Small animal general practice veterinarians’ use and perceptions of synchronous video-based telemedicine in North America during the COVID-19 pandemic

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OBJECTIVE  
To assess small animal general practice veterinarians’ use and perceptions of synchronous video-based telemedicine before and during the coronavirus disease 2019 (COVID-19) pandemic.

SAMPLE  
550 respondent veterinarian members of the Veterinary Information Network (VIN).

PROCEDURES  
An anonymous online survey was used to gather data from VIN-member veterinarians in small animal general practice regarding their perceptions and use of synchronous video-based telemedicine. Two emails to all VIN members were used to distribute the web-based questionnaire. For consistency, only responses from North American veterinarians who reported working in small animal general practice were included in analyses. Responses were collected between September 28, 2020, and October 21, 2020.

RESULTS  
There were 69,488 recipients and 680 respondents (1.0% response rate). 550 of whom had North American internet protocol addresses and reported working in small animal general practice. Not all respondents answered all questions. Use of video-based telemedicine substantially increased among respondents during the COVID-19 pandemic, and most (86/130 [66.2%]) reported little to no difficulty in adopting videoconferencing. Respondents also reported that telemedicine took less time (61/135 [45.2%]) and resulted in less financial compensation (103/135 [76.3%]) than in-person consultation. Several respondents reported concerns regarding legal issues and potential inferiorities of telemedicine.

CONCLUSIONS AND CLINICAL RELEVANCE  
Our results indicated that a substantial proportion of respondents incorporated synchronous video-based telemedicine into their practices during the COVID-19 pandemic. Despite low perceived difficulty in adopting videoconferencing telemedicine, many planned to discontinue it for some clinical applications once the pandemic is over. Further research is required to elucidate the perceptions and challenges in successful use of veterinary telemedicine. (J Am Vet Med Assoc 2021;258:1372–1377)

Although the scope of telemedicine can be broad and includes diverse applications, including the use of telephone calls, emails, and wearable monitoring devices to convey medical information, it can also be defined as the electronic exchange of clinical information between a health-care provider and patient. Synchronous services allow real-time interactions, whereas asynchronous services allow media and information to be stored for evaluation by the provider at their convenience. Numerous veterinary telemedicine platforms are commercially available. Many of these are synchronous and video based, allowing clients to direct their video camera toward their animals to yield real-time clinical information for their veterinarians.

Despite low technological and investment thresholds for implementing telemedicine, only 8 of the 951...
(0.8%) veterinarian respondents of a 2016 survey reported that they used a live video feed at least weekly to provide client consultations. Furthermore, results of recent surveys show that many veterinarians have negative perceptions of telemedicine.

Although the veterinary community has considered telemedicine a topic of interest for several years, the COVID-19 pandemic caused an unforeseen need for veterinarians to reduce in-person contact and increase the use of telemedicine services. Therefore, our objective of the study reported here was to assess small animal general practice veterinarians’ use and perceptions of synchronous video-based telemedicine before and during the COVID-19 pandemic.

Materials and Methods

We created a questionnaire (Supplementary Appendix S1, available at: avmajournals.avma.org/doi/suppl/10.2460/javma.258.12.1372) for use as an online survey that was administered with a commercially available survey platform. Two emails sent 1 week apart (September 28, 2020, and October 12, 2020) were used to distribute the survey to VIN-member veterinarians. We targeted the survey toward North American VIN-member small animal general practitioners to gather data regarding their use and perceptions of synchronous videoconferencing before and during the COVID-19 pandemic. Participation in the survey was voluntary and anonymous, other than our use of the respondent’s internet protocol address geolocation data to identify respondents from Canada and the United States.

The survey consisted of 20 to 28 questions (17 multiple choice [3 with an open-text field prompted when the selection was other], 3 yes or no, and up to 8 additional questions based on the affirmative responses to 1 question). Recipients were asked questions regarding whether they used telemedicine before and during the COVID-19 pandemic, for what clinical purposes it was used, and their perceptions of its use. Telemedicine was defined in the survey as synchronous videoconferencing with clients and their pets, where neither the client nor the pet was physically present at the veterinary clinic.

