

# Investigating Equestrians' Knowledge, Perceptions, and Experiences with Domestic Horse Oncology

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## Abstract

Common equine cancers, such as sarcoids, melanomas, and squamous cell carcinomas, can lead to pain, discomfort, and decreased quality of life, especially if improperly treated. These tumors often affect vital areas like the skin, eyes, and internal organs, impairing mobility and function. The management of equine cancer requires careful consideration of treatment options, many of which may be invasive or costly, and often necessitate long-term care. While incidence rates of different types of cancer are difficult to establish, identifying high-risk individuals is needed as part of clinical decision-making protocol. This study examines equine oncology through a mixed-methods approach, incorporating a survey of equestrians (n = 287), case studies (n = 164), and social media analysis (243 social media posts). The results indicate that equine skin cancers, particularly sarcoids, melanomas, and squamous cell carcinomas, are the most commonly reported among owners regardless of horse age, breed, and sex. Treatment methods, often chosen based on anecdotal evidence, vary widely, with combination therapies perceived as more effective than individual treatments. The study also reveals a concerning trend of equine owners relying on social media for cancer diagnosis and treatment advice, often in lieu of veterinary consultation. This underscores the need for better educational resources and support systems for equine caretakers. The findings highlight the challenges in diagnosing and treating equine cancer, emphasizing the importance of early detection and a multidisciplinary approach to improve equine welfare.

## Keywords

Equine cancer; equine welfare, sarcoids, equine oncology, owner knowledge

## 1. Introduction

The exact prevalence and incidence rates of cancer in horses are difficult to determine due to several factors, including underreporting, limited studies, and difficulties in diagnosis [1,2]. Sarcoids are the most commonly diagnosed equine tumor, with melanomas and squamous cell carcinomas (SCCs) also representing a substantial proportion of cancer cases in horses, with melanomas being especially common in grey horses [3–5]. Age is a major risk factor for cancer in horses, with older horses, particularly those aged 16 years or older, demonstrating higher incidence rates of tumors like lymphosarcomas and melanomas [6]. There is an increasing number of geriatric horses over 16 years of age globally and

particularly in the UK [7]. The exact incidence rates vary by breed and geographic location, but as horses age, the likelihood of developing cancer increases significantly [8,9]. Breed does play a significant role in the increased risk of cancer development. Arabians are more prone to melanomas, while Thoroughbreds and their crosses are more susceptible to sarcoids [10]. However, equine cancer prevalence is still thought to be lower than in other species due to shorter life expectancy and less frequent diagnostic testing [11,12].

### 1.1. Common Types of Equine Cancers

Sarcoids are the most frequently diagnosed type of tumor in horses, typically appearing as skin masses [13,14]. They are

generally non-metastatic but locally invasive and can recur after treatment [10,15]. Sarcoids come in several forms, including verrucous (wart-like), fibroblastic (fleshy), and nodular, affecting different parts of the horse's body [16]. These tumors are caused by the bovine papillomavirus (BPV) and often require various treatments, including surgical removal, topical chemotherapy, and immunotherapy [16,17]. Equine sarcoid tumors are more likely to be noticed, sampled, or excised and submitted to diagnostic laboratories, and therefore recorded in surveys as being accountable for 40% of equine cancers [18]. Melanomas are most commonly observed in grey horses, affecting up to 80% of this population by the age of 15 [8]. These tumors develop from melanocytes (pigment-producing cells) and tend to appear on the horse's perineum, tail, or head. Unlike sarcoids, melanomas can be both benign and malignant, with a risk of metastasis to internal organs over time [19]. Although surgical excision is the most common treatment, laser therapy and immunotherapy are also used to manage melanomas [20]. Squamous Cell Carcinomas (SCCs) affect the mucocutaneous junctions, such as the eyes, nose, and genitalia, and are associated with ultraviolet (UV) exposure, particularly in light-colored horses [21]. These tumors are malignant and can invade surrounding tissues, requiring early intervention [22,23]. Treatment options include surgery, cryotherapy, radiation therapy, and topical chemotherapy [24]. Although SCCs can be managed if caught early, they carry a higher risk of morbidity if left untreated. Lymphosarcomas are less common than the aforementioned cancers but are still noteworthy, particularly in older horses [25,26]. This cancer affects the lymphatic system and can present in various forms, including multicentric (affecting multiple organs) or cutaneous (restricted to the skin) [27]. Lymphosarcomas tend to be more aggressive and are often treated with systemic chemotherapy or corticosteroids [28]. The prognosis for horses with lymphosarcoma is generally poor, particularly for multicentric forms [29].

