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Survey of the knowledge and perceptions of horse owners in Ireland of common clinical conditions and their impact

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Abstract

Background: As the primary decision-maker for their horse's health and welfare, owners' knowledge of clinical conditions may impact their horse's health. Anecdotal evidence suggests that the emotional impact of equine illness on the owner can be severe but research is lacking.

Objectives: To evaluate horse owners' self-declared knowledge of eight common equine health conditions and perceptions of the quality of information available; to ascertain respondents' perceptions of the severity of impact on their horse of the conditions and potential emotional impact on themselves and to establish the factors of greatest concern to owners when their horse has a health condition and influential factors on end-of-life decisions.

Study design: Online survey of horse owners.

Methods: An online survey comprising three sections was created: respondent demographics; vignettes of clinical conditions; concerns and decision-making regarding illness and euthanasia. Vignettes focused on arthritis; Pars Pituitary Intermedia Dysfunction; Equine Metabolic Syndrome (EMS); gastric ulcers; high intestinal worm burden; dermatophilosis ('mud rash'); quidding and head tossing; and equine asthma. Respondents were self-selecting. The survey was circulated for completion by horse owners residing in Ireland and Northern Ireland obtaining 491 valid responses.

Results: Respondents declared that they had the highest knowledge of mud rash, with 84.1% rating their knowledge as very good compared to 42% of respondents for EMS. There was positive correlation between the perceived impact on their horse and emotional impact on the owner for all conditions ranging from weak (arthritis 0.36, $P < 0.001$) to strong (EMS 0.62, $P < 0.001$). Pain, discomfort, and quality of life were reported as the most common concerns when their horse has a medical condition or when considering euthanasia.

Main limitations: Potential bias among respondents towards computer literate owners, with good literacy and interest in equine health conditions.

Conclusions: Knowledge of equine health conditions, perceived impact of conditions on the horse and emotional impact on their owners varied significantly between conditions.

KEYWORDS
decision-making, emotional impact, euthanasia, horse, owner knowledge, welfare

1 | INTRODUCTION

Horse owners can expect to encounter some form of chronic or management-related equine health conditions throughout their horse's life with large scale surveys showing that approximately one-third of horses will suffer from at least one health condition each year.[1,2] As the primary decision-maker for their horse's health and welfare, owners' knowledge of clinical conditions may potentially impact their horse's immediate and ongoing health. It has been shown in humans that poorer health literacy and knowledge of chronic conditions such as diabetes and HIV are correlated with poorer management of these conditions.[3,4] Similarly, horse owners' experience and level of knowledge about equine healtconditions may be factors in equine disease management; owners of equines with severe equine asthma were more accurate in their assessment of treatment efficacy than clinicians and may therefore play a vital role in disease management.[5] Conversely, under-recognition of signs of disease has been highlighted as resulting in potential treatment delays.[6]

The emotional bond between owners and their horses is often considerable and anecdotal evidence suggests that the impact of equine illness on the owner can be severe. There has been some research into the effects on owners of the death and euthanasia of their horse(s)[7] and other companion animals[8,9]; however, to date there has been no research on the emotional impact of equine illness specifically on owners.

This study aimed to evaluate respondents' self-declared knowledge of eight common equine health conditions and their perceptions of the quality of information currently available relating to those conditions. The study also sought to ascertain the respondents' perceptions of the potential severity of the impact on their horse of the eight conditions and the potential related emotional impact on themselves of those conditions occurring in their own horses. In addition, respondents were asked about the factors of greatest concern to them when their horse has a medical condition and those factors that have the greatest influence on end-of-life decisions.

2 | MATERIALS AND METHODS

2.1 | Survey design

The survey consisted of three sections: respondent demographics; vignettes of clinical conditions; and concerns and decision-making regarding equine illness and euthanasia. The full survey questionnaire is provided as a supplementary item (Supplementary Item 1). Demographic data gathered in the first section included:

- Owner experience based on their confidence and knowledge level, rather than years of horse/pony ownership.
- Number of horses owned.
- Owner type (options: amateur rider or pony(ies)/horse(s) kept for companionship; competing amateur; non-competing professional; competing professional; other). Owner types were modified from Scantlebury et al.[10]
- Breed(s) owned (options: Connemara or Connemara cross Ponies ('Connemaras'); Thoroughbreds and other hot-blooded breeds ('Thoroughbreds'); Standardbreds ('Trotters'); Sport Horses and other Warmbloods ('Sport Horses'); Draft horses and other cold-blooded breeds ('Drafts'); Cobs; Ponies including Welsh cobs and other native breeds and everything under 14.2hh ('Ponies'); Other).

Respondents were presented with vignettes depicting a typical scenario for each clinical condition involving a veterinary diagnosis of said condition. Clinical conditions were selected based on the following criteria:

- Have a prevalence among the general horse and pony population of the UK and Ireland of more than 10%. True prevalence among all ages and breeds of horses in the UK and Ireland is difficult to ascertain due to the differing study populations therefore some extrapolation from studies with narrower inclusion criteria or from locations with similar management regimes was made. References for prevalence are provided in the next paragraph;
- Be such that management practices have a strong influence on the development and/or management of the condition;
- Not be contagious - High worm burden was considered as infectious but not contagious;
- Not be a disease affecting a single breed of horse or pony exclusively.

The conditions selected were: arthritis (prevalence data from[6,11]); Pars Pituitary Intermedia Dysfunction (PPID)[12,13]; Equine Metabolic Syndrome (EMS)[14,15]; gastric ulcers[16]; high intestinal worm burden (HWB)[17]; dermatophilosis ('mud rash')[18]; quidding and head tossing[6]; equine asthma.[19]

Where nomenclature has evolved and/or where respondents were more likely to know a condition by a particular name, that name

was used, for example, Cushing's Disease. Conditions were presented in alphabetical order.

