telemedicine. Instead, the many facets of the already established veterinary telemedicine come to the foreground, and with them some serious failings. The profession's hesitation towards the acknowledgement of telemedicine now seems to take its toll. Turned into a more positive perspective, one could argue, that the momentum brought into the veterinary profession's policymaking by the pandemic will finally result in obvious and overdue next steps. Veterinary telemedicine is lagging human telemedicine, especially concerning the economic, technical-digital and legal conditions (Weich, 2021).

#### **2.4.4. Main benefits and drawback of veterinary telemedicine**

Veterinary telemedicine's main benefits can be made up of improved access to care, more affordable services, convenience and practicality, less distress for the animal, improved access to specialist care, enhanced veterinary-to-client bond, more efficient triage, reduced the workload on front office staff and lastly a better option than the client consulting the internet. Possible barriers and drawbacks comprise the increased risk of missed diagnoses and medical error, lack of physical exams, fraud, miscommunication that could be avoided in-person, lower standards of practice, how will the monetization of virtual care be done and finally the limitations of technology (Magalhães-Sant'Ana et al., 2020; Massin Teller & Moberly, 2020).

#### **2.4.5. Wearables and smartphone applications**

The growth of wearables, smartphone applications, and other technology makes it easier than ever to collect data about an animal's activity, mobility, food consumption, and other health data. Smartphone apps may also play a role in what information can be gathered and shared through a virtual visit (Massin Teller & Moberly, 2020).

There are already many examples of wearable devices that are in the experimental phase and others that are already in use. Like in humans, animals can now have a continuous blood glucose monitor thanks to a sensor that can be used to take multiple measurements for up to 14 days. After gathering the data from an at-home glucose curve, the client can schedule a virtual visit

with the veterinarian and adjustments in the treatment plan can be made as needed (Corradini et al., 2016; Malerba et al., 2020). Another example is the experimental use in dogs of a wireless body electrocardiogram to diagnose cardiac arrhythmias, this research experiment has showed great potential (Brložnik & Avbelj, 2015).

While the global veterinary wearable devices industry is still in the primary phase, many major companies are creating feature-rich pet wearables and application alternatives. i4C Innovations, FitBark, PetPace LLC, Whistle Labs Inc., Tractive, and Garmin International Inc. are among the leading players on the market. A 2018 market research report found that the global veterinary wearable devices market was valued at \$1,498.4 million in 2018 and is anticipated to grow at a compound annual growth rate of 13.6% over the forecast period from 2019 to 2025 (Johnson, 2018).

One of the major limitations to wearables is battery life, though it improves with each iteration (Massin Teller & Moberly, 2020).

#### **2.4.6. Willingness to pay and financial benefits**

One hurdle that veterinary telemedicine faces is resistance to charge for it. It's not easy to change the mindset of veterinarians and staff to start charging for something that typically has been offered for free. On the other hand, clients are appreciative of the service because they perceive value in virtual care and are willing to pay for it (Packer, 2020).

There are some financial benefits of telemedicine compared with in-person consults. Virtual visits tend to be quicker than in-person, the increased number of visits per hour offsets any potential decrease in revenue per transaction. For this reason, daily revenue per doctor may be better than average transaction per doctor. Owner compliance and willingness to pursue additional diagnostics are often higher when the visit is virtual, a fact that she attributes to the virtual visit allowing more time for education and discussion about why certain diagnostic tests are important. Finally, because virtual visits lower the barrier to receiving care for some new pets, they may help bring in new clients (Packer, 2020).

Telemedicine could potentially serve as a mechanism to allow veterinarians to capture a share of online pet spending and provide a way to bring a unique revenue stream into the clinic (Widmar et al., 2020).

In the UK, the company Jooi launched in 2019 a smartphone app-based telemedicine service that switched to a 24/7 operation to keep up with demand. Pet owners can get a video consultation

with a vet nurse for free or talk to a vet surgeon for £20, irrespective of the time of day (Waters, 2020).

A 2020 study in the US found that Dog owners were willing to pay \$38.04 for telemedicine from their veterinarian, Cat owners were willing to pay \$38.12 and that pet owners placed more value on telemedicine with their own veterinarian (Widmar et al., 2020). In a previous study, (Hawk, 2018) also found that, in a survey, the participants were willing to pay \$40 per use of the veterinary telemedicine technology.

Regarding how to charge for a virtual visit, there are three main options: per appointment, per unit of time or by a subscription. The most common practice is to charge per appointment but many younger clients seem to prefer subscription-based services, so that may be a pricing model to consider (Packer, 2020).

## **2.5. Literature review summary**

Human telemedicine has been developing for many decades and its adoption has gone mainstream. Veterinary telemedicine generally still lags behind and in Portugal in particular can still be considered in its infancy. The Covid-19 pandemic crisis brought momentum into the veterinary profession's policymaking regarding telemedicine acceptance. Many benefits and drawbacks of veterinary telemedicine have already been described in scientific literature as well as the financial benefits and some reports of the client's willingness to pay. While the global veterinary wearable devices industry is still in the primary phase, projections show promising future growth. Although there is some research about the opinion of veterinary surgeons in Portugal, the opinion of potential clients is largely unknown.

### **3. Chapter III - Methodology**

#### **3.1. Research approach**

In this dissertation, a cross-sectional descriptive research approach was employed.

Descriptive research aims to do a snapshot of aspects of the market environment, in this case, aims to perceive the potential interest of the consumers on the concept veterinary telemedicine as a service, by performing a survey.

Studies are cross-sectional when data is at one point in time, for this research, the analysis of different periods of time is not crucial hence it can be considered a cross-sectional.

#### **3.2. Data collection method**

An online survey was chosen as the data collection method for this study. Qualtrics software was selected to conduct the online questionnaire because it is intuitive to use, protects all user data and allows data exportation in a compatible way with other data analysis software. The survey was pre-tested by four people before its distribution and consequently some questions were included, others rephrased and dropped out. The survey had the approximate duration of five minutes. The data was collected during 20 days in the period between November 10<sup>th</sup> and 30<sup>th</sup>, 2021.

#### **3.3. Online questionnaire**

The online questionnaire was divided in 4 parts, an introduction to the study, demographic questions, a small definition of veterinary telemedicine and lastly the core questions.