### 1.2. Diagnostic Tools for Equine Cancer

Early and accurate diagnosis is critical for managing equine cancer, but it is often challenging due to the variety of tumor presentations and limited access to advanced diagnostic tools in some areas [30]. Common methods include clinical examination, histopathology, cytology, imaging, and biopsy. Diagnosis typically begins with visual inspection of the affected area, as many equine cancers like sarcoids and melanomas present with distinctive external symptoms, though this alone is not definitive [9,12,20]. Histopathology, involving tissue sample analysis, is one of the most reliable methods for distinguishing between benign and malignant tumors [31], while cytology, though less invasive, may not provide as detailed a diagnosis. Imaging techniques such as ultrasound, X-rays, and MRI are valuable for assessing tumor extent and planning treatment. Additionally, molecular diagnostics like PCR can detect viral agents like BPV in sarcoids, and genetic profiling offers insights for personalized treatments.

Equine cancer is a multifaceted health issue, with sarcoids, melanomas, squamous cell carcinomas, and lymphosarcomas being the most common types observed in horses. Diagnosis is often complicated by the diversity of tumor presentations and the availability of diagnostic tools. While clinical examination, histopathology, cytology, and imaging remain the cornerstone of cancer diagnosis in horses, emerging molecular diagnostic

techniques hold promise for more accurate and early detection [32,33]. Ultimately, increased awareness, research, and advancements in diagnostic methods are essential for improving the management and treatment of equine cancer, thus enhancing horse welfare and longevity [34].

The aim of the current study was to investigate the prevalence and characteristics of different equine cancers, the diagnostic and treatment methods employed by horse owners, and the role of social media in disseminating information and support regarding equine oncology between horse owners. Through a detailed survey and case study analysis, this research seeks to explore the experiences of equestrians globally in managing common equine cancers. There is currently a lack of data investigating the equestrian's knowledge, perceptions, and experiences with equine cancer on a multinational scale. By examining the relationships between variables such as horse breed, age, cancer type, and treatment success, this study aims to identify patterns and provide insights into improving cancer management and equine welfare outcomes. Additionally, the study investigates the influence of social media on diagnosis, treatment decisions, and community support, highlighting both the benefits and risks of using online platforms for equine health advice.

## 2. Materials and Methods

### 2.1. Initial Survey Design

An initial survey comprising 12 questions that could be completed in approximately eight minutes was constructed and piloted with ten adult equestrians of different nationalities. The survey included 2 binary, 6 open-ended, and 6 multiple-choice questions, and was distributed via Microsoft and Google Forms. The survey consisted of two sections. The first section included demographic questions: gender, nationality, horse ownership, horse-related experience, horse information such as sex, age, breed, exercise, feeding, and housing regime. The second section focused on participants' experience with equine cancer; "which of these equine cancers have you had experience with, please outline your experience with these cancers, what diagnostic methods were utilized to diagnose the equine cancer, what symptoms did the horse display, what was the prognosis and what treatment methods did you utilize?" Participants were also given the opportunity to share with researcher specific case studies that they wished to highlight regarding cancer diagnosis, treatment, and prognosis in equines.

Three Facebook social media pages dedicated to equine oncology were selected for analysis, all of which opted to remain anonymous for the purpose of this study. These pages were chosen because they had over 10,000 members and averaged more than 10 posts per day. All pages were in English to avoid misinterpretation due to translation. Criterion sampling was used to select Facebook posts meeting specific criteria, including a description of the cancer the horse had, either through an image or written description, details about the horse such as age, breed, and sex. The post also needed to contain information about the diagnosis of the cancer e.g., whether the cancer had been diagnosed by a veterinarian and what treatment options had been attempted and their outcomes. The posts then were categorized according to their content, what type of cancer the horse had, whether veterinary

diagnosis was sought or not, and whether treatment had or had not been prescribed by a veterinarian.

**2.2. Participant Recruitment**

The target population consisted of English-speaking equestrians over 18 years old. Participation in the questionnaire and case study analysis was voluntary. For the social media analysis, administrators of pages granted permission for analysis. No personal data was gathered, and no distinguishing characteristics of participants were recorded. Ethical approval was granted by the UCNL Ethics Committee. To be eligible for participation, respondents had to meet the research criteria of being over 18 and have experience caring for an equine. By completing the questionnaire and submitting case studies, participants consented to their data being used for this study. The survey link was distributed online via personal social media and equestrian-related social media platforms e.g. UK Horse Owners. Social media pages were chosen that had over 1,000 members for questionnaire distribution and link sharing. Participants were required to have previously owned or been responsible for the health and welfare of a horse. The questionnaire was open from November 2022 to June 2023. Posts for the social media analysis were selected from social media pages that only allowed members over the age of 18. The social media posts that were used in the analysis were those posted between March 2023 and June 2023.

