ABSTRACT

Regular veterinary visits to improve herd health and production management (HHPM) are important management components on many dairy cattle farms. These visits provide opportunities for constructive conversations between veterinarians and farmers and for shifting management from a reactionary approach to proactively optimizing health and welfare. However, little is known about the structure of HHPM farm visits and to what extent veterinarians provide assistance beyond purely technical services. Therefore, our aims in this cross-sectional study were to describe HHPM farm visit structure, determine which dairy-specific topics were discussed, and assess whether the focus of the visits aligned with farmers’ priorities. Veterinary practitioners (n = 14) were recruited to record audio and video of regularly scheduled HHPM farm visits (n = 70) using an action camera attached to their chest or head. A questionnaire was distributed to farmers containing closed- and open-ended questions to assess their goals and perceptions related to farm management and HHPM farm visits. Descriptive statistics and negative binomial and Poisson regression models were used to study dairy-specific topics initiated by the farmer or veterinarian during various activities. A mean of 51% of the visit duration was dedicated to transrectal pregnancy and fertility diagnostics, and a considerable amount of time (30%) was spent on visit preparation, transitions between tasks, and leaving. A total of 488 discussions were initiated by either the veterinarian (55%) or the farmer (45%). Mean length of discussions was 2 min, and only 17% of the HHPM visit duration was spent discussing dairy-specific topics. Veterinarians initiated 62% of their discussions about herd issues, whereas farmer-initiated discussions revolved around herd health in 39% of the discussions. Discussion topics most frequently raised by participants included fertility, udder health, calf health and management, and transition diseases. Consistently, farmers’ answers to a rank question regarding their main HHPM farm visit goals indicated that their priorities were to have transrectal pregnancy and fertility diagnostics performed and to improve herd fertility and general herd health. Answers to an open-ended question revealed that additional aims of many farmers were to receive information, have questions answered, and identify and discuss problems. A farmer’s belief that HHPM farm visits were “absolutely” tailored toward his or her goals was positively associated with number of discussions during the visit and their conviction that they “always” voiced their wishes and needs to the veterinarian. Opportunities to broaden the focus of HHPM farm visits and improve communication between farmers and veterinarians should be identified and veterinarians should be trained accordingly, which would increase veterinarians’ ability to add value during HHPM farm visits.

Key words: dairy cattle, herd health management, veterinary communication, farm advisory

INTRODUCTION

With dairy cattle herds becoming increasingly larger and the need to remain competitive, the approach to dairy farming has undergone substantial changes in recent decades (Barkema et al., 2015). Prevention of disease and optimization of production have become more important, and the availability of herd data through advanced technologies can be used to inform management decisions (LeBlanc et al., 2006; Rutten et al., 2013). As a consequence, herd health and production management (HHPM) has become an integral aspect on many dairy farms (e.g., Lind et al., 2012; Derks et al., 2013a). Green et al. (2012) defined herd health management as “a method to optimize health, welfare, and production in a population of dairy cows through the systematic analysis of relevant data and through regular objective observations of the cows and
their environment, such that informed, timely decisions are made to adjust and improve herd management over time.” The herd veterinarian is generally the main farm advisor delivering HHPM services. However, to provide efficient consultancy, the focus of veterinary care must shift from a mainly reactive approach of treating sick animals to preventing disease (Lam et al., 2011). In the current environment, many farmers expect veterinary practitioners to advise on topics that go beyond clinical care, such as nutrition and animal welfare (Cannas da Silva et al., 2006). In Canada, most dairy farms have regularly scheduled HHPM farm visits 1 or 2 times per month (Denis-Robichaud et al., 2016) conducted by either clinic owners or employed veterinarians. Luby et al. (2013) also reported that 22% of the veterinarians who visit Western Canadian dairy farms dedicated >75% of their workload to dairy cattle and were classified by the authors as “dairy practitioners.” Luby et al. (2013) reported that dairy practitioners spent a median of 85% of their time on dairy farms, routinely performing tasks related to both individual animal medicine (e.g., examination of the abdomen) and herd health (e.g., estrus synchronization). Of the “mixed practice” veterinarians, 53 and 43% were reported to perform pregnancy palpations and breeding soundness examinations at least once a month, respectively (Luby et al., 2013).