Respondents who indicated that they did not use synchronous video-based telemedicine were directed to a multiple-choice question with a write-in field to select or write in their reason. Respondents who reported use of synchronous video-based telemedicine were asked about the frequency of use, approximate percentage of participating clients, time required, financial compensation, impact on client relationships, ease of adoption, and intentions for its use when veterinarians are allowed to resume regular veterinary practice (ie, after public health restrictions related to COVID-19 are lifted). Some questions referenced specific practice categories (ie, postsurgical care, dermatology, behavior, nutrition, triage or emergency assessment, palliative care, ongoing medical case man-

Table 1—Results for use, clinical application, and frequency of synchronous video-based (live videoconferencing) telemedicine performed before and during the COVID-19 pandemic as reported by 550 VIN-member veterinarians in North America who responded to an online survey between September 28, 2020, and October 21, 2020, and reported that they worked in small animal general practice.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Before the COVID-19 pandemic</th>
<th>During the COVID-19 pandemic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Used synchronous video-based telemedicine</td>
<td>Yes</td>
<td>23 (4.2)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>527 (95.8)</td>
</tr>
<tr>
<td>Clinical application</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ongoing case management</td>
<td>17 (3.1)</td>
<td>121 (22.0)</td>
</tr>
<tr>
<td>Behavior</td>
<td>14 (2.5)</td>
<td>79 (14.4)</td>
</tr>
<tr>
<td>Dermatology</td>
<td>11 (2.0)</td>
<td>115 (20.9)</td>
</tr>
<tr>
<td>Postsurgical care</td>
<td>11 (2.0)</td>
<td>65 (11.8)</td>
</tr>
<tr>
<td>Other (write-in answers)</td>
<td>1 (0.2)</td>
<td>9 (1.6)</td>
</tr>
<tr>
<td>Lameness or orthopedic</td>
<td>0 (0.0)</td>
<td>4 (0.7)</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>0 (0.0)</td>
<td>4 (0.7)</td>
</tr>
<tr>
<td>Client convenience</td>
<td>0 (0.0)</td>
<td>4 (0.7)</td>
</tr>
<tr>
<td>Frequency of use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 2 times/mo</td>
<td>18 (3.3)</td>
<td>87 (15.8)</td>
</tr>
<tr>
<td>1–5 times/wk</td>
<td>4 (0.7)</td>
<td>58 (10.5)</td>
</tr>
<tr>
<td>6–15 times/wk</td>
<td>0 (0.0)</td>
<td>13 (2.4)</td>
</tr>
<tr>
<td>&gt; 15 times/wk</td>
<td>1 (0.2)</td>
<td>5 (0.9)</td>
</tr>
<tr>
<td>Percentage of clientele</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 10%</td>
<td>22 (4.0)</td>
<td>143 (26.0)</td>
</tr>
<tr>
<td>10% to 25%</td>
<td>1 (0.2)</td>
<td>13 (2.4)</td>
</tr>
<tr>
<td>26% to 50%</td>
<td>0 (0.0)</td>
<td>3 (0.5)</td>
</tr>
<tr>
<td>51% to 75%</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>&gt; 75%</td>
<td>0 (0.0)</td>
<td>4 (0.7)</td>
</tr>
</tbody>
</table>
agrement, or other [selection of other also required a write-in response]).

Statistical analysis

Descriptive statistics for the survey results were compiled, and frequency distributions were reported as numbers and percentages; no inferential statistical analyses were conducted. Statistical calculations were performed with available software.¹

Results

The survey was sent by email to all 69,488 members of VIN but targeted those who were small animal general practitioners in North America. There were 680 respondents, yielding an overall response rate of 1.0%. Not every respondent answered every question. To maintain consistency, only results for respondents with internet protocol address geolocation data from Canada or the United States and who reported that they worked in small animal general practices (n = 550) were included for analyses. Of these 550 respondents, 23 (4.2%) indicated that they used live videoconferencing with pet owners (telemedicine as defined for the survey) before the COVID-19 pandemic, and 163 (29.6%) reported that they were using telemedicine during the pandemic when they completed the present survey (between September 28, 2020, and October 21, 2020; Table 1).

Respondents who reported that they had used telemedicine most commonly indicated it was for ongoing case management, behavior issues, postsurgical care, or dermatologic issues (Table 1). Additionally, most respondents indicated that they used telemedicine ≤ 2 instances/mo and with < 10% of their clients. When asked regarding client charges for videoconferencing performed by staff (technicians or nurses), 130 respondents answered the question; only 50 (38.5%) reported that their staff performed this service, and most (27/50 [54.0%]) reported not charging for this service.

Of the 135 respondents who reported that they started using synchronous video-based telemedicine during the COVID-19 pandemic and who answered questions regarding time requirements and financial compensations, 98 (72.6%) indicated that it took either the same or less amount of time and 103 (76.3%) reported that it yielded somewhat less or much less financial compensation, compared with in-person consultations (Figure 1). These 135 veterinarians also reported that it was somewhat more difficult to foster a good client relationship and to convey information through the use of synchronous video-based telemedicine, compared with in-person consultations.