**2.3. Data Collating**

All questionnaire responses were downloaded from Forms into Microsoft Excel. A total of 287 participants completed the questionnaire, 6 of which were dismissed due to an incomplete response. This left 281 valid responses being analyzed. Following completion of the questionnaire, participants were invited to provide further information relating to their individual experiences with equine cancer. Furthermore, 164 participants provided additional case studies for analysis. The case study information had to include the horse's breed, sex, and age when the cancer was first diagnosed or identified, an image of the cancer at initial diagnosis, an image of the cancer post-treatment, and an approximate size of the tumor at various stages throughout the treatment period. A total of 243 social media posts were analyzed for the social media analysis, with comments from the posts also being categorized based on their content. Answer choices for questions were open-ended to allow for a full description of the events and experiences of participants related to equine cancer.

**2.4. Statistical Analysis**

Data was analyzed using IBM SPSS statistics software (version 24). Frequency analysis was undertaken for the demographic data of participants and the data relating to their horses. The analyzed data consisted of nominal/categorical data and binary data; therefore, a chi-squared test for association was used to analyze the data. A *p*-value < 0.05 was considered statistically significant. To meet the test assumptions, all cell frequencies involved in the analysis contained values greater than 5. Some answer categories were combined to provide sufficient data for analysis.

**3. Results**

A total of 287 participants completed the survey, with 51.2% of responses being received in the first week of distribution.

After discarding incomplete surveys, results from *n* = 281 participants were analyzed, representing a margin of error of ±5% based on 15 million global English-speaking equestrians and a 95% confidence rate. It could be predicted that a repeat of data collection would be comparable if 95 out of 100 people were randomly selected to complete the same survey.

**3.1. Participants Demographics**

Sixteen nationalities were represented, with the majority of participants originating from the UK (67%, *n* = 188), the USA (7%, *n* = 20), and Ireland (7%, *n* = 20). The remaining 53 participants (19%) comprised nationalities such as Australian, Norwegian, French, South African, and Canadian. 96% of participants (*n* = 270) were female, and 4% were male (*n* = 11). Nationality, gender, horse information, and experiences with equine cancers are all summarized in **Table 1**.

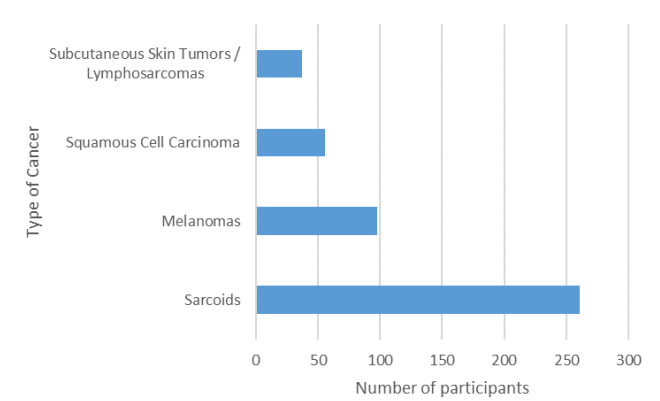
**3.2. Participants Experience with Equine Oncology – Questionnaire Results**

Most participants declared they had experiences with their horses having sarcoids (93%, *n* = 261), 35% (*n* = 98) of participants had experiences with equine melanomas, 20% (*n* = 56) had experiences with Squamous Cell Carcinomas, and 13% (*n* = 37) of participants had experiences with subcutaneous skin tumors and Lymphosarcomas (**Figure 1**).

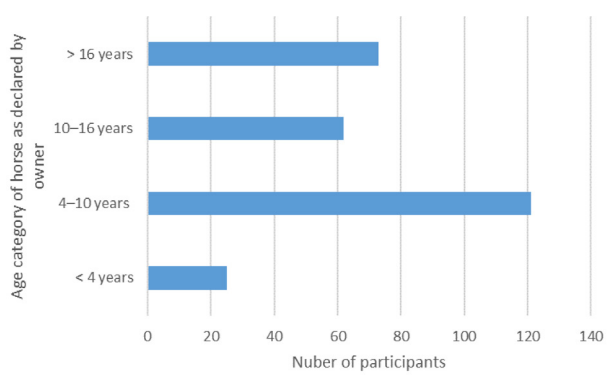
9% (*n* = 25) of participants declared their horse to be below 4 years of age, 43% (*n* = 121) of participants declared their horse to be 4–10 years old, 22% (*n* = 62) declared their horse to be 10–16 years old, and 26% (*n* = 73) declared their horse to be over 16 years old (**Figure 2**).