Forty-four percent of the veterinary communication during HHPM farm visits was reported to be related to relationship building, including facilitation, activation, and rapport-building statements such as social talk (Ritter et al., 2018a). However, ideally, HHPM farm visits also include a constructive dialog between the veterinarian and farmer related to herd health and welfare topics, addressing issues that the farmer wants to discuss or that the veterinarian believes require attention (Cipolla and Zecconi, 2015; Svensson et al., 2018). As such, these visits should also provide services other than transrectal pregnancy and fertility diagnostics performed by the veterinarian. However, in the Netherlands, pregnancy diagnostics are still the predominant aspect of HHPM farm visits (Derks et al., 2013a). Further, Higgins et al. (2013) reported that 37% of UK veterinary practitioners did not perform proactive monitoring for any of 3 important diseases on dairy farms (i.e., lameness, Johne’s disease, and mastitis), but concluded that cattle-specific postgraduate specifications can further veterinary involvement in proactive services. Moreover, there is evidence that communication between veterinarians and farmers is not always optimal (e.g., Derks et al., 2013b; Ritter et al., 2018a; Svensson et al., 2018), which could be due to a lack of veterinarians’ awareness of farmers’ goals and can hinder veterinarians in adequately assessing farmers’ priorities. For example, whereas veterinary practitioners in the Netherlands preferred to discuss udder health and milk production and overestimated farmers’ perceptions of the importance of nutrition, farmers appeared to be more concerned about fertility (Derks et al., 2013b).

In North America, there is limited information about what HHPM farm visits entail and to what extent these visits go beyond purely technical veterinary services. The objectives of this study were to (1) describe activities performed during HHPM visits on Canadian dairy farms, (2) determine which dairy-specific topics were discussed by farmers and veterinarians during various activities on those farm visits, and (3) evaluate whether the topics discussed were consistent with farmers’ priorities.

MATERIALS AND METHODS

Recording of Visits

Enrollment of veterinarians and farmers and details on recording of the HHPM farm visits were described by Ritter et al. (2018a). Briefly, in Alberta, Canada, veterinarians who had at least 10 dairy clients (based on the Alberta Johne’s Disease Initiative database; Wolf et al., 2015), who were familiar to the authors, and who lived at a feasible distance (<750 km) from Calgary, Canada, were asked to participate in the study. Of the 16 veterinarians contacted, 11 agreed to obtain consent from the farmers and record HHPM visits on farms that they service regularly (i.e., at least every 6 wk) for HHPM. In Ontario, 36 veterinarians who had signed up for a Dairy Health Management Continuing Education Program (Ontario Veterinary College, University of Guelph, ON, Canada) course were contacted and asked to participate. As a response, 6 additional veterinarians (5 from Ontario and 1 from Alberta) enrolled in this study. Veterinarians selected which HHPM visits they recorded. They were, however, encouraged to record on farms that they believed to represent a cross-section of their clients. Veterinarians were informed that they would receive Can$100 (approximately US$75) if they completed all study aspects. Data collection took place between October 2015 and September 2017.

Participating veterinarians were equipped with a GoPro camera (GoPro Inc.) to be worn around their chest or head and a voice recorder that they handed to the farmer to wear around the neck (files were merged for analysis; Ritter et al., 2018b). Veterinarians were encouraged to each record one entire HHPM farm visit on 7 different farms that they service regularly. Ethics
approval was obtained from the University of Calgary’s Research Ethics Board (REB15-1800).

Analysis of Recordings

Not all veterinarians submitted the requested 7 recordings; reasons included not having enough consenting dairy clients or insufficient time. Therefore, a total of 99 recordings were received; of these, 70 recordings by 14 veterinarians were deemed of sufficient quality and had the necessary paperwork (i.e., farmer consent form and questionnaire) to be analyzed (Ritter et al., 2018a).