The introduction informed the participants about the researcher, the purpose of the study and the anonymity agreement. The demographic questions ascertained the respondent's gender, age group, location they live in Portugal, the annual household income, their employment status, and what animal species the participants had as pets. Before the core questions a small definition of veterinary telemedicine was given to the participants so they could get familiarized with the terms, in case they were not acquainted with them. The core questions were designed to answer the study research questions. The survey participants were asked if they are interested in a veterinary telemedicine service. if they accept telemedicine with a new veterinary surgeon, or

if they prefer telemedicine with their regular veterinary surgeon. In the respondent's opinion, what are the main benefits and drawbacks of veterinary telemedicine. If they believe veterinary telemedicine only viable for follow-up consults. The participants were also asked if they are interested in using wearable devices and smartphone applications in Veterinary care. How much are they willing to pay for a veterinary telemedicine service. It was asked if they would be more interested in using veterinary telemedicine if it is covered by pet insurance. Finally, they were questioned if they are more confident in Human telemedicine when compared with veterinary telemedicine. At the end of the survey, a message guaranteeing the responses were recorded and a thank you for the participation appeared to all respondents.

### **3.4. Sample**

The survey targeted any individual that resided in Portugal. A total for 125 started the questionnaire, 21 were non-valid, 9 partial and 95 completed responses. 7 surveys were also rejected because the individuals didn't reside in Portugal. 68 of the participants were female (70,1%) and 29 were male (29,9%). The most common age group was between 25-34 years old with 48 respondents (49,5%), followed by the ages between 35-44 years with 12 respondents (12,4%). The least common age groups were the 85 or older, with 0 respondents and under 18 years old with 1 respondent (1%). The large majority (78) lived in the center of Portugal (80,4%), with only 15 from the south (15,5%) and 4 from the north (4,1%). Regarding employment status, most respondents (67) were employed full-time (69%) followed by students with 10 (10,3%). The least common employment status was disabled with 0 responses and employed part time with 4 (4,1%). Concerning annual household income, 30 participants had an annual income of less than €15,000 (30,9%), 26 had between €15,000-€25,000 (26,8%) and 18 had between €25,000-€50,000 (18,6). Lastly, regarding what animal species the participants had as pets, dogs (43,8%) and cats (35,6%) were the most common, followed by birds (8,8%), don't have a pet (5,6%) and other (3,75%). The horse (2,5%) was the least common animal owned.

### **3.5. Measurement scales**

In the survey's core questions, six questions used a 7-point Likert scale, participants were asked to show their level of agreement (from 1- strongly disagree to 7- strongly agree) with the given statement, to determine the participants opinion on multiple veterinary telemedicine topics.

A Likert scale was chosen because it was devised to measure attitude in a scientifically accepted and validated manner (Joshi, Kale, Chandel, & Pal, 2015). The 7-point scale provides more varieties of options which in turn increase the probability of meeting the objective reality of people when compared with a 5-point scale (Joshi et al., 2015).

Three opinion questions used multiple choice, two of them with the option of choosing a maximum of 3 answers and the possibility of writing a different option.

One question asked for a price willing to pay for the service, in a scale from 0 to 100 with 0 number of decimals.

### **3.6. Data analysis**

The data analysis was carried out using the program IBM® Statistics SPSS® version 26. Descriptive statistics reporting the frequencies of responses, percentage, standard deviation (SD) and mean were calculated in all the questions of the survey. The graphs with the results obtained were created using Microsoft Excel.

## 4. Chapter IV – Results and discussion

### 4.1. Research question 1: Are the potential clients interested in a veterinary telemedicine service?

**H1: Potential clients are, in general, interested in using a veterinary telemedicine service.**

In Portugal, the potential client's interest in a veterinary telemedicine service is a topic with scarce academic research. A paper aimed at gathering the views and perceptions of Portuguese veterinarians regarding the regulation and practice of veterinary telemedicine found only a small majority (51%) considered that, in some cases, video-consultations can replace face-to-face consultations and that Veterinary teleadvice has historically also been looked with suspicion by the Portuguese veterinary community (Magalhães-Sant'Ana et al., 2020). However, the public opinion on the subject seems to be more supportive of veterinary telemedicine, in the Portuguese region of Cascais the autarchy has expanded the social measures and now offers free veterinary tele-consultations to help families and elderly with financial difficulties to have access to specialized counseling for their animal pets (Fernandes, 2021).

A 2018 survey in the United States of America found that owners had a positive attitude toward veterinary telemedicine and also have some degree of likelihood to adopt and utilize veterinary telemedicine technology in the future (Hawk, 2018).

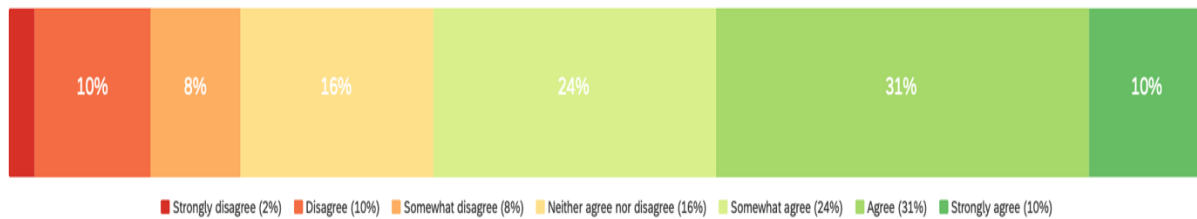
In the present study, 64.52% (sixty participants) broadly agreed (i.e., aggregate of somewhat agree, agree, and strongly agree responses) that they would be interested in a Veterinary telemedicine service whereas 19.35% (eighteen participants) broadly disagreed (i.e., aggregate of somewhat disagree, disagree, and strongly disagree responses) and 16.13% (fifteen participants) neither agreed nor disagreed (mean (M)  $\pm$  standard deviation (SD);  $4.82 \pm 1.53$ ). Detailed results can be found in graph 1.

This results seemingly support the hypothesis that there is interest by potential client's in using a veterinary telemedicine service. This preliminary evidence of demand for a veterinary telemedicine service in Portugal could allow the Veterinary medicine sector to adapt and evolve to a more digital future.

H1: Potential clients are interested in using a veterinary telemedicine service → **Valid**



**Graph 1 - Participants' opinions on the statement: I would be interested in a Veterinary telemedicine service. Values were rounded to no decimals.**



#### **4.2. Research question 2: Do potential clients accept telemedicine with a new veterinary surgeon, or do they prefer telemedicine with their regular veterinary surgeon?**

**H2: Potential clients prefer telemedicine with their regular veterinary surgeon.**

There are now several opportunities for clients to access telehealth services for their pets in Canada, the US and UK (Gyles, 2019; Waters, 2020) but this services can be digital communication platforms (websites, Smartphone Apps) that connect veterinarians with pet owners to provide consultation on health issues (Waters, 2020). In these cases, pet owners will have to have a consultation with a new veterinary surgeon and not with their regular.