**Table 1:** Questionnaire respondents' demographics: nationality, gender, type of cancer experienced, age of horse, breed of horse, and sex of horse.

Question	Answer categories
Nationality	UK (67%, <i>n</i> = 188), USA (7%, <i>n</i> = 20), Ireland (7%, <i>n</i> = 20), Australia (6%, <i>n</i> = 17), Norway (5% <i>n</i> = 14), France (3%, <i>n</i> = 8), Canada (3%, <i>n</i> = 8), South Africa (2%, <i>n</i> = 6)
Gender	Female (96%, <i>n</i> = 270), Male (4%, <i>n</i> = 11)



**Figure 1:** The types of cancer compared with the number of participants who have had experience with equine cancer; Sarcoids (93%, *n* = 261), Melanomas (35%, *n* = 98), Squamous Cell Carcinomas (20%, *n* = 56), and Lymphosarcomas (13%, *n* = 37).



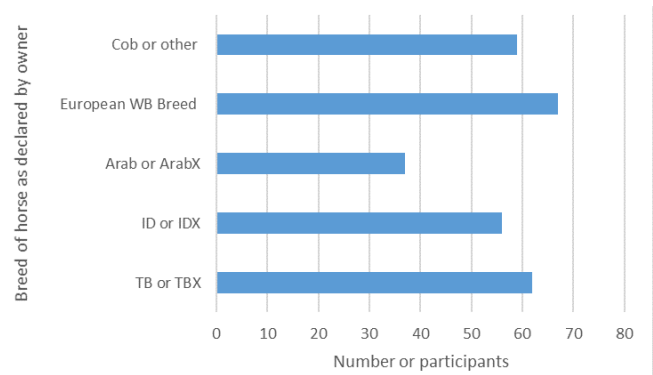
**Figure 2:** The age categories of horses as declared by participants of questionnaire; Below 4 years (9%, n = 25), 4–10 years of age (43%, n = 121), 10–16 years of age (22%, n = 56), and 16 years and above (26%, n = 73).

75% (n = 211) of horses were declared as geldings when the cancer was diagnosed, 22% (n = 62) were declared as mares, and 3% (n = 8) were declared as stallions.

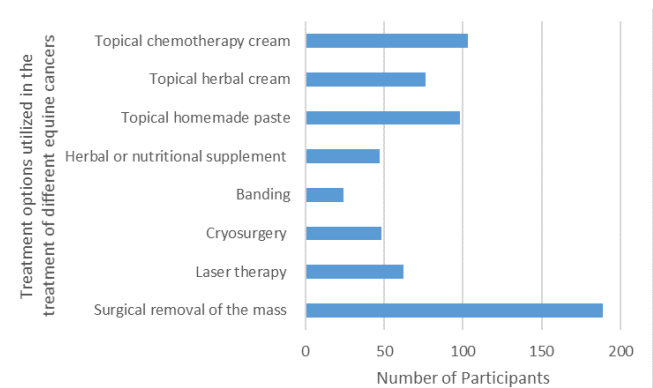
80% (n = 225) of participants stated that they had sought and received a confirmed veterinary diagnosis for the cancer present in their horse, while the remaining 20% (n = 56) had not received a confirmed veterinary diagnosis. Visual diagnosis of the cancer type was the most utilized method for diagnosing the cancer in horses, with 98% (n = 275) relying on visual inspection. All participants who had not sought veterinary diagnosis relied on their own visual inspection to diagnose the cancer in the horse. All participants mentioned visual inspection, and "evidence of a visible mass" was mentioned by all participants, regardless of whether self or veterinary diagnosis was utilized.

There was no statistically significant association between the breed of the horse and the type of cancer declared by the owner, regardless of whether a veterinary diagnosis was present ( $p > 0.05$ ). However, horses whose owners sought veterinary diagnosis were analyzed alone, and the breed did demonstrate an association with the type of cancer declared by the owner ( $X^2(9) = 10.78, p < 0.05$ ). The highest incidence rates were demonstrated in Arabs and Arab crosses associated with melanomas and TB and TB crosses associated with sarcoid presence (Figure 3). There was no association between the sex of horses and the types of cancer present within the individuals ( $X^2(6) = 1.25, p > 0.05$ ). There was a statistically significant association between the age of horses and the type of cancer they presented with ( $X^2(9) = 13.56, p < 0.05$ ). Horses in the older category (16+ years old) demonstrated a greater incidence of Lymphosarcomas than the other age categories (n = 28).