Activities During HHPM Farm Visits

Video-audio recordings were reviewed by C. R., and the duration that each participant spent on each aspect of an HHPM farm visit was documented. Activities were coded as transrectal pregnancy and fertility diagnostics, individual animal examinations or treatments, group procedures, herd performance review, preparation, leaving, transitions, and other activities. The time a veterinarian spent on preparing the visit (e.g., gathering equipment) or leaving the farm (e.g., cleaning equipment) occurred at the beginning or end of the HHPM farm visit, whereas a transition was defined as the time between 2 activities or when the veterinarian and the farmer changed locations (e.g., walked to another barn). For a transition to be defined as such, it had to last at least 1 min. For a section of the HHPM farm visit to be classified as individual animal examination or treatment, either the farmer or the veterinarian had to believe that there was a problem with an individual animal. Indicators that were used to identify these individual health problem portions of the farm visit included verbalizing a concern about a specific animal, use of diagnostic tools (e.g., stethoscope, thermometer), separation of the animal from the group, application of pharmaceuticals, or the veterinarian’s statement of a diagnosis or treatment plan. However, if the veterinarian simply advised the farmer on fertility treatment (e.g., application of prostaglandin F2ß), this was not coded as individual animal examination or treatment but rather as transrectal pregnancy and fertility diagnostics. The latter activity generally included routine examinations of several cattle. Group procedures were characterized by the veterinarian attending to a group of cattle for the purpose of conducting routine procedures, such as dehorning or vaccinations. Herd performance review was defined as the veterinarian and farmer reviewing topics of interest related to the entire herd or individual animals, generally in the farm’s office and consulting data on a computer or in paper format. Activities were coded as “other” if they did not fit any of the descriptions (e.g., if the veterinarian tended to animals other than cattle).

Discussion of Topics

In addition to the duration of the main sections of the HHPM farm visit, specific topic discussions that were raised during the HHPM farm visit were reported. It was further identified whether the veterinarian or farmer initiated the topic and whether the topic was related to individual animals or was a more general discussion related to the entire herd (or a subset of the herd; e.g., all heifers). For this objective, one author (C. R.) reviewed transcripts of the farm visit provided by a third-party transcription service. When a section of the visit was identified that could be classified as a discussion, the video recording was reviewed for confirmation. Most topics were defined a priori based on assumptions about commonly discussed topics on dairy farms. These topics included fertility, udder health, claw health including lameness, transition diseases, nutrition, housing and facilities, calves, biosecurity, injuries, and milk production. However, if a topic was discussed that did not match any of the a priori themes but was deemed relevant, it was added. Although initially recorded as separate topics, due to low counts, we combined discussions about personnel management as well as collection and interpretation of data into the topic “business management,” whereas the topic “dairy industry” comprised discussions about regulations, voluntary or mandatory industry programs, and conferences. These topics, as well as the topic “drugs” (e.g., how a specific drug affects the animal), were not stratified into herd versus individual animal discussions. The topic “biosecurity” included discussions about bovine leukosis, Johne’s disease, bovine tuberculosis, and the general concept of biosecurity. “Unspecified issue” described a discussion in which the farmer or veterinarian believed that there was a problem with an animal, but no diagnosis was reached; hence, the discussion could not be classified as a specific topic.

A topic was identified as “discussion” if there were at least 2 speaker changes (e.g., the farmer made a comment or asked a question, the veterinarian responded, and then the farmer followed up). However, percentage of contribution to the conversation by the farmer and the veterinarian could vary (e.g., the farmer could follow up to information provided by the veterinarian with only a short response, indicating understanding). Total length of communication related to that topic had to be at least 100 words (~4 to 10 sentences). This was done to ensure that a substantial amount of information was transferred.
After every recorded farm visit, the veterinarian handed a sealed envelope to the farmer. Inside the envelope was a short note thanking the farmer for his or her participation, a questionnaire, and another sealable enveloped that was stamped and addressed to be returned directly to the research team. Veterinarians were asked to have farmers complete the questionnaire (Supplemental File S1, https://figshare.com/articles/journal_contribution/Ritter_et_al_Supplemental_File_S1_Questionnaire_Farmer_pdf/14346713, Ritter, 2021a) immediately after the HHPM farm visit but not in the presence of the veterinarian.