The clinical conditions were presented in a narrative context using vignettes. Following each vignette, respondents were asked to rate, using Likert scales (options in brackets):

- Their knowledge of the condition based on the following: how to recognise it; how a vet would diagnose it; how it is treated or managed; whether it can be cured. Possible responses included: I have never heard of it; I only recognise the name; I have knowledge of one of the above; I have knowledge of two of the above; I have knowledge of at least 3 of the above.
- Perception of likelihood that their horse/pony will develop the condition (Likert Scale: highly unlikely; unlikely; likely; very likely; my horse or pony has already contracted this condition).
- Perceived impact on the horse's comfort level (Likert Scale: unaffected; mildly affected – occasionally/mildly uncomfortable; moderately affected – often/moderately uncomfortable; very affected – constantly/severely uncomfortable).
- Perceived impact on the horse's activity levels (Likert Scale: unaffected; mildly affected – less active/performance mildly compromised; moderately affected – much less active/performance compromised; very affected – almost completely inactive).
- Perceived emotional impact on the owner (Likert Scale: not worried; it would be at the back of my mind; I would be very conscious of it; it would cause me considerable stress; it would definitely keep me up at night).
- Availability and suitability of information available online (if applicable) (Likert Scale: I have never searched for information on this condition; there is no information available; the available information is too complex and/or out of date; there is limited availability of easy to understand and up-to-date information; there is broad availability of easy to understand and up-to-date information).

The third section of the survey consisted of two questions. The first of these asked respondents to select the three factors that would concern them the most when their horse or pony has a medical condition. The options given were: pain and discomfort; cost of treatment and management changes (e.g., change to a more expensive diet); challenges of future management (e.g., managing dust in the yard, time consuming care); loss of monetary value and income; re-homing potential and management compliance by future owners; effect of the condition on quality of life; inability of the pony/horse to carry out its normal activity now and in the future.

The second question asked respondents to choose the five factors that would have greatest influence on their decision to euthanise their horse/pony. The options given were: vet advice; emotional bond with the pony/horse; cost of treatment; age of the pony/horse; effect of a condition on quality of life; pain and discomfort; prior experience of the same condition; likelihood that the condition will reoccur or that the symptoms will resolve; inability of the pony to carry out its normal activity; monetary value of the pony/horse; body disposal concerns.

For both questions respondents were given the option to provide a freeform text answer. The options given were devised by the researchers based on their experiences as horse owners and/or equine vets. When analysing these responses, any respondent who selected more than the requested number of factors was excluded from that particular analysis. Prior to starting the survey respondents were told that it would take approximately 20 min. This was based on feedback from pilot respondents.

The survey was piloted on 15 respondents. These were personal contacts of two of the researchers and were selected to give a range of experience, types of owners, and to ensure that the survey was trialled by owners in both Ireland and Northern Ireland, to account for any terminology differences. They were asked to complete the survey and either provide comments at the end or on each page, or to complete the survey while on a video call with one of the researchers. Trial respondents were asked to provide feedback on the length of the survey, ease of completion, understanding of questions and anything that they would recommend changing. Minor changes were made to the language used in the survey as a result.

2.2 | Survey distribution

The survey was hosted online (Survey Monkey Europe UC) from 7 July to 3 August 2020. The final survey was circulated to the wider Irish equine community using the following channels - email to all affiliates of Horse Sport Ireland (https://www.horsesportireland.ie/about/affiliates), published in The Irish Field newspaper (https://www.theirishfield.ie/horse-sense-what-effect-does-a-sick-horse-have-on-an-owners-well-being-560121) and shared on UCD Veterinary Hospital's social media accounts (https://www.facebook.com/ucdvet/ and https://twitter.com/ucdvetmed?ref_src=twsrc%5Egoogle%7Ctwcamp%5Eserp%7Ctwgr%5Eauthor). Respondents comprised a self-selecting convenience sample of the horse-owning population residing in Ireland and Northern Ireland. An incentive of the option to enter a draw for a €80 voucher for an equestrian store was used to encourage participation.

In order to take part in the survey, respondents were required to give consent by ticking a box after receiving information regarding the survey. Respondents were informed that they could withdraw consent by not completing the survey and that incomplete responses would not be analysed. All survey responses were collected anonymously, downloaded and subsequently deleted from the online hosting site. Email addresses were collected separately if respondents wished to enter the draw, used only for the purpose of selecting and contacting the winner and then immediately deleted.

2.3 | Data analysis

Data were exported from the online hosting site (Survey Monkey) to spreadsheets (Microsoft Excel for Microsoft 365 MSO) and analysis was performed using SPSS v.26 (IBM Corp, 2016). Kruskal–Wallis test was used to determine the differences in the respondents' estimation of the likelihood of their horse contracting a condition based on the type of horse owned, with Dunn's pairwise comparisons conducted post hoc on the two conditions reporting significant differences. Post-

hoc alpha levels were adjusted using Bonferroni correction for multiple comparisons and adjusted *P* values are reported with a significance level of 0.05. Friedman tests were performed to rank conditions by knowledge level, perceived impact on horses and emotional impact on respondents. Post-hoc pairwise comparisons using Wilcoxon were made with alpha levels adjusted using the Bonferroni correction for multiple comparisons and adjusted *P* values are reported with a significance level of 0.05. Spearman rho tests were used to assess strength and direction of association between two variables. R coefficients are reported. Where all conditions were tested, alpha levels were manually adjusted using Bonferroni correction for multiple comparisons. Unadjusted *P* values are reported and the significance level in these cases is 0.006 due to the same test being repeated for each of the 8 conditions (0.05/8). Fisher's Exact Tests were used to determine the effect the scenario whereby a horse had already contracted a specific condition had on the respondents' responses to certain questions. Where all conditions were tested, alpha levels were manually adjusted using Bonferroni correction for multiple comparisons. Unadjusted *P* values are reported and the significance level in these cases is 0.006 due to the same test being repeated for each of the eight conditions (0.05/8). Fisher's Exact Tests were used to determine if owner demographics affect the factors of most concern to them when faced with the scenario that a clinical diagnosis was made in their horse or pony. Alpha levels were manually adjusted using Bonferroni correction for multiple comparisons. Unadjusted *P* values are reported and the significance level in these cases is 0.007 (i.e., 0.05/7). Fisher's Exact Tests were used to determine if owner demographics affect the factors that would influence an owner's likely decision regarding euthanasia. Alpha levels were manually adjusted using Bonferroni correction for multiple comparisons. Unadjusted *P* values are reported and the significance level in these cases is 0.005 due to the same test being repeated for each of the 11 factors (0.05/11).