There was a significant association between the type of cancer diagnosed and the treatment options explored by participants ( $X^2(6) = 8.72, p < 0.05$ ). Different treatment methods were highlighted by participants for the different cancers, with several participants using multiple treatment methods in conjunction with one another (Figure 1). Typically, the topical chemotherapy treatments used by participants were AW4 – LUDES and AW5 cream. The topical herbal creams typically included ingredients such as Thuja, Mistletoe, and Echinacea. Homemade topical treatments included ingredients such as flour, water, sugar, manuka honey, turmeric, and toothpaste (Figure 4).



**Figure 3:** The breed of horses as declared by participants of questionnaire; TB or TBX (22%, n = 62), ID or IDX (20%, n = 56), Arab or ArabX (13%, n = 37), European WB Breed (24%, n = 67), and Cob or other (21%, n = 59).



**Figure 4:** Treatment options utilized in the treatment of different equine cancers; Surgical removal of the mass (n = 189), Laser therapy (n = 62), Cryosurgery (n = 48), Topical chemotherapy cream (n = 103), Topical herbal cream (n = 76), Topical homemade paste (n = 98), Herbal or nutritional supplement (n = 47), and Banding (n = 24).

All respondents who had sought veterinary diagnosis, when asked about the prognosis provided by the veterinarian, declared that their horse would continue to have "a good quality of life." All commented on the management of the cancer being positive even if treatment did not eradicate; there was an emphasis on trying to maintain the horse's welfare. There was an association between the treatment method utilized and the perceived success of the treatment by the respondents ( $p > 0.05$ ). Combination treatments were associated with a higher perceived success rate in the treatment of equine cancer compared to single treatment methods ( $X^2(1) = 12.43, p < 0.05$ ). There was no association between the type of treatment utilized and the perceived success rate of the participants.

### 3.3. Participants Experience with Equine Oncology – Case Study results

A total of 164 participants provided additional information regarding specific case studies involving equines they are responsible for, including image evidence of the cancer and before and post-treatment images. Of the 164 participants who sent case studies, 38 had not sought a veterinary diagnosis, while the remaining 126 had a confirmed veterinary diagnosis for the present cancer. Additional analysis related to the previous questionnaire result analysis from the case

studies included the location of the cancer as confirmed by image evidence, the size of the skin tumor as confirmed by the owner's description, and the success of treatment as provided by image evidence and participant commentary where applicable.

All case study horses presented with skin tumors in the images. Some had multiple sarcoids in a single image, resulting in 258 tumors being presented. However, in 18 of the case study horses, the photographs were not clear enough to categorize the tumor based on tissue morphology. The photographic evidence demonstrated a variety of tumors with different tissue morphology, including hairless circles flush to the skin, protruding wart-like growth with thickened nodules, smooth and firm protruding growth, and ulcerated protruding mass. Most of the tumors presented were smooth and firm protruding masses ( $n = 146$ ), hairless circles ( $n = 56$ ), protruding wart-like growth ( $n = 32$ ), and ulcerated protruding mass ( $n = 24$ ).

Of the 164 case study horses, the most common site of cancer development was the genitals and groin area, with 114 horses presenting with tumor development in this area. The remaining locations on the body where the cancer developed were the head and neck ( $n = 30$ ), the legs ( $n = 18$ ), and the main body mass ( $n = 2$ ). Regarding tumor size, 11 horses (7%) presented with skin tumors smaller than 2 cm in diameter at their widest part, 82 horses (50%) presented with tumors between 2–5 cm in size, 69 horses (42%) presented with tumors 5–10 cm in size, and 2 horses (1%) presented with skin tumors greater than 10 cm (Figure 5).

Of the 164 case studies presented, 96 provided additional photographic evidence of the skin tumor before treatment commencement and following treatment. Images of tumors before treatment were provided at different stages of development. Some individuals provided images from the date of detection, some from the date of veterinary diagnosis, and others from the date that treatment commenced. The images of the tumors after treatment were taken at various stages, ranging from 1 week after treatment to one year after treatment. Of the 96 participants who submitted the images, 90% ( $n = 86$ ) presented images that they determined as successful. These participants made comments relating to tumor size decreasing, changes in tissue morphology, and horse behavior related to discomfort. The remaining 10% ( $n = 10$ ) submitted images of tumors following treatment that they did not deem successful. These participants made comments relating to tumor size increasing or remaining the same, an increase in horse discomfort, and negatively perceived tissues morphology changes, such as bleeding.

### 3.4. Participants Experience with Equine Oncology – Social Media Analysis

A total of 243 social media posts were analyzed concerning their content relating to equine cancer: diagnosis, treatment, and prognosis. Social media analysis indicated a strong community support system, with many users sharing personal experiences and advice on managing equine cancer. Keywords frequently associated with equine oncology in social media posts included "treatment," "hope," "support," and "awareness."