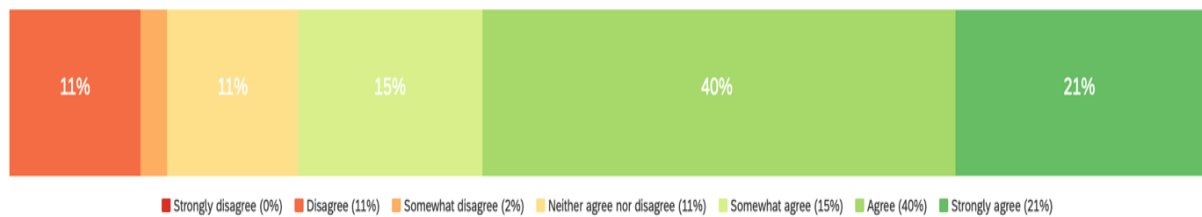
A 2019 survey found that the great majority (91.9%) of the study participants that had a traditional care veterinarian would make use of veterinary telemedicine if made available by them (Roca & McCarthy, 2019).

In this survey, 75.82% (sixty-nine participants) broadly agreed that they would be more interested in Veterinary telemedicine with their regular veterinarian versus a new veterinarian although 13.19% (twelve participants) broadly disagreed and 10.99% (ten participants) neither agreed nor disagreed ( $M \pm SD$ ;  $5.33 \pm 1.52$ ). Detailed results can be found in graph 2.

These findings somewhat hamper the idea of a business that only offers veterinary telemedicine as a service, most of the participants would prefer to have a telemedicine consult with their regular local veterinarian. It can also be argued that this results support that there is demand for local veterinary clinics and hospitals to start offering a telemedicine service to their clients.

**H2: Potential clients prefer telemedicine with their regular veterinary surgeon → Valid**

**Graph 2 - Participants' opinions on the statement: I would be more interested in Veterinary telemedicine with my regular veterinarian Vs a new veterinarian. Values were rounded to no decimals.**



### **4.3. Research question 3: In the potential client's opinion, what are the main benefits and drawbacks of veterinary telemedicine?**

**H3: The main benefits and drawbacks of veterinary telemedicine match the existing literature.**

There are many potential benefits and drawbacks already described in the existing literature, improved access to care, more affordable services, convenience and practicality, less distress for the animal, improved access to specialist care, enhanced veterinary-to-client bond, more efficient triage, reduced the workload on front office staff and lastly a better option than the client consulting the internet are most of the benefits already described and, increased risk of missed diagnoses and medical error, lack of physical exams, fraud, miscommunication that could be avoided in-person, lower standards of practice, how will the monetization of virtual care be done and finally the limitations of technology are most of the drawback (Magalhães-Sant'Ana et al., 2020; Massin Teller & Moberly, 2020).

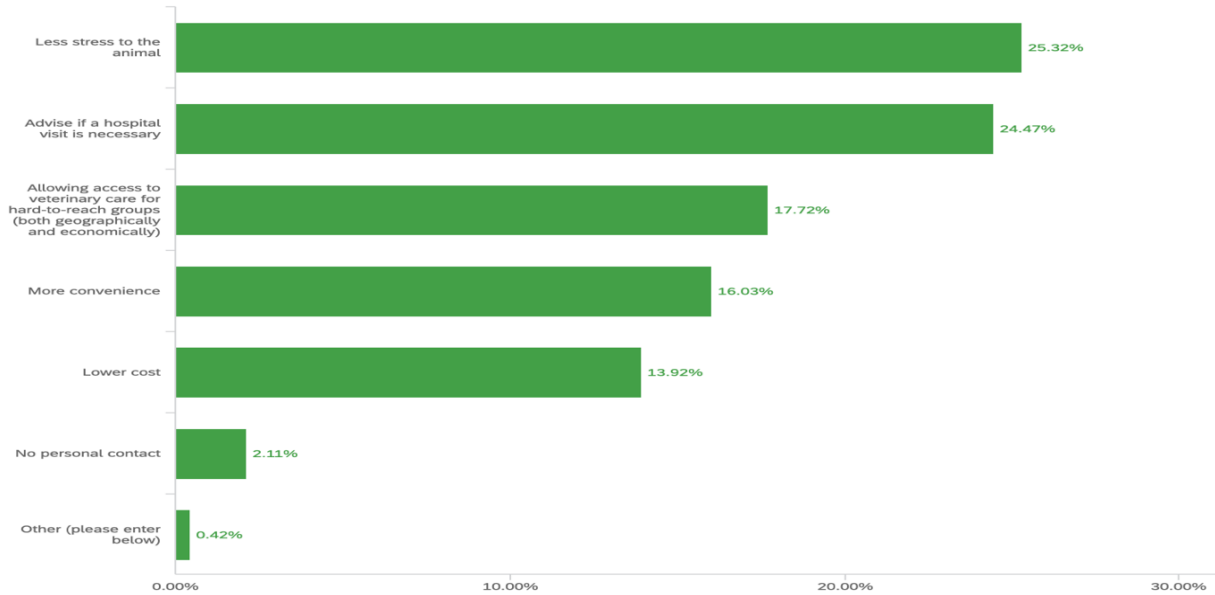
For this report, six main benefits and six main drawbacks were selected. Less stress to the animal was the most chosen benefit of veterinary telemedicine with a percentage of 25.32%, followed by advice if a hospital visit is necessary (24.47%) and allowing access to veterinary care for hard-to-reach groups (both geographically and economically) (17.72%).

On the other hand, risk of missed diagnoses was the most chosen drawback of veterinary telemedicine with a percentage of 34.38%, followed by lack of physical exams (33.04%) and may still need a hospital visit (22.77%). Detailed results can be found in graph 3 and 4.