3 | RESULTS

In total 734 respondents started the survey. Respondents who did not consent to taking part ($n = 5$), whose country of residence was not Ireland or Northern Ireland ($n = 15$) or did not own a horse/pony ($n = 42$) were removed from analysis. An additional 161 respondents did not complete all questions in the survey and their responses were removed from analysis, leaving 491 valid, complete responses. The average time taken by the majority of respondents (85.33%, $n = 419$) deemed to have completed the survey on first attempt (within 1 h of starting the survey) was 12 min 35 s.

3.1 | Demographics

47.7% of respondents ($n = 235$) identified as experienced, 30.8% ($n = 152$) were very experienced and 19% ($n = 94$) had some experience. Only 2.4% ($n = 12$) were novices. The majority of respondents were owners only (73%; $n = 360$), whilst 27% ($n = 131$) were both owners and responsible for horses that they do not own. Nearly half of respondents described themselves as competing amateurs (44.6%; $n = 220$) with amateur riders or keeping horses for companionship (37.7%; $n = 186$) making up the majority of the remainder. Non-competing (13.2%; $n = 65$) and competing (4.5%; $n = 22$) professionals constituted the rest of the respondents. The majority of respondents (58.4%; $n = 288$) owned one or two horses, 25.4% ($n = 125$) owned between three and five and the remainder owned over six horses, with a small proportion (6.3%; $n = 31$) owning more than 10. Connemara ponies (34.9%) and Sport Horses (31.9%) were the most popular breeds/types owned (Figure 1).

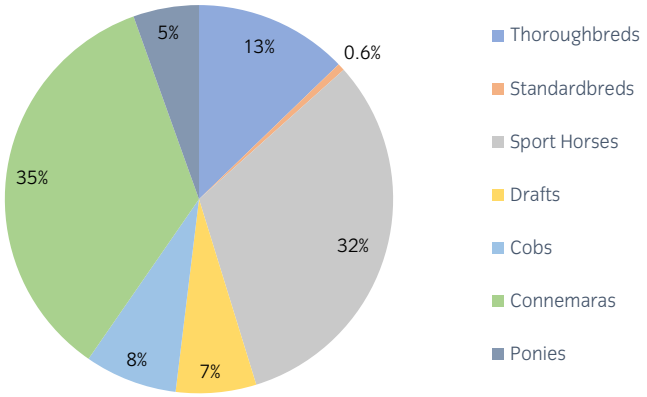

FIGURE 1 Breeds/types of horses and ponies owned by respondents ($n = 491$) to an online survey of the knowledge and perceptions of horse owners in Ireland of common clinical conditions and their impact. Thoroughbreds includes thoroughbreds and other hot-blooded breeds; Sport Horses includes sport horses and other warmbloods; drafts includes draft horses and other cold-blooded breeds; Connemaras includes purebred and Connemara cross ponies; ponies are defined as under 14.2 hands and includes Welsh cobs and other native breeds.

3.2 | Perceived likelihood of diagnosis

Mud rash was the most common condition which had been previously encountered by respondents (17.7%), followed by arthritis (11.6%). The conditions which had been previously encountered by respondents less commonly were a high worm burden (3.3%), and EMS (4%). PPID, gastric ulcers, quidding and equine asthma were reported by 6 to 10% of respondents (Figure 2). Respondents with no previous direct experience of the conditions reported on their perception of how likely it was that their horse might contract this condition in its lifetime and the responses are detailed in Figure 3.There was no difference in the prediction of a future diagnosis of a condition between owners of different breeds, with the exceptions of EMS ($P < 0.001$) and gastric ulcers ($P < 0.001$). Pairwise comparisons showed that owners of Thoroughbreds thought that their horses were less likely to be

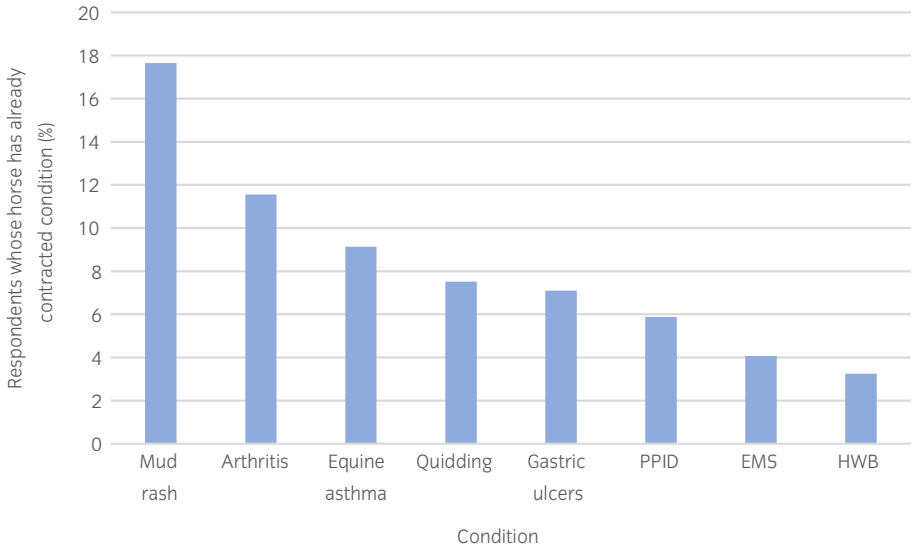

FIGURE 2 Percentage of respondents ($n = 491$) whose horse(s) had already been diagnosed with one or more of various conditions from an online survey of the knowledge and perceptions of horse owners in Ireland of common clinical conditions and their impact. PPID, pituitary pars intermedia dysfunction; EMS, equine metabolic syndrome; HWB, high worm burden.