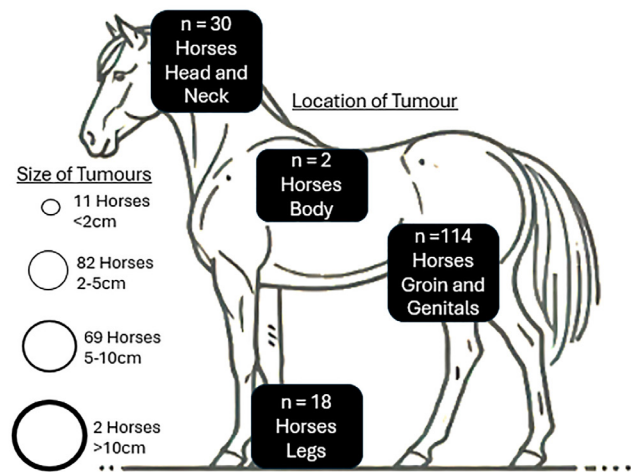


Figure 5: Location and size of tumors in case study horses ( $n = 164$ ) presented for case study analysis.

All posts were divided into three categories: those relating to seeking aid in the diagnosis of equine cancer ( $n = 60$ ), those seeking advice on treatment options available for cancer following diagnosis ( $n = 147$ ), and those raising awareness of treatment options previously utilized and the subsequent prognosis ( $n = 26$ ).

60 posts were categorized due to the post asking the public/social media members to aid in the diagnosis of suspected equine cancer presence. None of the respondents in the comments of these posts who gave advice regarding diagnosis, all analyzed within 24 hours of posting, declared previous veterinary experience as their reasoning behind their "diagnosis." Several comments advised the original poster to seek the advice of a veterinarian. This advice was present on 16 of the 60 categorized posts.

Participants reported using a variety of sources on social media to seek advice on the treatment of equine cancer. The most frequently cited sources included veterinary professionals and clinics (45%), Equestrian influencers and bloggers (35%), Equine health organizations (30%), and personal anecdotes and experiences from other equestrians (60%). Treatment success varied within those relating to prognosis, with 50% ( $n = 13$ ) reporting positive outcomes, 30% ( $n = 8$ ) reporting mixed results, and 20% ( $n = 5$ ) reporting negative experiences. Common treatments mentioned included surgery, chemotherapy, and radiation therapy alongside alternative treatments such as topical cream application, alternative therapies, and herbal product application.

The analysis of social media posts showed a significant amount of engagement, with posts about treatment options particularly receiving an average of 67 likes and 12 comments. The sentiment analysis of these posts revealed a predominantly positive tone, with 70% ( $n = 862$ ) of all comments ( $n = 1232$ ) offering support and encouragement to the original poster. Common forms of positive support included content referring to emotional encouragement,

practical advice, shared experiences, and recommendations for care, treatment, and veterinary support.

#### 4. Discussion

This research investigated knowledge, perceptions, and experiences with domestic horse oncology. The study explored a comprehensive examination of the diagnosis and treatment options sought within equine oncology through dual data collection methods, which included participant questionnaires and analysis of social media posts. Incident rates for equine cancer have not been accurately established to a significant extent globally [35]. The current study's results included 16 nationalities being represented, providing a global perspective on the incidence rates of different cancers. For future research, emphasis could be placed on comparing incidence rates across different countries to determine whether this correlates with increased incident rates in specific cancers.

Knowles *et al.* [10] analyzed records from a database containing neoplastic equine histology submissions from 1982–2010, with 964 cases examined. They found that the majority of tumor types were sarcoids (24%), which aligns with the current study's finding that 93% of participants had experience with sarcoids. Knowles *et al.* [10] also identified submitted cases of gonadal stromal tumors or mast cell tumors (MCT) in their study, while no individuals in the current study mentioned their horses suffering from gonadal stromal tumors or mast cell tumors. This could have been due to the breeds of horses included in the current study or lack of owner and veterinarian knowledge regarding the symptoms associated with these tumors. Regarding breed, both the current study and Knowles *et al.* [10] found that Thoroughbred and Thoroughbred cross individuals had an increased risk of sarcoid development.

Knowles *et al.* [10] found that Cob/Cob crosses had an increased risk of SCC and MCTs, and Arab and Arab crosses were at a higher risk of developing Mast Cell Tumors. In comparison, within the current study, Arab/Arab crosses were statistically associated with melanoma development, and Cob/Cob crosses did not associate with any particular tumor development. Melanoma has been recognized to appear most frequently in specific equines, with figures showing 80% of these cases have appeared in grey horses, indicating genetic predisposition [36]. The current study did not ask for the color of the horses, although the case studies would have provided this for some of the individuals in which images were clear enough. In the future, further information from participants, including coat color, could be obtained to assess their association with specific tumor development. Knowles *et al.* [10] also found that mares were at a reduced risk of SCC, and the current study found that there was no association between the sex of horses and the types of tumors presented in the current study.