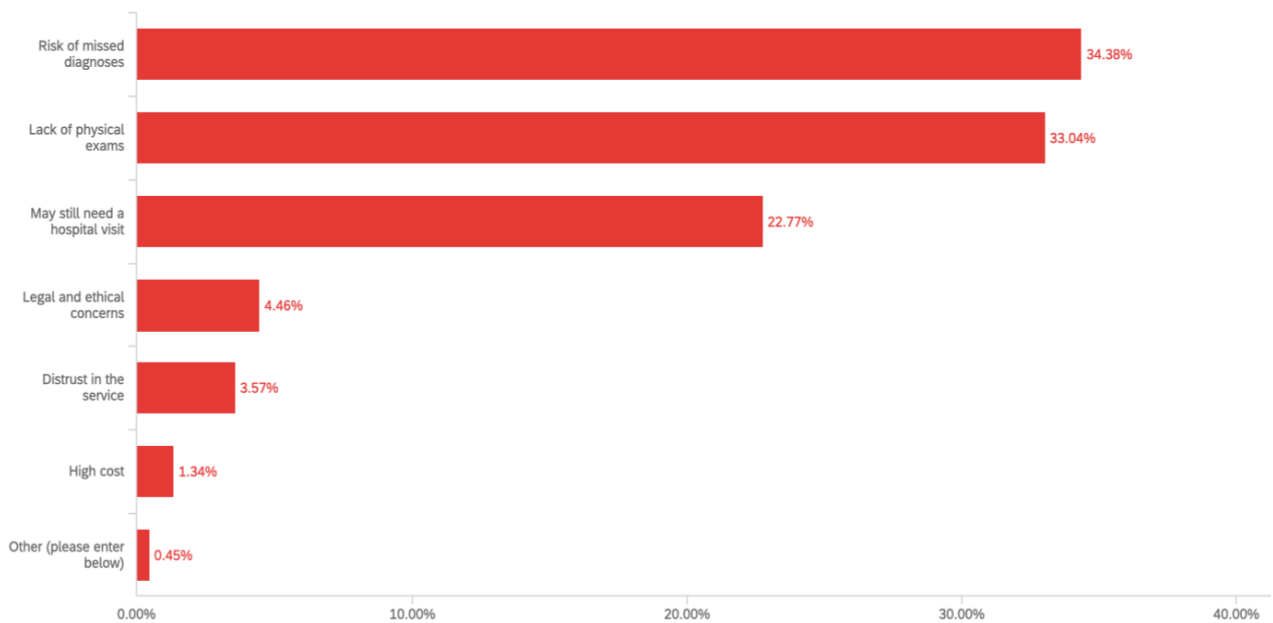
Is of note that, surprisingly, the benefit of no personal contact was least chosen option despite the survey being conducted during the Covid-19 pandemic.

H3: The main benefits and drawbacks of veterinary telemedicine match the existing literature → **Valid**

**Graph 3 - Participants' opinions on the question: In your opinion what are the main benefits of Veterinary telemedicine? (Choose a maximum of 3 answers).**



**Graph 4 - Participants' opinions on the question: In your opinion what are the main drawbacks of Veterinary telemedicine? (Choose a maximum of 3 answers).**



#### 4.4. Research question 4 – Is a veterinary telemedicine service only viable for follow-up consults?

##### H4: A veterinary telemedicine service is only viable for follow-up consults.

Many believe that veterinary telemedicine should only be used if a veterinarian-client-patient relationship is already established, in other words, it should only be used for a follow-up consult (Magalhães-Sant’Ana et al., 2020; Massin Teller & Moberly, 2020; Weich, 2021).

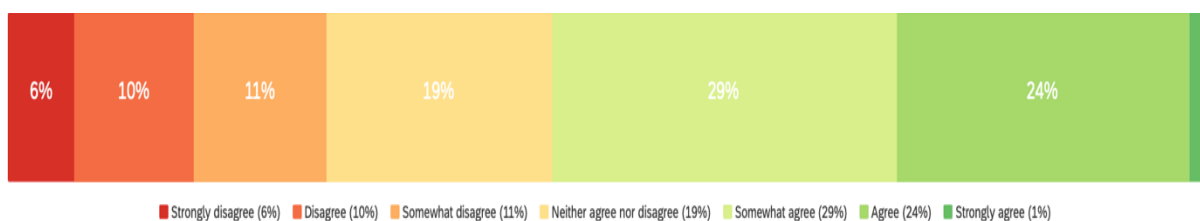
In a survey of Portuguese veterinary surgeons, 68% of the participants broadly agreed that a remote consultation must always be preceded by a face-to-face consultation (Magalhães-Sant’Ana et al., 2020).

In the current study, 54.44% (forty-nine participants) broadly agreed that they would only use a veterinary telemedicine service for follow-up consults but 26.67% (twenty-four participants) broadly disagreed and 18.89% (seventeen participants) neither agreed nor disagreed ( $M \pm SD$ ;  $4.33 \pm 1.51$ ). Detailed results can be found in graph 5.

These findings are in line with most literature but must be acknowledge that only a small majority broadly agreed and that the opinions of the potential clients are divided. Also can be argued that in other countries, veterinary telemedicine services that don’t require a previous veterinarian-client-patient relationship already exist (Gyles, 2019; Waters, 2020), leaving questions about this hypotheses.

H4: A veterinary telemedicine service is only viable for follow-up consults → **Valid**

*Graph 5 - Participants’ opinions on the statement: I would only use a Veterinary Telemedicine service for follow-up consults. Values were rounded to no decimals.*



#### 4.5. Research question 5 - Are the potential clients interested in using wearable devices and smartphone applications in veterinary care?

**H5: Potential clients are interested in using wearable devices and smartphone applications in veterinary care.**

Global veterinary wearable devices market is growing fast (Johnson, 2018) and many examples of wearable devices that are in the experimental phase and others that are already in use (Corradini et al., 2016; Malerba et al., 2020). Smartphone applications may also play an important role in what information can be gathered and shared through a telemedicine consult (Massin Teller & Moberly, 2020).

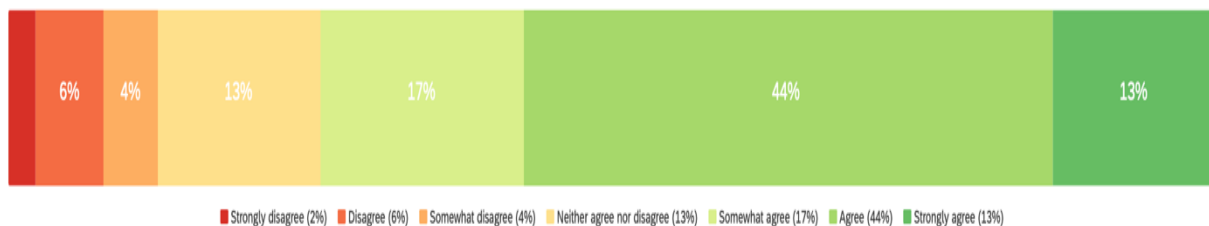
In the present study, 74.15% (sixty-six participants) broadly agreed that they would be interested in using wearable devices and smartphone applications for veterinary care yet 12.36% (eleven participants) broadly disagreed and 13.48% (twelve participants) neither agreed nor disagreed ( $M \pm SD$ ;  $5.22 \pm 1.45$ ). Detailed results can be found in graph 6.