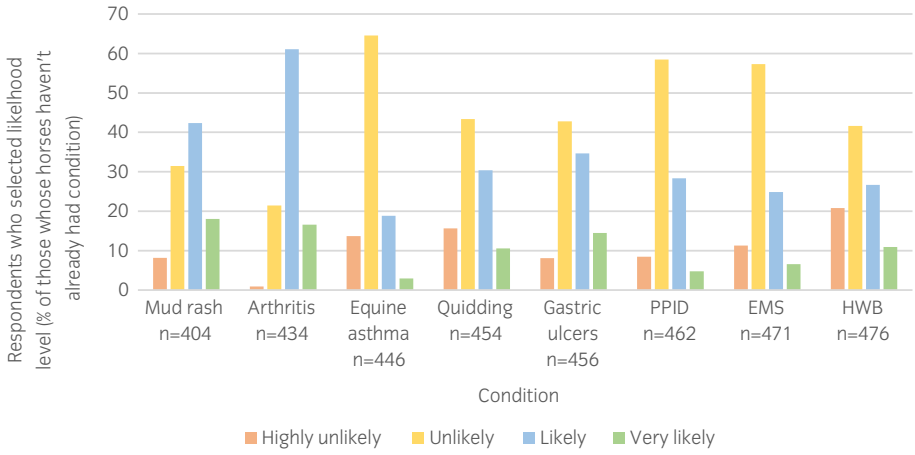

FIGURE 3 Respondents' perceptions of the likelihood that their horse would be diagnosed with various conditions from an online survey of the knowledge and perceptions of horse owners in Ireland of common clinical conditions and their impact. Respondents whose animals had already been diagnosed with these conditions were excluded. PPID, pituitary pars intermedia dysfunction; EMS, equine metabolic syndrome; HWB, high worm burden.

diagnosed with EMS in future than did owners of Connemaras ($P = 0.01$), cobs ($P = 0.007$), and ponies ($P = 0.004$). In addition, owners of Thoroughbreds thought that their horses were more likely to be diagnosed with gastric ulcers in future than did those of ponies ($P < 0.001$), drafts ($P < 0.001$), cobs ($P = 0.001$), Connemaras ($P < 0.001$) and Sport Horses ($P = 0.003$).

3.3 | Self-rated knowledge of conditions

Overall, respondents reported that they had the highest knowledge of mud rash, with 84.1% rating their knowledge as very good compared to 42% of respondents for EMS. EMS was the condition in which the highest proportion of respondents reported that their knowledge was very poor with almost 1 in 5 stating that they had never heard of the condition. Less than 1% of respondents said the same about mud rash, arthritis or gastric ulcers (Figure 4). There was significant difference between knowledge levels of the eight conditions, with lowest self-rated knowledge relating to EMS and highest relating to mud rash ($P = < 0.001$). Effect sizes for pairwise comparisons are displayed in Table 1.

Respondents whose horse had previously been diagnosed with a specific condition were more likely to rate their knowledge of that condition as good or very good for all conditions except high worm burden and mud rash (arthritis: 96.5% of disease-experienced respondents rated their knowledge as good or very good versus 80% of disease-naïve respondents, $P = 0.001$; PPID: 93.1% of disease-experienced versus 67.7% of disease-naïve respondents, $P = 0.003$; EMS: 100% of disease-experienced respondents versus 52.4% of disease-naïve respondents, $P < 0.001$; ulcers: 97.1% of disease-experienced respondents versus 76.3% of disease-naïve respondents, $P = 0.002$; high worm burden: 93.3% of disease-experienced respondents versus 84.9% of disease-naïve respondents, $P = 0.7$; mud rash: 98.9% of disease-experienced respondents versus 90.8% of disease-naïve respondents, $P = 0.007$; quidding: 100% of disease-experienced respondents versus 83% of disease-naïve respondents, $P = 0.002$; equine asthma: 93.3% of disease-experienced respondents versus 66.6% of disease-naïve respondents $P < 0.001$).

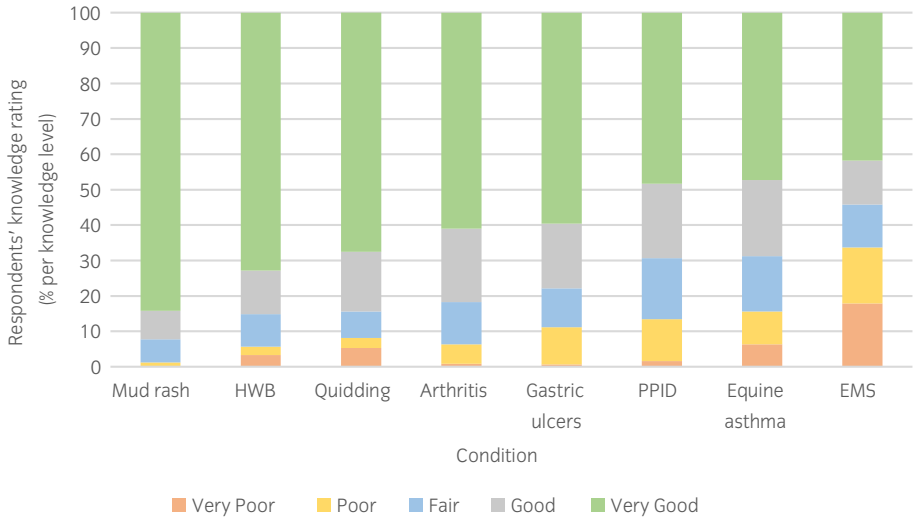

FIGURE 4 Respondents' ($n = 491$) self-rated knowledge of various conditions from an online survey of the knowledge and perceptions of horse owners in Ireland of common clinical conditions and their impact for each condition surveyed. HWB, high worm burden; PPID, pituitary pars intermedia dysfunction; EMS, equine metabolic syndrome.