Each farmer questionnaire could be linked to the respective farm recording through a unique identifier and contained questions regarding general demographic data about the farmer and their farm, whether the farmers believed they could be themselves in front of the camera, and whether they perceived the recorded visit to be representative of other HHPM farm visits on their farm. Farmers were also asked about the main goals they would like to achieve. Open-ended questions included “What are your short-term (1-year) goals for your farm?” “What are your long-term (5-year) goals for your farm?” and “What are the main goals you want to achieve with the herd health visits?” Later in the questionnaire, farmers were prompted to rank the 5 most important goals they would like to achieve with HHPM visits out of 9 predefined goals. (“What are the main goals you want to achieve with the herd health visits? Please rank your 5 most important goals.”) Here, they had the option to add an additional goal if it was not listed. The farmers were also asked to what extent the HHPM farm visit was tailored toward their goals (5-point semantic differential item: “absolutely” to “not at all”) and how often they bring up their wishes or needs (5-point semantic differential item: “always” to “never”). To obtain the veterinarian’s demographic information, the practitioners filled out a questionnaire (Supplemental File S2, https://figshare.com/articles/journal_contribution/Ritter_et_al_Supplemental_File_S2_Veterinarian_Questionnaire/14346728, Ritter, 2021b) containing a unique identifier at the end of the study once all farm visits were completed.

First, the overall number of topics during the entirety of all HHPM farm visits (outcome variable) that were initiated by the veterinarian or farmer (first predictor variable) and that focused on individual animals or the herd (second predictor variable) were compared using a Poisson regression model, including an interaction term between the 2 predictor variables. Similarly, to investigate whether the farmer or veterinarian initiated specific topics more frequently, Poisson or negative binomial regression models (if data were overdispersed) were created individually for each of the 14 identified topics (outcome) across all HHPM farm visits. Predictors included whether the specific topic was initiated by the farmer or the veterinarian and whether the focus was on individual animals or the herd. Here, a Bonferroni adjustment was applied to account for multiple comparisons. Second, 2 logistic regression models were used to assess relationships for dichotomized outcome variables (i.e., whether farmers “absolutely” agreed that the HHPM visit was tailored toward their farm and whether they stated they “always” raised their wishes or needs) and number of discussions as the predictor variable.

For all regression models described previously, potential clustering was accounted for by considering veterinarian and HHPM farm visit as random effects. However, if the likelihood ratio test comparing the mixed-effect model with the model without random effects was not significant ($P > 0.05$), the latter model was used while accounting for potential remaining clustering through inclusion of clustered standard errors. Furthermore, Poisson and negative binomial models included HHPM farm visit duration as offset to account for various lengths, whereas logistic models included visit duration as a fixed effect. Demographic variables of veterinarians and farmers were assessed as effect modifiers or confounders for the Poisson regression model investigating the overall number of initiated discussions and the 2 logistic regression models. However, demographic variables were retained in the final model only if $P < 0.05$ in the Wald test or if removal of the demographic variable led to a considerable (>15%) change in the outcome coefficient. Demographic variables were not considered in the 14 regression models related to specific topics due to partly low numbers of observations and, therefore, unstable regression parameters.

Third, to assess the timing of topics discussed during various activities of the HHPM farm visit, data sets were merged based on the time stamp assigned to the topics and activities. For a discussion that spanned more than 1 activity of the visit (e.g., was initiated during transition and ended during herd performance review), the duration of the discussion that took place
during each activity was calculated. When calculating the number of topics discussed per activity, a topic that spanned more than 1 activity was counted more than once.