In our days, people wearing devices and using smartphone apps that track their activity and health is becoming very common. The results of this survey also show that the large majority of potential clients are interested in using wearables and smartphone applications for their animal pets in veterinary care.

In the future, the combination of wearable devices, smartphone application, and data analytics technology can be a mainstream option for value-based veterinary care.

H5: Potential clients are interested in using wearable devices and smartphone applications in veterinary care → **Valid**

*Graph 6 - Participants' opinions on the statement: I would be interested in using wearable devices and smartphone applications for Veterinary care. Values were rounded to no decimals.*



#### **4.6. Research question 6 - How much are the potential clients willing to pay for a veterinary telemedicine service?**

**H6: Potential clients willing to pay the same price for a veterinary telemedicine consult compared with a regular hospital visit.**

How much potential clients are willing to pay for a veterinary telemedicine service is important to know if it is a viable business endeavor. In the US, two studies found that the participants were on average willing to pay 40\$ per telemedicine consult (Hawk, 2018; Widmar et al., 2020). In the UK, it already exists a smartphone app-based telemedicine service that offers a talk and a video consultation with vet surgeon for a charge of £20 (Waters, 2020).

In this survey, half price was the most chosen amount of money that the participants were willing to pay for a veterinary telemedicine consult compared with a regular hospital visit with a percentage of 40.45%, followed by  $\frac{3}{4}$  price (20.22%) and same price (19.10%) ( $M \pm SD$ ;  $5.42 \pm 1.16$ ). On average the participants were willing to pay 22.70€ for a veterinary telemedicine consult ( $SD = 9.74$ ). Detailed results can be found in graph 7 and table 1.

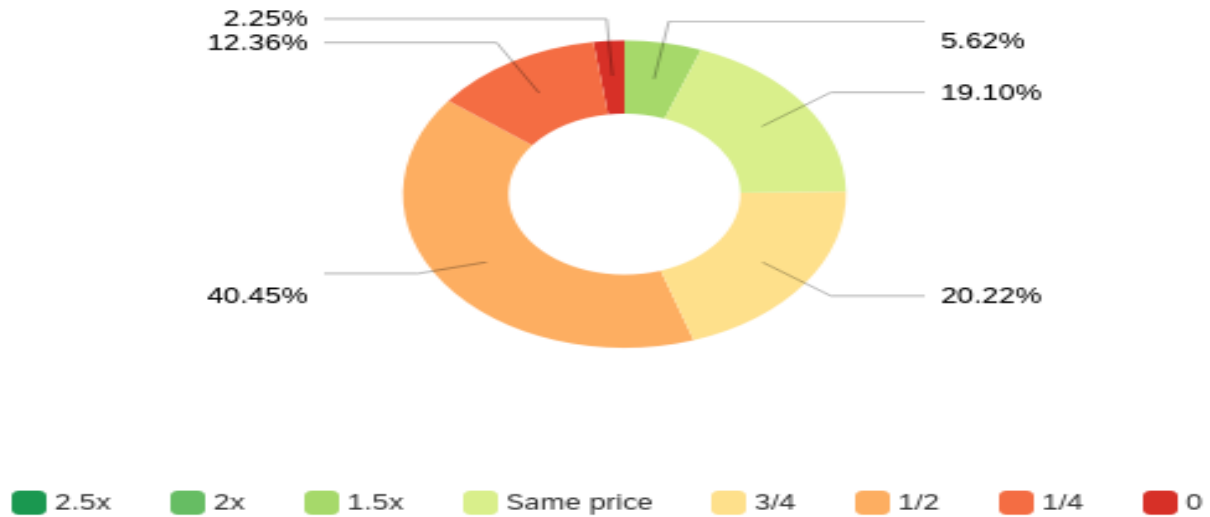
An interesting metric that wasn't explored in other scientific research was how much money that the participants were willing to pay for a veterinary telemedicine consult compared with a regular consult, the results showed that most potential customers weren't willing to pay the same amount of money a telemedicine consult compared with a regular consult. This was surprising because potential clients using this service would be able to save time and money in the commute from their home to the veterinary hospital or clinic.

When asked how much they would pay in euros, on average the participants answered that they would pay 22.7€, this value is very close to the price practiced in the UK example but almost half of what research shows that willingness to pay is in the US. The difference seen in comparison with the US is most likely related with the fact that regular veterinary consults in the US are more expensive.

Although potential clients are not willing to pay the same price for a telemedicine consult compared with a regular consult, it is encouraging that they are willing to pay half the price and on average 22.7€.

H6: Potential clients willing to pay the same price for a veterinary telemedicine consult compared with a regular hospital visit → **Not Valid**

**Graph 7 - Participants' opinions on the question: Roughly, how much money would you be willing to pay for a Veterinary telemedicine consult compared with a regular hospital visit?**



**Table 1 - Participants' opinions on the question: How much money (in €) would you be willing to pay for a Veterinary telemedicine consult?**

Field	Minimum	Maximum	Mean	Std Deviation	Count
euros €	5.00	65.00	22.70	9.74	89

**4.7. Research question 7 - Are the potential clients more interested in using veterinary telemedicine if it is covered by pet insurance?**

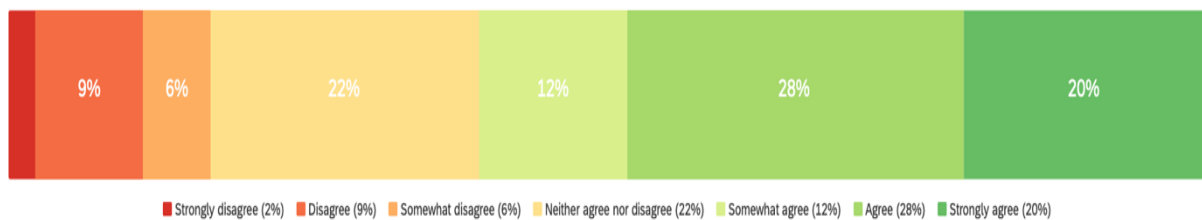
**H7: Potential clients are more interested in using veterinary telemedicine if it is covered by pet insurance.**

In Portugal, health pet insurance is still not widespread but because most consider veterinary care expensive, it can start to be seen as an investment and more widely adopted (Prata, 2020). In this study, 60.67% (fifty-four participants) broadly agreed that they would be more inclined to use a veterinary telemedicine service if it was covered by a pet insurance however 16.86% (fifteen participants) broadly disagreed and 22.47% (twenty participants) neither agreed nor disagreed ( $M \pm SD$ ;  $4.99 \pm 1.65$ ). Detailed results can be found in graph 8.