Hollis [37] discusses the evidence behind the most used treatments for equine sarcoids, ultimately concluding that no one treatment is universally successful, and there are many treatments with varying levels of scientific evaluation and reported success rates. This would relate to the current study's findings of varying treatment options being employed by horse owners for various tumor types. Previous studies have identified the success of surgery, chemotherapy,

radiotherapy, and immunotherapy to treat sarcoid patients [16,38,39]; however, the difficulty lies with the varying success of cheaper, more accessible options employed by horse owners. Unfortunately, due to no treatment modality being proven to be the singular most effective when attempting to treat equine patients diagnosed with sarcoid tumors [38,40], this opens the door to less scientifically grounded methods of treatment and potentially even those that may impact equine welfare in a negative manner. In addition to this, limitations due to tumor size and the severity of tissue invasion may make the surgical removal of the tumor impossible in advanced cases [41]. These instances require the use of drugs such as chemotherapy but are often complicated because of inconsistent results and costs [41]. Pitman [42] states that due to a lack of research and reported incidence within equine cancer, limitations are apparent within the development of treatment options, further suggesting the challenges including cost and limited information for horse owners and carers to restrict the conduction of reliable studies to develop a greater level of understanding.

Most participants had a gelding (75%), and most case study horses (n = 114) presented with tumors in the groin and genital area. Penile SCCs are a common, potentially life-threatening neoplasm, thought to be commonly caused by Equine caballus papillomavirus (EcPV) [23]. Giuliano [43] declared squamous cell carcinoma (SCC) as the most prevalent tumor affecting the equine eye and equine genitals worldwide. For the current study, sarcoids were declared the most common tumor seen in participants' horses; however, this could be due to the Facebook groups participants were recruited from causing a bias in results. With SCCs, if the tumors are minor or recognized as carcinomas in situ, surgical excision of the SCC may be sufficient [44]. However, inadequate surgical excision has been reported to cause tumor recurrence, concluding this method of treatment success rate to not be the best practice [45]. A larger scale more focused study on genital tumors in male horses is needed to assess the incidence rates and to make any associations between age, breed and castration status.

While earlier studies have explored the varying processes to diagnose equine cancer with a need for veterinarian physical examination [9], they have not explicitly addressed the use of social media within an owner's remit of diagnosis. The results of this study indicated a strong correlation between the various veterinary treatment modalities, with combination therapies being perceived as more effective than individual ones. With owners' views being positive in relation to cancer management, focusing on maintaining the horse's welfare even if the treatment did not eradicate the cancer. Social media analysis highlighted owners seeking support from alternative sources as opposed to a veterinary diagnosis, indicating further support for equine ownership is necessary in relation to cancer.

Through the analysis of questionnaire results, our study suggests that participants use a variety of sources on social media to seek advice on the treatment of equine cancer. The results demonstrate that social media is a vital resource for equestrians regarding equine cancer, significantly enhancing knowledge and providing emotional support. However, the presence of misinformation highlights the necessity for improved information accuracy and expert involvement. Leveraging social media's strengths while

addressing its weaknesses can further benefit the equestrian community in managing equine cancer. However, the obvious reliance of equine owners on the support of peers when investigating abnormalities within their equine suggests a lack of veterinarian investigation being sought due to the owner's need for emotional support or reassurance in these circumstances, which may result in misinformation being provided, and a delay in care being obtained. In relation to existing research [32], our research voids the gap between veterinary diagnosis and seeking advice through social media, suggesting that 70% of post responses are positive and helpful, in turn leaving 30% of responses being unhelpful or inclusive of misinformation. In relation to the questionnaire, there was a significant association between the type of cancer diagnosed and the treatment options explored ( $X^2(6) = 8.72, p < 0.05$ ), which is supportive of equine owners seeking veterinary input into diagnosis. However, 38 of 164 participants who provided case studies had not sought veterinary diagnosis, instead relying on image evidence and support group input into their presumed diagnosis based upon appearance, location, and other owners' experience.