TABLE 1 Post hoc pairwise comparisons using Wilcoxon of owner ($n = 491$) self-rated knowledge of eight equine health conditions.

	Mean rank order	Mud rash	HWB	Quidding	Arthritis	Gastric ulcers	PPID	Equine asthma	EMS
Mud rash	1	–	0.28*	0.33*	0.40*	0.45*	0.56*	0.57*	0.63*
HWB	2		–	0.10	0.14	0.21*	0.37*	0.41*	0.55*
Quidding	3			–	0.06	0.14	0.29*	0.34*	0.49*
Arthritis	4				–	0.09	0.29*	0.31*	0.51*
Gastric ulcers	5					–	0.22*	0.26*	0.46*
PPID	6						–	0.05	0.36*
Equine asthma	7							–	0.31*
EMS	8								–

Note: Effect size shown ($Z/\sqrt{n}$). *indicates significance at adjusted alpha level calculated using Bonferroni correction.
Abbreviations: EMS, equine metabolic syndrome; HWB, high worm burden; PPID, pituitary pars intermedia dysfunction.

TABLE 2 Post hoc pairwise comparisons using Wilcoxon of owners' ($n = 491$) perceived impact of eight equine health conditions on their horse/pony.

	Mean rank order	EMS	Equine asthma	Quidding	Gastric ulcers	PPID	Arthritis	HWB	Mud rash
EMS	1	–	0.04	0.19*	0.27*	0.34*	0.41*	0.55*	0.67*
Equine asthma	2		–	0.17	0.27*	0.32*	0.38*	0.54*	0.68*
Quidding	3			–	0.1	0.19*	0.2*	0.44*	0.62*
Gastric ulcers	4				–	0.1	0.13	0.42*	0.6*
PPID	5					–	0.02	0.25*	0.49*
Arthritis	6						–	0.28*	0.52*
HWB	7							–	0.29*
Mud rash	8								–

Note: Effect size shown ($Z/\sqrt{n}$). *indicates significance at adjusted alpha level calculated using Bonferroni correction.
Abbreviation: EMS, equine metabolic syndrome; HWB, high worm burden; PPID, pituitary pars intermedia dysfunction.

3.4 | Perceived impact of conditions on horses' comfort and activity

Consistency between the horse comfort and activity impact scores was adequate to good (Cronbach alpha = 0.75 to 0.88) across conditions, enabling pooling of data. The combination scores were tested for consistency against both the comfort and activity levels (Cronbach alpha = 0.86 to 0.89 across conditions). Analyses involving the perceived potential impact on the horse or pony of the conditions were made using the combined scores. Effect sizes for pairwise comparisons are displayed in Table 2, with EMS and equine asthma considered to potentially have the most severe impacts and mud rash the least ($P < 0.001$). Figure 5 displays owners' perceptions on how severely the conditions might impact an affected horse.

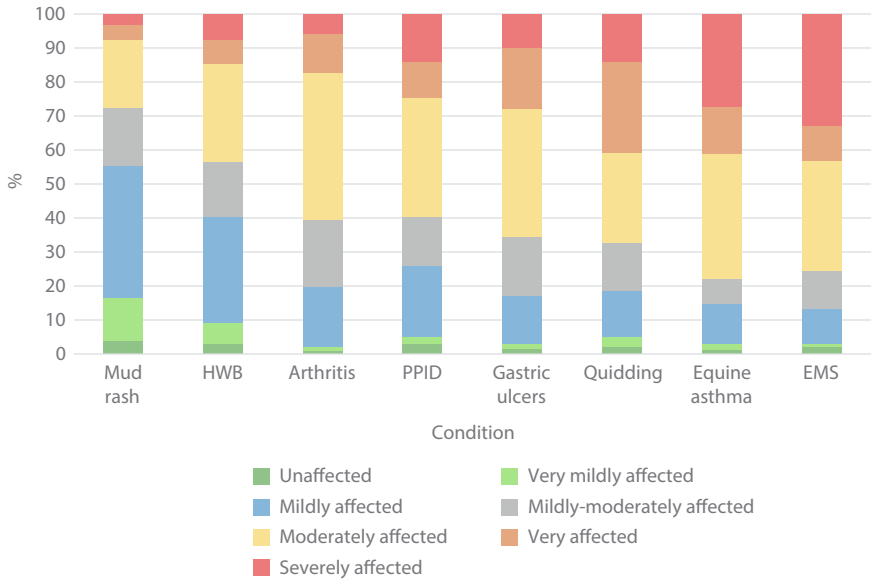

FIGURE 5 Respondents' ($n = 491$) perceptions of severity of the impact which various conditions would have on their horse from an online survey of the knowledge and perceptions of horse owners in Ireland of common clinical conditions and their impact. Levels of severity combine respondents' responses to questions regarding the potential impacts on their horses' comfort levels and activity. HWB, high worm burden; PPID, pituitary pars intermedia dysfunction; EMS, equine metabolic syndrome.

TABLE 3 Post hoc pairwise comparisons using Wilcoxon of the perceived emotional impact on owners ($n = 491$) of their horse/pony being diagnosed with each of eight equine health conditions.

	Mean rank order	Equine asthma	EMS†	PPID†	Gastric ulcers	Arthritis	HWB†	Quidding	Mud rash
Equine asthma	1	–	0.02	0.25*	0.32*	0.44*	0.44*	0.57*	0.71*
EMS	2		–	0.25*	0.29*	0.43*	0.42*	0.52*	0.71*
PPID	3			–	0.07	0.24*	0.23*	0.38*	0.62*
Gastric ulcers	4				–	0.16*	0.22*	0.38*	0.64*
Arthritis	5					–	0.06	0.24*	0.54*
HWB	6						–	0.19	0.55*
Quidding	7							–	0.39*
Mud rash	8								–

Note: Effect size shown ($Z/\sqrt{n}$). *indicates significance at adjusted alpha level calculated using Bonferroni correction.
Abbreviations: EMS, equine metabolic syndrome; HWB, high worm burden; PPID, pituitary pars intermedia dysfunction.