These results give indication that if pet insurance adoption continues to increase in Portugal there is a possibility that the demand for telemedicine could also increase. Also, can be argued that there is confidence in the telemedicine service because if price wasn't part of the equation, most participants broadly agreed that they would be more inclined to use it.

H7: Potential clients are more interested in using veterinary telemedicine if it is covered by pet insurance → **Valid**

**Graph 8 - Participants' opinions on the statement: I would be more inclined to use a veterinary telemedicine service if it was covered by a pet insurance. Values were rounded to no decimals.**



#### **4.8. Research question 8 - Are the potential clients more confident in human telemedicine when compared with veterinary telemedicine?**

**H8: Potential clients have more confidence in human telemedicine when compared with veterinary telemedicine.**

Human telemedicine already advanced, its benefits and harms are carefully researched and debated, there is a big contrast to an underdeveloped veterinary telemedicine (Weich, 2021).

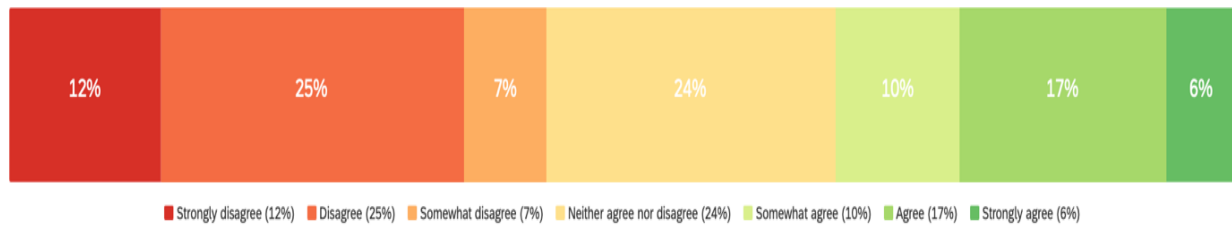
43.82% (Thirty-nine participants) broadly disagreed that they have more confidence in Human telemedicine compared with veterinary telemedicine whereas 32.58% (twenty-nine participants) broadly agreed and 23.60% (twenty-one participants) neither agreed nor disagreed ( $M \pm SD; 3.67 \pm 1.83$ ). Detailed results can be found in graph 9.

It is interesting to acknowledge that although veterinary telemedicine is still in its infancy in Portugal, a small majority broadly disagreed that they have more confidence in Human telemedicine compared with veterinary telemedicine.

H8: Potential clients have more confidence in human telemedicine when compared with veterinary telemedicine → **Not Valid**



**Graph 9 - Participants' opinions on the statement: I would be more inclined to use a veterinary telemedicine service if it was covered by a pet insurance. Values were rounded to no decimals.**



## 4.9. Business plan

With the interest of potential clients acknowledged, the next step is to create a viable business plan for this business opportunity. Businesses that utilize business plans are typically more successful than others (Hormozi, Sutton, McMinn, & Lucio, 2002). Do to the fact that a business plan is not the main scope of this research, the analysis will be more on the simplistic side, aiming to check if the numbers add up.

Even though the potential clients prefer telemedicine with their regular veterinary surgeon, for simplistic reasons, this business venture will be a stand-alone veterinary telemedicine service, with clients connecting with veterinary surgeons for a consultation, via a purpose build website or smartphone application. Ideally this service should complement an existing veterinary hospital / clinic business, allowing for a seamless in person follow up consult if needed. This would also allow potential cost savings.

Taking into account that this concept is not yet in use in the Portuguese market, it is hard to predict which are the main drivers and costs of setting up the business, mainly considered the known investments needed to open and operate a small online service provider.

### 4.9.1. Clients

It is difficult to forecast the number of telemedicine consults that would be provided in the first year of activity. Currently there are 2.9 million pets registered in the Companion Animal Information System in Portugal, although 64.5% of the respondents broadly agreed that they would be interested in a Veterinary telemedicine service it was conservatively forecasted only that 0.1% of the registered animals would use our service for one teleconsultation in the first

year of activity. This adds up to 2900 consults. As it is easier to grow in the beginning of the business, and difficult to maintain the growth in the medium and long-run, it was assumed that the business will be able to grow 100% in the number of consults in the 2<sup>nd</sup> year, and 60%, 40% and 30% between the 3<sup>rd</sup> and 5<sup>th</sup> year.

#### 4.9.2. Pricing

The respondents are willing to pay on average 22.7€ for a telemedicine consult but it was considered starting with a lower price to attract clients. Therefore, it was decided to start with a price per consult of 12.7€ in the first year, and then gradually increase the price until it matches the average price that the respondents are willing to pay.

*Table 2 - Consults, price and revenue forecasts*

	Year 1	Year 2	Year 3	Year 4	Year 5
<b># Consults</b>	2 900	5 800	9 280	12 992	16 889
<b>Price (€)</b>	12.7	15.2	17.7	20.2	22.7
Consults annual growth (%)		100%	60%	40%	30%
Price annual growth (€)		2.5€			
# Monthly installments		12			
<b>Annual Revenues</b>	<b>36 830</b>	<b>88 160</b>	<b>164 256</b>	<b>262 438</b>	<b>383 380</b>

#### 4.9.3. Capital and operational expenditures

To set up this business, the main capital and operational expenditures lie on securing an office space and filling it with the necessary equipment and building a website and smartphone application where the service will be distributed. Currently 12,7€ is the monthly price of rent per square meter in Lisbon, we predicted that 100 square meters is enough for this business and allows for further expansion, thus it was assumed that 1 270€ is our monthly cost for the space. A quick search found that the price to build a costume website and smartphone application roughly costs 50 000€ and 25 200€ respectively, for a total of 75 200€. Moreover, the estimates for the price of the necessary office equipment were 6 000€ for furnishing and 6 000€ for IT (Information technology) hardware, for a total of 12 000€. As the furniture and IT hardware

tend to depreciate and become obsolete throughout time, it is also required to forecast the need to replace these fixed assets. Thus, it was decided that the furniture would need to be replaced every 10 years and the IT hardware every 5 years.

**Table 3 - Initial Investments needs**

Office rent (monthly)	1 270€
Website development	50 000€
Smartphone application development	25 200€
Office equipment	12 000€
Annual replacement of equipment's	1 800€

#### **4.9.4. Marketing expenses**

For the business to grow at the projected pace it is important to advertise our service. Because it is an online service it was decided that online was the best place to reach the target audience. Social network publicity and posts powered by influencers were the marketing options chosen. The total expenses forecasted amount to 6 500€ per year.