For qualitative data analysis, questionnaire responses to open-ended questions were coded using representational thematic text analysis (Popping, 2015). Codes that related to farmers’ short- and long-term goals were used by C. R. to inductively develop 14 themes (Boyatzis, 1998), which were summarized in a codebook. The codebook included a short definition of each topic (e.g., defining inclusion and exclusion criteria; DeCuir-Gunby et al., 2011). Similarly, regarding HHPM visit goals, C. R. inductively developed a codebook that also included 14 themes. There were no limitations on the number of themes that could be assigned to a farmer’s response, and many responses contained multiple themes.

**Interrater Agreement.** To test interrater reliability coding of the HHPM farm visit activities and topics, L. D. coded 3 randomly chosen video recordings using the categories developed by C. R. Coding was compared and discussed by C. R. and L. D. Only 1 minimal adjustment to the definition of 1 code was made, and L. D. then coded 7 additional randomly selected recordings. Coding of these 7 recordings was used to assess percentage of agreement between coders separately for activities performed, classification of conversation segments into various topics, whether farmer or veterinarian initiated the topic, and whether the discussion focused on the herd or an individual animal.

To assess agreement with the themes related to farmers’ goals, both codebooks were forwarded to L. D., who also coded all farmer responses. Then, percentage of agreement was calculated. For final analysis and compilation of results, only codings by C. R. were used.

### RESULTS

#### Interrater Agreement

The 2 coders agreed on 65 (88%) of the 74 topics in the 7 recordings used to assess interrater agreement. Furthermore, when coding who initiated a discussion (farmer or veterinarian), they agreed in 91% of the cases, and agreement was 90% for whether the discussion revolved around an individual animal or the herd. An additional 11 and 14% of the discussions coded by one coder were not classified as discussion by the other coder.

When identifying activities, agreement between coders was very high, with the main difference being that one coder added a total of 4 transitions, whereas the other coder did not classify those separately. Mean difference in duration for activities (across the 7 recordings) between coders was 51 s (SD = 77 s). When coding the HHPM visit goals, coders agreed on 94 (85%) of the 110 assigned codes based on developed themes, whereas agreement was 89% (123 codes) for short-term goals and 91% (96 codes) for long-term goals.

#### Study Participants and Perceived Representativeness of the HHPM Farm Visit

Demographic characteristics of participants are displayed in Table 1. All 67 farmers who answered this question stated that they were able to be themselves in front of the camera, and 63 (97%) of 65 farmers stated that the recorded HHPM farm visit was representative of other HHPM farm visits on their farm.