When asked about the level of difficulty that they had in adopting the use of videoconferencing, 130 respondents answered the question, and 86 (66.2%) reported little to no difficulty (Table 2). In contrast, 131 answered the question regarding the level of difficulty their hospital staff had in adopting videoconferencing, and only 49 (37.4%) reported that their hospital staff had little to no difficulty. When participants were asked what they picture happening to how often they used live videoconferencing for the conditions listed earlier in the survey once they are allowed to resume regular veterinary practice (ie, after COVID-19 pandemic–related restrictions were lifted), most veterinarians reported that they would use it less for the various clinical applications, except for the same or increased level of use with postsurgical care (23/51 [45.1%]) and nutrition consultations (12/24 [50.0%]; Figure 2).

Of the 387 respondents who reported that they had not used synchronous video-based telemedicine before or during the COVID-19 pandemic, 386 answered the multiple-choice question regarding their reasons, and multiple selections were allowed. Of these, 163 (42.2%)...
Many veterinarians who adopted synchronous video-based telemedicine during the pandemic reported that, compared with in-person consultations, the use of video-based telemedicine generated less revenue and made it more difficult to foster relationships and convey information to clients. Additionally, respondents generally reported that they had less difficulty adopting telemedicine than did their staff. Except for an open-text field associated with respondents’ selection of other as an answer for 5 of the multiple-choice questions, our survey did not collect data regarding possible factors that influenced respondents’ satisfaction with telemedicine. However, in human health care, the perceived value of adaptability in clinical practice and demographic factors such as urban practice location were independently associated with adoption and satisfaction with telemedicine. It seems likely that these same factors would influence the adoption of telemedicine by veterinarians in small animal practice.

In the present study, 24 of 130 (18.5%) respondents reported that they charged either much less or nothing for videoconferencing, compared with in-person consultations. This lack of perceived financial value may be an additional factor contributing to some veterinarians’ unwillingness to use telemedicine; however, there is evidence that pet owners are willing to pay for and are satisfied with telemedicine services. This contrast suggested that respondents might have had inaccurate perceptions regarding the value of telemedicine and as a result were reluctant to charge for the services. The convergent point between economic viability and practicability of telemedicine merits further investigation.

It was surprising that given the public health risks of in-person contact during the pandemic, only 163 of the 550 (29.6%) respondents reported that they used telemedicine. For the 387 respondents who reported that they had not used telemedicine, 24 of 130 (18.5%) respondents reported that they had not used telemedicine because most of their work requires a physical examination of the pet, despite the fact that some of the listed clinical applications (eg, nutrition and behavior) might not require physical contact with the pet.

Respondents selected that their practice had remained open to all clients, 96 (24.9%) selected that their practice type and caseload did not lend itself to remote consultations, 95 (24.6%) selected that they were unfamiliar with videoconferencing technologies, and 174 (45.1%) selected other and explained their decision in an open-text field, including 33 respondents who indicated that they did not use telemedicine because most of their work requires a physical examination of the pet, 27 who expressed concerns about the inferior quality of telemedicine, and 13 who reported legal concerns. Twenty-nine of these 174 (16.7%) respondents reported that they used other forms of telemedicine (eg, asynchronous or nonvideo forms) that did not meet the survey definition of telemedicine.

Discussion

Results of our survey suggested a substantial uptick in the use of synchronous video-based telemedicine by veterinarians during the COVID-19 pandemic. Before the pandemic, only 23 of the 550 (4.2%) respondent VIN-member veterinarians in small animal general practice in North America reported using live videoconferencing, whereas 163 (29.6%) respondents reported that they were using it when they completed the present survey during the pandemic. These findings were similar to those in human health care, in which investigators show increases of between 8- and 20-fold in the use of telemedicine during the COVID-19 pandemic. Many veterinarians who adopted synchronous video-based telemedicine during the pandemic reported that, compared with in-person consultations, the use of video-based telemedicine generated less revenue and made it more difficult to foster relationships and convey information to clients. Additionally, respondents generally reported that they had less difficulty adopting telemedicine than did their staff. Except for an open-text field associated with respondents’ selection of other as an answer for 5 of the multiple-choice questions, our survey did not collect data regarding possible factors that influenced respondents’ satisfaction with telemedicine. However, in human health care, the perceived value of adaptability in clinical practice and demographic factors such as urban practice location were independently associated with adoption and satisfaction with telemedicine. It seems likely that these same factors would influence the adoption of telemedicine by veterinarians in small animal practice.