**Table 4 - Investments in marketing**

Social network publicity	3 000€
Posts powered by influencers	3 500€
Annual expenditures	6 500€

#### **4.9.5. Personnel**

To start this business venture, there is the need to hire staff to work, namely veterinary surgeons and an employee for cleaning. It was assumed that 30 was the number of consults a veterinarian could perform in a day, multiplying that per the number of working days in a year lead to the conclusion that 1 veterinary surgeon would have the capacity for 7800 consults in a year.

The staff need for this business would need to grow as the number of telemedicine consults increase, thus it is estimated that the number of veterinary surgeons working for this venture will increase from 1 to 3 by the 5<sup>th</sup> year.

Staff salary will start with the average remuneration of that profession in Portugal. There will be an annual salary growth of 2%.

**Table 5– Personnel expenses**

	Year 1		Year 2		Year 3		Year 4		Year 5	
	#	Salary	#	Salary	#	Salary	#	Salary	#	Salary
Veterinary Surgeon	1	1 240	1	1 265	2	1 290	2	1 316	3	1 342
Cleaning	1	750	1	765	1	780	1	796	1	812
<b>Annual personnel costs</b>		<b>34 477</b>		<b>35 170</b>		<b>58 212</b>		<b>59 373</b>		<b>83 818</b>

# Salary months	14
Social Security Fee	23.75%
Salaries annual growth	2.0%

#### 4.9.6. External supplies

Lastly, it was estimated the recurring and ongoing costs of operation, such as insurance (forecasted as a percentage of wage workers for the work accidents, and as percentage of initial asset value), utilities (forecasted as a percentage of the office rent), website and smartphone application maintenance and update service, IT support, office supplies (960€ per employee/year) and accounting service.

**Table 6 - External supplies forecast**

Insurance	
Work accidents	2%
Equipment	4%
Utilities	3 048€
Website and App maintenance and updates	5 400€
IT support	1 440€
Office supplies	960€ per employee / year
Accounting	1 200€

#### 4.9.7. Forecasts

As previously stated, our forecasts aim to be simplistic and parallelly conservative. The projections were based both on the answers retrieved from the survey, and from information available online.

Taking into account all sales and costs projected, these results suggest that this new venture shall become operationally-, income- and cash-positive within the 2<sup>nd</sup> year of operation, with the capital needed to fund and run the business amounting to approximately 120 000€. Moreover, it is expected to get the initial investment back during the 5<sup>th</sup> year of operation.

**Table 7 - Financial forecasts**

	Year 1	Year 2	Year 3	Year 4	Year 5
<b>Revenues</b>	<b>36 830</b>	<b>88 160</b>	<b>164 256</b>	<b>262 438</b>	<b>383 380</b>
(-) External supplies					
Insurance	(1 170)	(1 183)	(1 644)	(1 667)	(2 156)
Utilities	(3 048)	(3 048)	(3 048)	(3 048)	(3 048)
Website and App maintenance / update	(5 400)	(5 400)	(5 400)	(5 400)	(5 400)
IT support	(1 440)	(1 440)	(1 440)	(1 440)	(1 440)
Office supplies	(960)	(960)	(1 920)	(1 920)	(2 880)
Accounting	(1 200)	(1 200)	(1 200)	(1 200)	(1 200)
(-) Rent	(15 240)	(15 240)	(15 240)	(15 240)	(15 240)
(-) Personnel	(34 477)	(35 170)	(58 212)	(59 373)	(83 818)
(-) Marketing	(6500)	(6500)	(6500)	(6500)	(6500)
<b>Operating income</b>	<b>(32 605)</b>	<b>18 019</b>	<b>69 652</b>	<b>166 650</b>	<b>261 698</b>
(-) Depreciation	(1800)	(1800)	(1800)	(1800)	(1800)
<b>Income before taxes</b>	<b>(34 405)</b>	<b>16 219</b>	<b>67 852</b>	<b>164 850</b>	<b>259 898</b>
(-) Taxes	0	(3 406)	(14 249)	(34 619)	(54 579)
<b>Net profit</b>	<b>(34 405)</b>	<b>12 813</b>	<b>53 603</b>	<b>130 231</b>	<b>205 319</b>

**Capital and Operational Expenditures**

	Year 1	Year 2	Year 3	Year 4	Year 5
Initial CapEx needed	87 200				
Additional CapEx					6 000
<b>Total</b>	<b>87 200</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>6 000</b>

**Cash Flow**

Cash flow	-119 805	14 613	55 403	132 031	201 119
Accumulated cash flow	-119 805	-105 192	-49 789	82 242	283 361

## **5. Chapter V – Conclusions, study limitations, and future research**

### **5.1. Conclusions**

Telemedicine has been flourishing in European human medicine during the last two decades as part of a future-oriented digitalization, whereas veterinary medicine mostly had discarded it.

The onset of the Covid-19 worldwide pandemic and its containment measures (i.e.: quarantine, social distancing, general lockdown) created big challenges on how to provide veterinary care. Veterinary medicine was compelled to re-examine and consider the use of telemedicine and with this, a significant uptake in the utilization of veterinary telemedicine was observed.

This dissertation study pretended to fulfill part of the gap on the literature concerning the view of potential clients of a veterinary telemedicine service in Portugal.

Most participants agreed that they would be interested in a Veterinary telemedicine service. Most agreed that they would be more interested in veterinary telemedicine with their regular veterinarian versus a new veterinarian. It was observed that the main benefits of telemedicine in the eye of the participants are less stress to the animal, advice if a hospital visit is necessary and allowing access to veterinary care for hard-to-reach groups (both geographically and economically) and that main drawbacks are risk of missed diagnoses, lack of physical exams and may still need a hospital visit. A narrow majority agreed that they would only use a veterinary telemedicine service for follow-up consults. The participants mostly agreed that they would be interested in using wearable devices and smartphone applications for veterinary care. Half price was the amount of money that most of the participants were willing to pay for a veterinary telemedicine consult compared with a regular hospital visit and on average the participants were willing to pay 22.70€ for a veterinary telemedicine consult. If covered by a pet insurance, the participants, would be more inclined to use a veterinary telemedicine service. When asked if they have more confidence in Human telemedicine compared with veterinary telemedicine, most of the participants disagreed.

Finally, considering the business plan for a veterinary telemedicine service, which was based on rather conservative premises, this business opportunity shall be profitable in the second year, and any investor shall have its capital returned by the fifth year.