### Table 1. Demographic characteristics of participating veterinarians and farmers

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Farmers (n = 70)</strong></td>
<td></td>
</tr>
<tr>
<td>Province1</td>
<td></td>
</tr>
<tr>
<td>Alberta</td>
<td>41 (59)</td>
</tr>
<tr>
<td>Ontario</td>
<td>29 (41)</td>
</tr>
<tr>
<td>Sex1</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>7 (10)</td>
</tr>
<tr>
<td>Male</td>
<td>63 (90)</td>
</tr>
<tr>
<td>Role on farm1</td>
<td></td>
</tr>
<tr>
<td>Owner</td>
<td>40 (57)</td>
</tr>
<tr>
<td>Family/manager</td>
<td>26 (37)</td>
</tr>
<tr>
<td>Education1</td>
<td></td>
</tr>
<tr>
<td>Grade 12 or less</td>
<td>31 (44)</td>
</tr>
<tr>
<td>Postsecondary education</td>
<td>35 (50)</td>
</tr>
<tr>
<td>Age2 (yr)</td>
<td>39, 36 (21–66)</td>
</tr>
<tr>
<td>Duration as dairy producer2 (yr)</td>
<td>13, 12 (1–50)</td>
</tr>
<tr>
<td>Duration of professional relationship2 (yr)</td>
<td>8, 6 (0.2–35)</td>
</tr>
<tr>
<td>with veterinarian2 (yr)</td>
<td>1.7, 2 (0.5–4.5)</td>
</tr>
<tr>
<td>HHPM3 farm visits2 (no./mo)</td>
<td>125, 100 (34–500)</td>
</tr>
<tr>
<td>Lactating cows2 (no.)</td>
<td>34.8, 35 (26–44)</td>
</tr>
<tr>
<td>Bulk milk SCCC2 (×1,000/mL)</td>
<td>178, 161 (66–389)</td>
</tr>
<tr>
<td><strong>Veterinarians (n = 14)</strong></td>
<td></td>
</tr>
<tr>
<td>Province1</td>
<td></td>
</tr>
<tr>
<td>Alberta</td>
<td>9 (64)</td>
</tr>
<tr>
<td>Ontario</td>
<td>5 (36)</td>
</tr>
<tr>
<td>Sex1</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>4 (29)</td>
</tr>
<tr>
<td>Male</td>
<td>10 (71)</td>
</tr>
<tr>
<td>Employment1</td>
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<tr>
<td>Full time</td>
<td>12 (86)</td>
</tr>
<tr>
<td>Part time</td>
<td>2 (14)</td>
</tr>
<tr>
<td>Communication training of at least 20 h1</td>
<td>8 (57)</td>
</tr>
<tr>
<td>Yes</td>
<td>6 (43)</td>
</tr>
<tr>
<td>Age2 (yr)</td>
<td>42, 38 (25–68)</td>
</tr>
<tr>
<td>Duration of experience in dairy practice2 (yr)</td>
<td>14, 12 (1–44)</td>
</tr>
<tr>
<td>Clients who are dairy farmers2 (%)</td>
<td>67, 80 (8–95)</td>
</tr>
<tr>
<td>HHPM visits2 (no./mo)</td>
<td>28, 27 (4–80)</td>
</tr>
</tbody>
</table>

1Values are no. (%). Percentages are based on total number of participating farmers (n = 70) and veterinarians (n = 14).
2Values are mean, median (minimum–maximum).
3Herd health and production management.
Structure of HHPM Visits

Across the 70 HHPM farm visit recordings, 99 h and 33 min of audio-video material was analyzed. Mean recording duration was 85 min per visit. A previous study (Ritter et al., 2018a) that analyzed the same veterinarian–farmer interactions focused on communication between participants. In the previous study, the beginning and end of the recordings were trimmed if there was no conversation, resulting in reporting of slightly shorter interactions (82 min) compared with the previous study.

All HHPM farm visits included transrectal pregnancy and fertility diagnostics (mean duration per visit: 43 min; 51% of the mean visit), whereas a mean of 26 min (30%) per visit was spent on preparations, transitions, or leaving. All recordings included these activities (Figure 1; Table 2). Other aspects of the HHPM farm visits occurred less frequently, and mean time spent on these activities (even when performed) was considerably lower (Table 2). A total of 54 individual animal examinations or treatments were performed across 36 HHPM farm visits; of these, 47 (87%) included a cow or heifer and 7 (13%) included a calf. Eight (40%) of the group procedures involved calves and 12 (60%) involved cows or heifers. In total, 20 group procedures were conducted across 14 HHPM farm visits. Further, 36 (51%) of the visits included herd performance reviews and 6 (9%) included other activities, including tending to sheep and dogs and, in one instance, inspecting the barn design.

Discussion of Dairy-Specific Topics

Across all 70 recordings, there were 488 discussions between participants. Overall, veterinarians and farmers had a mean of 5 discussions/h (SD = 4 discussions/h), and the mean length of these discussions was 2 min (SD = 2 min). Total duration spent on each of the topics across all HHPM visits was highly correlated with the number of times a topic was discussed by the participants (Spearman’s rho = 0.96; P < 0.0001).