Whether the respondent reported direct experience of a horse previously diagnosed with the condition in question had no bearing on how the owner judged the potential severity of impact of that condition on the horse with the following exceptions: Disease-experienced respondents whose horses already had a high worm burden diagnosis ($n = 15$, median severity score = 4, IQR = 2) judged the impact on the horse as more severe than disease-naïve ($n = 476$, median severity score = 3, IQR = 4) whose horses had not had a diagnosis of high worm burden ($P = 0.006$) while regarding equine asthma, disease-experienced respondents (n = 45, median severity score = 4, IQR = 3) judged the impact of equine asthma as less severe than disease-naïve respondents (n = 446, median severity score = 4, IQR = 2) ($P < 0.001$).

There was a moderate positive correlation between perceived impact on the horse and the emotional impact on the owner for all conditions (PPID $r = 0.59$, $P < 0.001$; ulcers $r = 0.59$, $P < 0.001$; high worm burden $r = 0.53$, $P < 0.001$; mud rash $r = 0.52$, $P < 0.001$; quidding $r = 0.51$, $P < 0.001$; equine asthma $r = 0.55$, $P < 0.001$) except EMS for which there was a strong positive correlation ($r = 0.62$, $P < 0.001$) and arthritis for which there was a weak positive correlation between perceived impact on the horse and emotional impact on the owner ($r = 0.36$, $P < 0.001$).

3.5 | Emotional impact

There was significant difference between the respondents' reports of the likely emotional impact that the eight conditions would have if they were diagnosed in one of the respondents' animals, with equine asthma and EMS predicted to have the highest emotional impacts and mud rash the lowest ($P < 0.001$). Effect sizes for pairwise comparisons are displayed in Table 3. Figure 6 displays the perceived severities of the potential emotional impact on the respondents of each of the conditions surveyed.

There was no difference in the perceived emotional impact of the various conditions depending on whether the respondent had past experience of horses diagnosed with the conditions or not, except with equine asthma where 59.4% disease-naïve respondents ($n = 446$, median emotional impact score = 3, IQR = 1) said that they would be very or extremely worried while 35.6% disease-experienced respondents ($n = 45$, median emotional impact score = 2, IQR = 1) gave the same response ($P = 0.001$).

Perceived emotional impact associated with the conditions described in the questionnaire vignettes was not or only negligibly negatively correlated with both owner experience (arthritis $r = -0.06$, $P = 0.2$; PPID $r = -0.15$, $P = 0.001$; EMS $r = 0.12$, $P = 0.008$; ulcers $r = -0.09$, $P = 0.04$; high worm burden $r = 0.01$, $P = 0.8$; mud rash $r = -0.05$, $P = 0.3$; quidding $r = -0.04$, $P = 0.4$; equine asthma $r = -0.11$, $P = 0.01$) and number of horses owned (arthritis $r = -0.09$, $P = 0.06$; PPID $r = -0.13$, $P = 0.005$; EMS $r = -0.12$, $P = 0.009$; ulcers $r = -0.08$, $P = 0.06$; high worm burden $r = 0.07$, $P = 0.1$; mud rash $r = -0.01$, $P = 0.9$; quidding $r = -0.08$, $P = 0.08$; equine asthma $r = -0.1$, $P = 0.02$).

3.6 | Availability of information

The percentage of respondents who stated that they had not searched for information on each of the 8 conditions (Figure 7) ranged from 10.8% for mud rash to 37.5% for EMS, with the highest proportions of respondents considering that there is a broad availability of easy to understand and up-to-date information for ulcers (79.2% of those who expressed an opinion regarding the quality of information), high worm burden (78.8%) and mud rash (82%). Comparatively, of those who expressed an opinion on the quality of information on arthritis, EMS and equine asthma, just under half (45.8%, 43% and 41.5% respectively) indicated that they thought that there was inadequate information available.

For all conditions except EMS ($r = 0.48$, $P < 0.001$), the correlation between level of respondents' knowledge of the conditions and the respondents' rating of information available about the conditions was either not significant (high worm burden $r = 0.13$, $P = 0.009$; mud rash $r = 0.13$, $P = 0.008$; quidding $r = 0.14$, $P = 0.007$) or was weak

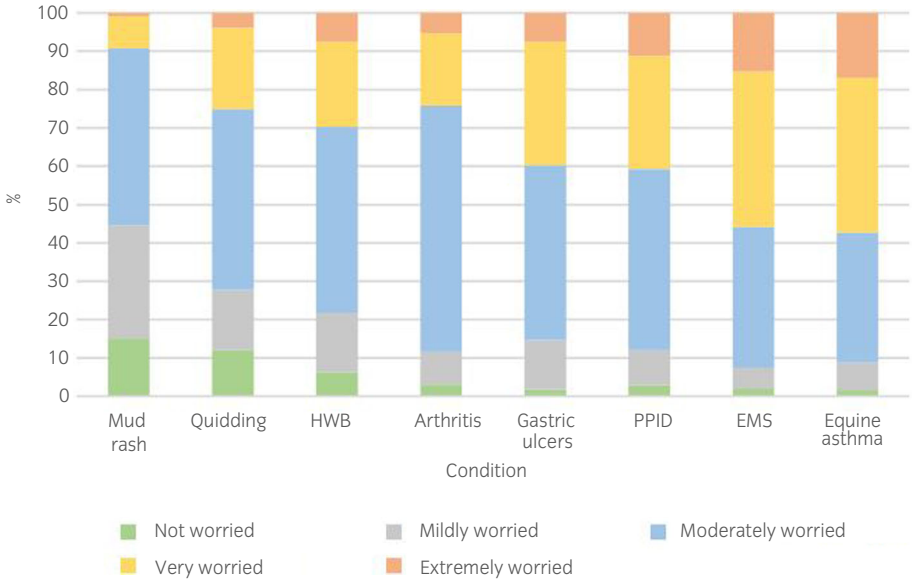

FIGURE 6 Respondents' ($n = 491$) perceptions of the potential emotional impact they would experience if their horse(s) were diagnosed with various conditions from an online survey of the knowledge and perceptions of horse owners in Ireland of common clinical conditions and their impact. HWB, high worm burden; PPID, pituitary pars intermedia dysfunction; EMS, equine metabolic syndrome.