Recent observations suggest that there is extensive research and knowledge of common types of cancer and treatment options available; however, these are not always plausible for equine owners to access, which results in them seeking support online and undertaking self-treatment options as a primary action. However, as Durham [32] suggests, the goal of equine clinicians is early cancer detection, with a priority to treat the oncology patient and improve its quality of life. Our findings provide conclusive evidence that this phenomenon is associated with a need for greater support for the owner than is able to be provided by a veterinary professional, resulting in social media support being pursued, sometimes as the only source of diagnosis. Further research into the reasons behind this would be of benefit to aid in a greater support network with solely reliable input being provided. This would be in keeping with Smith *et al.* [46], who discuss appropriate treatment methods and choices made by the owner being dependent on personal beliefs and often result in inexperienced and inadequate self-treatment options.

## 5. Limitations

This study employed an online survey and social media analysis to collect data on equine oncology experiences. However, it has several notable limitations which could affect the overall validity and reliability of its findings.

One significant limitation of this study is the reliance on self-reported data from participants. Although the survey includes questions on equine cancer diagnoses, symptoms, and treatments, these responses heavily rely on the participants' recollection and interpretation of their experiences. Memory biases and misinterpretations of events or symptoms could lead to inaccurate reporting. Moreover, self-diagnosis of cancer, particularly for respondents who did not seek veterinary advice, may introduce substantial errors in data accuracy. Participants who based their assessment on visual inspection might misclassify other health issues as cancer, which can distort the results.

Another limitation arises from the sample composition. Despite including participants from multiple nationalities, the majority (67%) are from the UK, with females comprising 96%

of the participants. While this might reflect the demographics of equestrians, it limits the generalizability of the findings to a broader population of horse owners. This underrepresentation of males and other nationalities means the results may not accurately reflect the experiences or practices of the global equestrian community, particularly in regions with different veterinary practices or cancer awareness levels.

The use of social media platforms and equestrian-specific groups for recruiting participants and obtaining case studies introduces selection bias. Individuals active in such groups may already have a heightened interest or awareness in equine cancer, leading to an overrepresentation of highly engaged or informed participants. Additionally, the study may overlook the perspectives of horse owners who do not participate in these online communities, thus limiting the diversity of experiences and knowledge within the sample. This is particularly important when analyzing social media posts, as the content might be skewed towards individuals who are more vocal or actively seek advice and support on these platforms.

A significant portion of the survey and social media data relies on visual diagnosis or owner assumptions without veterinary confirmation, posing a challenge to the study's diagnostic reliability. Without consistent professional diagnosis across all cases, it is difficult to determine the true prevalence and type of equine cancers. This limitation introduces the possibility of misclassification, as what one participant identifies as sarcoids may be an entirely different condition. This affects the study's ability to draw accurate conclusions about the types and distribution of cancers in the equine population.

Although the survey included a mix of binary, multiple-choice, and open-ended questions, the structure may still limit the depth of responses. While open-ended questions allow for nuanced answers, they also make it challenging to ensure consistency in the data provided. Respondents may interpret questions differently, leading to variability in the quality and scope of the answers. Additionally, while the survey was piloted on a small group of participants, a broader pilot might have uncovered issues related to question phrasing or answer categorization that could enhance clarity and consistency in responses.

In summary, while the study provides useful insights into equine oncology from a large sample of participants, its reliance on self-reported data, non-random sampling, and lack of consistent professional diagnostic validation are key limitations that may affect the generalizability and accuracy of its conclusions.

## 6. Conclusion

In conclusion, the results of this study offer valuable insights into the experiences and knowledge of equestrians regarding equine cancer, highlighting significant trends in diagnosis, treatment, and prognosis. The participant demographic demonstrated strong representation from the UK, with females dominating the responses. Experiences with sarcoids were overwhelmingly common, with veterinary diagnosis sought by a majority of participants. Notably, breed and age were significantly associated with specific cancer types, particularly melanomas in Arabs and sarcoids in TB crosses, echoing findings from prior research on breed predispositions

to equine cancer. The association between combination treatments and higher perceived success rates also aligns with literature advocating for multimodal approaches in cancer treatment. Social media emerged as an essential platform for community support and shared experiences, although the prevalence of misinformation underscores the need for expert-led guidance. These findings contribute to the growing body of literature on equine oncology, particularly in the context of breed-specific risks and the evolving role of social media in equestrian health care, as observed in prior studies on digital health communication and animal welfare.

### Authors' Contribution

Conceptualization; G.B., methodology; G.B., formal analysis; G.B., writing original draft preparation; G.B. & J.W., writing review and editing; G.B. and J.W. All authors have read and agreed to the published version of the manuscript.

### Data Availability

The data supporting the findings of this study are available within the article.

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The research did not receive any funding.

### Conflicts of Interest

The authors declare that there are no conflicts of interest.

### Ethical Approval

Data collection adhered to the DN Colleges Ethical Policy and followed the guidelines of the Declaration of Helsinki.

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