During the HHPM farm visits, veterinarians and farmers initiated 55 and 45% of all discussions, respectively (Figure 2A). Overall, 52% of the 488 discussions focused on herd issues (veterinarians initiated 67% of these), 33% focused on individual animals (36% of these were veterinarian initiated), and the remainder focused on general topics such as the dairy industry or business management (59% of these were veterinarian initiated; Figure 2B). Consequently, veterinarian-initiated discussions revolved around herd health in 62% of the cases and around individual animals in 22% of the cases.
In contrast, farmers initiated 39% of their discussions about herd issues and 48% about individual animals. Further, percentage of herd-related discussions for individual veterinarians ranged from 24 to 68% (median = 53%). Hence, veterinarians focused more on herd issues compared with farmers (interaction effect: coefficient = −0.95; 95% CI = −1.37 to −0.53; \( P < 0.001 \)), and there was a cluster effect by veterinarian (likelihood ratio test: \( P = 0.04 \)). In terms of demographic factors, there was a negative relationship between number of lactating cows on the farm and number of topics that were initiated during the visit.

Veterinarians raised the topics “milk production” (coefficient = 1.06; 95% CI = 0.20 to 1.91; \( P = 0.02 \)) and “nutrition” (coefficient = 0.84; 95% CI = 0.04 to 1.65; \( P = 0.04 \)) more often, and when discussing udder health, they focused more on the herd, whereas farmers focused more on individual animals (interaction effect: coefficient = −1.36; 95% CI = −2.65 to −0.07; \( P = 0.04 \)). The likelihood ratio test revealed clustering by veterinarian for the topics “claw health” (\( P = 0.01 \)), “milk production” (\( P = 0.02 \)), “transition diseases” (\( P = 0.003 \)), and “udder health” (\( P = 0.03 \)). However, with the exception of the cluster effect of the veterinarian for the discussion of transition diseases, differences regarding individual topics were insignificant when adjusting for multiple comparisons using Bonferroni corrections (i.e., applying a significance level of 0.0035 for 14 comparisons).

### Timing of Discussions During the HHPM Farm Visit

The highest mean frequency of discussions was observed during individual animal examinations or treatments (15 discussions/h; SD = 16 discussions/h), followed by herd performance review (11 discussions/h; SD = 10 discussions/h); group procedures (10 discussions/h; SD = 12 discussions/h); preparation, transition, and leaving (6 discussions/h; SD = 5 discussions/h); other activities (3 discussions/h; SD = 4 discussions/h); and transrectal pregnancy and fertility diagnostics (4 discussions/h; SD = 4 discussions/h). This trend was confirmed when assessing the total duration participants spent discussing various topics. During individual animal examination or treatment and during herd performance review, participants spent 52% (SD = 35) and 39% (SD = 35%) of the duration discussing various topics, followed by discussions during other activities (26%; SD = 39%); group procedures (25%; SD = 35%); preparation, transition, and leaving (16%; SD = 15%); and transrectal pregnancy and fertility diagnostics (10%; SD = 9%). Dairy-specific discussions took place during 17% (mean; SD = 14%) of the total HHPM farm visit duration. The highest proportion of herd-level discussions took place during group procedures (68% of all discussions; 91% of veterinary-initiated discussions) and herd performance review (65% of all discussions; 72% of veterinary-initiated discussions), whereas during the other activities, overall proportion of herd health discussion varied between 18% (individual animal examination and treatment) and 55% (transrectal pregnancy and fertility examinations).

### Farmer Goals of HHPM Visits

Sixty-two and 56 farmers submitted answers to the open-ended question regarding their short- and long-term farm goals, respectively (Figure 3), with the largest percentage of the farmers’ short-term goals relating to milk production (37% of the responses included this), fertility and reproduction (34%), improving facilities and expansion (27%) and animal health (18%).
The most commonly mentioned long-term goals were improving facilities and expansion (25%) and milk production (27%).