With these results, it is clear and important to note that telemedicine is essentially a tool, and as such, it is not appropriate for every healthcare issue, situation, client, or animal, but evidently, there appears to be a promising future for veterinary telemedicine in Portugal. It could expand

access to veterinary health care, provide an inexpensive triage service, thus is particularly effective in situations such as follow-up after an office or hospital visit or for inspection of surgical sites or mobility. It can also provide new business models and revenue streams for the veterinary medicine sector.

The support shown by the potential clients in this dissertation study suggests that it is time to move forward with veterinary telemedicine in Portugal, always using thoughtful consideration of the benefits and drawbacks that surround any new tool that will be integrated into veterinary medicine practice.

## **5.2. Study limitations**

As in all studies, there were some limitations that created obstacles to make the analysis more conclusive.

The lack of literature on the topic of veterinary telemedicine in Portugal was one of the strongest limitations of this investigation, having to rely on mostly research conducted in other countries. It is relevant to mention the challenges related to the fact that the distribution of the questionnaire was mostly done through online social media platforms. In view of the fact that the survey was answered online, it becomes hard to evaluate under what conditions the participants were in, which can bias their real answers. Furthermore, this study also did not contain attention tests to minimize this problem.

In terms of sampling issues, the sample of the survey was small having 9 partial, 88 completed responses consequently turning the analysis less diversified and more limited: the participants were more females (70.1%) than males; the large majority of the respondents resided in the center of Portugal (80.4%); there is a low variation in terms of age's distribution, namely, 49.5% is composed by individuals from 25 until 34 years old.

Lastly, the lack of time influenced the data collection process by shortening the amount of time the survey could have been active.

## **5.3. Future research**

In future studies, it is advised to reproduce this research at a national level with a random and representative sample of the Portuguese population. Only by doing this, it is possible to be completely confident in the interest of the Portuguese consumers in a veterinary telemedicine service.

It would also be interesting to run a pilot veterinary telemedicine service with constant feedback from the clients and the duration needed to measure the impact that this service has on their opinions on the matter.



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## Appendix

### Veterinary Telemedicine Survey

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#### Introduction

Thank you for taking the time to open this link.

Please note that all answers will be anonymous, so feel free to provide honest feedback.

I am a final year student of the master's in business, in Católica Lisbon School of Business and Economics.

This questionnaire has been created as part of my Masters' Dissertation, which is focused on service innovation in particular on Veterinary Telemedicine as a service.

I highly appreciate your participation in this survey!

Thank you in advance.

---

#### Demographic

Gender: What is your gender?

- ▼ Male
  - Female
  - Non-binary
  - Prefer not to answer
-

Age: What is your age?

▼ Under 18

18 – 24

25 – 34

35 – 44

45 – 54

55 – 64

65 – 74

75 – 84

85 or older

Prefer not to answer.

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Location: Where do you live in Portugal?

▼ North

Center

South

Live in another country

Prefer not to say

---

Income What is your annual household income?

▼ Less than €15,000

€15,000 - €25,000

€25,000 - €50,000

€50,000 - €100,000

€100,000 - €200,000

More than €200,000

Prefer not to say

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Employment: What is your current employment status?

- ▼ Employed full time
- Employed part time
- Unemployed
- Retired
- Student
- Disabled
- Prefer not to say

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## Introduction Telemedicine

### **What is Telemedicine?**

“Telemedicine – the use of electronic communication and information technologies to provide clinical healthcare remotely – is one of these emerging areas of practice in the veterinary sector. Telemedicine extends to the provision of veterinary services by video-link, text, instant messaging or telephone, or by any other remote means.” (RCVS - Royal College of Veterinary Surgeons)

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## Questions

Q1 What animal do you have or had as a pet? (Can select more than one)

- Dog
  - Cat
  - Horse
  - Bird
  - Don't have a pet
  - Other (please enter below)
- 

Q2 In your opinion what are the main **benefits** of Veterinary telemedicine? (Choose a maximum of 3 answers).

- Lower cost
  - Less stress to the animal
  - Other (please enter below)
- 
- No personal contact
  - Advise if a hospital visit is necessary
  - Allowing access to veterinary care for hard-to-reach groups (both geographically and economically)
  - More convenience
-



Q3 In your opinion what are the main **drawbacks** of Veterinary telemedicine? (Choose a maximum of 3 answers).

May still need a hospital visit

High cost

Other (please enter below)

---

Lack of physical exams

Distrust in the service

Risk of missed diagnoses

Legal and ethical concerns

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Q4 Please say how much do you agree or disagree with the following statements:

I would be interested in a Veterinary telemedicine service.

Strongly disagree

Disagree

Somewhat disagree

Neither agree nor disagree

Somewhat agree

Agree

Strongly agree

---

Q5 Please say how much do you agree or disagree with the following statements:

I would be more interested in Veterinary telemedicine with my regular Veterinarian versus a new Veterinarian.

- Strongly disagree
  - Disagree
  - Somewhat disagree
  - Neither agree nor disagree
  - Somewhat agree
  - Agree
  - Strongly agree
- 

Q6 Please say how much do you agree or disagree with the following statements:

I would **only** use a Veterinary Telemedicine service for follow-up consults.

- Strongly disagree
  - Disagree
  - Somewhat disagree
  - Neither agree nor disagree
  - Somewhat agree
  - Agree
  - Strongly agree
-

Q7 Please say how much do you agree or disagree with the following statements:

I would be interested in using wearable devices and smartphone applications for Veterinary care.

- Strongly disagree
  - Disagree
  - Somewhat disagree
  - Neither agree nor disagree
  - Somewhat agree
  - Agree
  - Strongly agree
- 

Q8 Roughly, how much money would you be willing to pay for a Veterinary telemedicine consult compared with a regular hospital visit?

- 2.5x
  - 2x
  - 1.5x
  - Same price
  - 3/4
  - 1/2
  - 1/4
  - 0
-

Q9 How much money (in €) would you be willing to pay for a Veterinary telemedicine consult?

euros € (0 - 100)	
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Q10 Please say how much do you agree or disagree with the following statements:

I would be more inclined to use a veterinary telemedicine service if it was covered by a pet insurance.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

Q11 Please say how much do you agree or disagree with the following statements:

I have more confidence in Human telemedicine compared with Veterinary telemedicine.

- Strongly disagree
- Disagree
- Somewhat disagree
- Neither agree nor disagree
- Somewhat agree
- Agree
- Strongly agree

---

End of survey message

We thank you for your time spent taking this survey.

Your response has been recorded.