FIGURE 7 Respondents' ($n = 419$) ratings of the availability and quality of information on various conditions from an online survey of the knowledge and perceptions of horse owners in Ireland of common clinical conditions and their impact. HWB, high worm burden; PPID, pituitary pars intermedia dysfunction; EMS, equine metabolic syndrome; OOD, out-of-date; limited, limited availability of easy to understand and up-to-date information; broad, broad availability of easy to understand and up-to-date information.

(arthritis $r = 0.21$, $P < 0.001$; PPID $r = 0.17$, $P = 0.001$; ulcers $r = 0.17$, $P = 0.001$; equine asthma $r = 0.19$, $P < 0.001$).

3.7 | Concerns regarding medical condition diagnosis and factors influencing euthanasia decisions

From a list of options (see Supplementary Item 1) from which owners were allowed to choose 3, factors of greatest concern to respondents which arise when their horse or pony has a medical condition which were selected most frequently were pain and discomfort (96.5% of respondents) and effect of condition on quality of life (82.7%). Approximately a third to half of respondents also selected inability of the pony/horse to carry out its normal activity now and in the future (46.2%), challenges of future management (31.6%) and cost of treatment and management changes (28.7%). The remaining options were selected by less than 4% of respondents. These selections were unaffected by the owner demographic, with the following exceptions: Competing (4.6% of 65) and non-competing (9.1% of 22) professionals were more likely ($P = 0.001$) than competing amateurs (0.5% of 219) to select loss of monetary value and income as a concern; Competing amateurs (58.4% of 219) were more likely ($P < 0.001$) to be concerned with the inability of the pony/horse to carry out its normal activity now and in the future than other respondents (36.4% of 272).

From a list of options (see Supplementary Item 1) from which owners were allowed to choose 5, factors with the greatest influence on euthanasia decisions which were most frequently selected were pain and discomfort (94.3%), effect of a condition on quality of life (90.4%), vet advice (87.8%) and age of the horse or pony (62.7%). Approximately a third of respondents selected emotional bond with the horse or pony (38.3%) or likelihood that the condition will reoccur or that the symptoms will resolve (30.6%) as influences on euthanasia decisions, with one in five respondents stating that inability of the pony to carry out its normal activity is one of their top five influences regarding euthanasia decisions. Cost of treatment was selected by 16.5% of respondents and 14% said that prior experience of the same condition would be a significant factor in their decision-making regarding euthanasia. The factors selected by respondents as having the greatest influence on euthanasia decisions were unaffected by the owner demographic, with the following exceptions: Very experienced (30.3% of $n = 152$) respondents were less likely ($P = 0.001$) than those with some experience (52.7% of n = 93) to select the bond with their horse or pony as an influence on euthanasia decisions; very experienced (23% of $n = 152$) respondents were more likely ($P = 0.003$) than others (10% of $n = 339$) to state that previous experience of a condition has an influence on their decisions regarding euthanasia as were those ($P = 0.001$) with 3–10 horses (20.7% of $n = 174$) compared with owners of one or two (9.1% of $n = 286$).

4 | DISCUSSION

Our results confirm that the emotional impact on horse owners of equine health conditions is directly linked to how severe they perceive the condition's impact on the affected horse. Furthermore, the experience level of the owner makes no, or at most negligible, difference to this emotional impact. Our results show significant differences between conditions with regard to the self-rated knowledge of the conditions included in the survey. With regards to concerns relating to the emotional impact of a health condition diagnosed in the respondents' horses, the most commonly selected factors of concern were pain and discomfort and quality of life. These were likewise the most commonly selected factors of importance when making end of life decisions with vet advice being a commonly selected influencer.

The only difference between perception of disease prevalence depending on breed owned was that Thoroughbred owners believed their horses are less likely to suffer from EMS and more likely to suffer from gastric ulcers. Based on the levels of previous diagnosis of these conditions by breed reported by respondents to this survey, these differences would appear to be justified. Only 4% of respondents reported they had previously had an animal diagnosed with EMS; however, published results from studies on mixed-breed, mixed-age populations suggest there is a prevalence of insulin dysregulation of 18%–27%.[14,15] The higher prevalence was from a study that included only pony breeds and insulin sensitivity is reported to be lower in ponies than horses[21]; however, our results suggest that EMS may be under-diagnosed in the general Irish horse population but further work is required to investigate this assertion.

In this study, knowledge of EMS was significantly lower than that of all other conditions examined, with nearly 18% of respondents never having heard of the condition, a rate three times that of the condition with the next lowest rated knowledge, equine asthma. Arana-Valencia et al.[22] found that an almost identical percentage of horse owners in the South-Eastern United States were unaware of insulin dysregulation (ID). The same study found that even among those owners who stated that they were aware of ID, when asked to select clinical signs, a significant percentage selected those associated with PPID rather than ID/EMS, while less than two-thirds identified a low-carbohydrate diet as a management requirement and only half identified exercise and weight loss as such. Compared with other conditions, EMS is relatively newly defined[23,24] and developments in recognition, diagnosis, and treatment logically take time to be communicated from research to first opinion veterinarians and finally to owners. This may explain the stronger correlation between the respondents' assessment of knowledge and the rating assigned to available information for EMS than other conditions. In addition to online sources,[22,25] owners will also use coaches and other owners for information and advice[22,25]; therefore, increased knowledge among the equestrian community in general may be beneficial. Research into the quality of online equine health information might also be informative.