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It was surprising that given the public health risks of in-person contact during the pandemic, only 163 of the 550 (29.6%) respondents reported that they used telemedicine. For the 387 respondents who reported that they had not used synchronous videoconferencing before or during the COVID-19 pandemic, key reasons reported included the perceptions that it is inferior to in-person evaluations and concerns for potential legal issues. Legal concerns are legitimate and consistent with previous reports. Although legal restrictions on veterinary telemedicine vary by local governance, important disagreements have occurred between national veterinary organizations. Additionally, 33 respondents indicated that they did not use telemedicine because most of their work required a physical examination of the pet, despite the fact that some of the listed clinical applications (eg, nutrition and behavior) might not require physical contact with the pet.
Concerns for the inferiority of veterinary telemedicine in certain scenarios might be unfounded. For instance, a study on postsurgical recheck examinations of 30 dogs that underwent routine surgical sterilization shows no increased risk of complications with the use of telemedicine versus in-clinic recheck examination. In addition, a study in which clients used a veterinary telemedicine application shows that the treatment recommendations received electronically were generally consistent with in-clinic recommendations. In human health care, there is little evidence of harm from telemedicine. Even in pediatric populations, which most closely resemble a veterinary situation because clinicians cannot question the patient directly but must rely on interactions with the guardian or findings on physical examination, adverse events with telemedicine are rare. What harm has been found in telemedicine services appears to be mainly found in direct-to-consumer telemedicine, a specific form of telemedicine in which medical providers advertise services through electronic means directly to a consumer, usually outside of an existing patient-provider relationship. For instance, there is evidence of inferior antimicrobial stewardship and lower adherence to diagnostic guidelines in direct-to-consumer models, however, these problems have not been found in telemedicine services operating within an existing patient-provider relationship. To our knowledge, no data exist on adverse events in veterinary telemedicine; nonetheless, not all clinical situations are appropriate for synchronous remote consultations.

Our study had limitations. We had a low response rate, which could have resulted in an overrepresentation of practitioners with more passionate views about telemedicine. Also, the survey restricted the definition of telemedicine to synchronous videoconferencing and did not include other forms of telemedicine, such as communications through texts, emails, or telephone calls or the use of asynchronous photographic or video-based telemedicine, by which many commercial telemedicine platforms operate. In the present study, 5.3% (29/550) of respondents reported that they used such other forms of telemedicine. Because this information was provided by respondents without a specific prompt in the open-text field, we believe this finding likely underestimated the percentage of respondents who used these other forms of telemedicine. Another limitation was that because there is wide variation in fee schedules, standardization of financial compensation is difficult; thus, we investigated the issue relative to respondents’ in-person consultations, which could have had confounding factors.

Findings of the present study underscored important perceptions held by veterinarians regarding the use of telemedicine during the COVID-19 pandemic. Our results indicated that, similar to human healthcare professionals, a substantial proportion of respondents reported that they incorporated synchronous video-based telemedicine into their veterinary practices during the COVID-19 pandemic. Despite their reported little to no difficulty in adopting this type of telemedicine, many veterinarians planned to discontinue it for some clinical applications once the pandemic is over. Further research is required to elucidate the perceptions and challenges in successful use of veterinary telemedicine.

Acknowledgments

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Footnotes

- Alchemer, Alchemer LLC, Louisville, Colo.
- Excel, version 16.46, Microsoft Corp, Redmond, Wash.

References

From this month’s AJVR

Impact of specimen type on findings for bacterial composition within the intestinal tract of dogs and cats with and without chronic enteropathy

Stacie C. Summers et al

OBJECTIVE
To compare bacterial diversity and community composition among fecal, rectal swab, and colonic mucosal biopsy specimens from dogs and cats with and without chronic enteropathy (CE).

ANIMALS
9 healthy dogs, 8 dogs with CE, 8 healthy cats, and 9 cats with CE.

PROCEDURES
In a cross-sectional study design, fecal, rectal swab, and colonic mucosal biopsy specimens were obtained by colonoscopy from healthy dogs and dogs and cats with CE. Fecal and rectal swab specimens were collected from healthy cats. Genomic DNA was extracted, the 16S rRNA V4 gene region was amplified, and sequencing was performed by use of primers 515F to 806R on a paired-end platform.

RESULTS
For healthy dogs and dogs and cats with CE, bacterial diversity based on the Chao1 estimate of total species richness was higher for colonic mucosal biopsy specimens than for fecal specimens. Analysis of similarities by use of the Bray-Curtis dissimilarity index revealed that the bacterial communities captured in rectal swab specimens were similar to those captured in fecal specimens for healthy dogs and dogs with CE and similar to those captured in colonic mucosal biopsy specimens for both dog groups and cats with CE.

CONCLUSIONS AND CLINICAL RELEVANCE
Rectal swab and colonic biopsy specimens were successfully used to characterize the bacteriome of the intestinal tract in dogs and cats by 16S rRNA gene sequencing. Although the specimen types evaluated in this study were not interchangeable in results, rectal swab specimens were practical to collect from dogs and cats to study bacterial composition within the intestinal tract and may provide an alternative to colonic mucosal biopsy and fecal specimens. (Am J Vet Res 2021;82:494–501)