The two conditions with the highest self-reported owner knowledge levels (mud rash and high worm burden) were the only conditions in which owner knowledge was not influenced by whether an owner's horse had previously had the condition. These two conditions were at opposite ends of the reported prevalence among these respondents; it is therefore unlikely that the high knowledge levels are a direct result of the prevalence of the

conditions within this population. These were the conditions with the highest proportions of respondents who stated that there is broad availability of up-to-date and easy to understand information. This suggests that owners may be prompted to search for information on a condition for reasons other than that their horse is suffering from said condition. Qualitative research would be required to identify these factors.

With regards to the emotional impact on owners of the different conditions, it is worth noting that respondents with either more experience or more horses reported similar levels of emotional impact as those with less experience or fewer horses. Although some research into the emotional impact of horse death and euthanasia has been conducted,[7] research into the emotional impact of horse illness on owners is lacking. Our study shows that the emotional impact of an equine health condition on the owner can be severe and that the predicted extent of the emotional impact of the conditions presented in the survey vignettes is correlated with the owner's perception of the impact of the condition on their horse. The greater perceived impact on the horse of high worm burden diagnosis by respondents who have already experienced the condition is notable as it suggests that disease-naïve owners may underestimate the potential impact that parasitic disease could have on horses. The opposite being true of equine asthma suggests that management of the condition and the opportunity to ameliorate its effects on the horse is perhaps less emotionally impactful for owners than disease-naïve respondents think.

Aside from the few exceptions listed above, respondents expressed similar concerns or influences irrespective of their experience level, their type of horse ownership or number of horses owned. It is perhaps not unexpected that owners who compete their horses on an amateur basis, who may have only one or a small number of competition horses at any one time, would be more concerned about potential impact on the horse's ability to carry out its normal activity if a condition occurs and that professionals are more concerned about a loss of value or income in the face of disease-occurrence.

The main influences which respondents reported that influenced their views on euthanasia in this study were horse pain and discomfort, the effect of a condition on quality of life and vet advice, similar to other studies.[7,26] Although less experienced respondents were more likely to select their emotional bond with the pony/horse as a key influence on euthanasia decisions, the survey question was not framed to determine whether this delayed or brought forward the decision to euthanase. McGowan et al.[7] reported that owners who found the decision to euthanase their horse more difficult than others placed more importance on the bond with their horse, while Clough et al.[26] suggest the emotional bond with the horse may impact the timeliness of owners' decisions regarding euthanasia. It is unsurprising that owners with greater experience or more horses would be more likely to have prior experience of more conditions than other owners and we speculate that this may influence their decisions regarding euthanasia, however, again, it is not known in what direction that influence would be.

This study has a number of limitations. Although distribution was designed to be as wide as possible, due to the impact of the SARS-CoV-2 pandemic and resulting inability to obtain data from owners in person, there was likely a bias in the respondents towards those who are computer users. The requirement to read and understand the vignettes, questions and answers required a certain level of literacy among respondents. It is also possible that the owners who elected to take part in the survey were more likely to have a greater interest in or existing understanding of equine health conditions than may be the case in the overall horse owner population.[27,28] These factors and the fact that respondents were self-selecting means that our results cannot be directly generalized to a larger population.

In terms of the survey wording, consideration was given to the terminology used for clinical conditions to ensure that it was appropriate for owners. A pilot of the survey was conducted among a variety of respondents to address this issue. However, the terminology used may have influenced recognition of the conditions or owner responses. It is also possible that geographic differences in terminology between Ireland and Northern Ireland, or regions therein, may have had some impact.

The use of disease prevalence in the selection of diseases described in the vignettes was based on assessment of previous studies, all of which were performed using different study populations with variable criteria for positive diagnosis and the true prevalence of these conditions in the Irish horse population is unknown. In addition to the differences in reported prevalence for EMS discussed above, the prevalence of mud rash was 12% has been found in one European study[18] a figure which is lower than the percentage reporting the condition in this Irish survey.

The total sport horse (animals kept for non-racing purposes) population in Ireland is estimated to be approximately 135 000 animals[20] and our classification of owner type may have led to an over-representation of Connemara owners and not accounted for their concurrent ownership of other breed(s). Purebred Connemara Ponies (excluding crosses) make up approximately 15% of foal registrations in Ireland[20] while Connemara crosses are usually recorded as sport ponies or sport horses but would have been included as Connemaras given the wording used in this survey which may explain the higher proportion of respondents describing Connemara ownership than official registrations. Analyses showed no differences between these two breed groups with regard to survey responses.

In conclusion, our study showed that self-declared owner knowledge of equine clinical conditions and the perceived impact of conditions on the horse and the corresponding emotional impact on their owners varies significantly. One in five owners stated that they have not heard of EMS. An owner's level of experience and the number of horses they own have no impact on the emotional impact of the horse contracting a health condition nor in most cases on their level of worry related to the diagnosis of clinical conditions in their horses or influences regarding euthanasia decisions. Pain and discomfort and quality of life was selected by a majority of respondents as an important concern. Veterinary advice was influential in euthanasia decisions. This study highlights the need for further research into the effects of horse illness on their owners and on the quality of equine health information available to owners.

AUTHOR CONTRIBUTIONS

E. Golding participated in the study conception, study design, execution, data analysis and manuscript preparation. V. Duggan and N. Walshe participated in study conception, study design, execution and manuscript preparation. A. Neavyn Neita participated in study design, execution and manuscript preparation. G. Mulcahy and A. Hanlon participated in the study conception and manuscript preparation. All authors approved the final version of the manuscript.

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No competing interests have been declared.

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DATA AVAILABILITY STATEMENT

Raw data are available from the corresponding author upon reasonable request.

ETHICAL ANIMAL RESEARCH

This study was exempted from full ethical review by UCD's Human Research Ethics Committee (approval reference LS-E-20-45-Golding-Duggan).

INFORMED CONSENT

Informed consent was obtained for all participants.

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