Farmer responses (n = 58) to the open-ended question regarding what they wanted to achieve with HHPM visits were most commonly (74% of responses) related to fertility and reproduction, including transrectal pregnancy and fertility diagnostics. Other themes commonly mentioned included overall herd health and animal care (28%), receiving information or having questions answered (21%), and identifying and discussing problems (21%). Remaining themes that were mentioned less frequently included udder health (9%), milk production and milk quality (9%), transition diseases (5%), group procedures including vaccines (5%), calf treatments including routine procedures (3%), treatment of “problem cows” (3%), improving general herd performance (3%), hoof health (2%), nutrition (2%),

Figure 2. (A) Topics during 70 dairy herd health and production management farm visits, stratified by whether the farmer or the veterinarian initiated the discussion. Numbers after bars represent rounded percentages of times the veterinarian and the farmer initiated topic discussions. “Unspecified issue” includes discussions about an issue without diagnosis (i.e., participants were uncertain about what might be wrong with an animal). (B) Topics during 70 dairy herd health and production management farm visits, stratified by whether the discussion focused on individual animals or the herd. Numbers after bars represent percentage of times topic discussions focused on herd issues versus individual animals. “Unspecified issue” includes discussions about an issue without diagnosis (i.e., participants were uncertain about what might be wrong with an animal). NA = not applicable.
and optimization of protocols (2%). The rank question (answered by 62 farmers) confirmed the responses of the open-ended question, with the answers “improve herd fertility,” “fertility and pregnancy diagnostics,” and “improve general herd health” being the most dominant goals (Table 3).

Most (55%) of the 65 farmers who answered this question stated that the HHPM farm visits were “absolutely” tailored toward their goals, whereas 42% felt they were “mostly” and 3% believed they were “sometimes” or “rarely” tailored toward their goals. Recordings of the farmers who stated that HHPM farm visits were “absolutely” tailored toward their goals contained more discussions (mean = 8.6; SE = 0.9) compared with recordings of the farmers who were less positive (mean = 5.7; SE = 0.6; coefficient = 0.17; 95% CI = 0.05 to 0.30; \( P = 0.007 \)).

Of the 65 responding farmers, 32 and 58% stated that they “always” or “often” express their wishes or needs when talking to their herd veterinarian, respectively, with the remaining farmers stating that they express wishes and needs “sometimes” (8%) or “rarely” (2%). There was no difference between the number of discussions initiated by farmers who stated that they always express their wishes or needs (mean = 3.3; SE = 0.6) and the remaining farmers (mean = 3.3; SE = 0.4; coefficient = 0.04; 95% CI = −0.18 to 0.27; \( P = 0.72 \)). However, compared with farmers who stated that they do not always express their wishes or needs, farmers who stated that they always voice their wishes or needs had higher odds of answering that the HHPM farm visits were “absolutely” tailored toward their goals (coefficient = 1.34; 95% CI = 0.17 to 2.51; \( P = 0.02 \)).

**DISCUSSION**

Whereas a variety of studies have used questionnaires or interviews to gain insights into HHPM farm visits (e.g., Derks et al., 2012, 2013a; Hall and Wapenaar, 2012; Luby et al., 2013; Svensson et al., 2018), this study analyzed audio-video recordings to report on HHPM visit activities and topics discussed. Compared with other Canadian studies, participating farmers were slightly younger [in Winder et al. (2016), mean age was 43 yr; in Denis-Robichaud et al. (2019), 60.8% were >39 yr], whereas the age and sex distribution of participating veterinarians was similar to that of other food animal veterinary practitioners (Jelinski and Barth, 2015; Winder et al., 2016). Further, duration of the veterinarians’ clinical experience (Luby et al., 2013), number of lactating cows per farm (Canadian Dairy Information Centre, 2017), and milk production per cow (Ritter et al., 2015) were comparable with previously published data. Although a range of farm sizes was included, the largest participating farm had 500

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**Table 3.** Answers of dairy farmers (n = 62) ranking predefined goals they would like to achieve with herd health and production management farm visits

<table>
<thead>
<tr>
<th>Goal</th>
<th>Rank (%)</th>
<th>Ranked among top 5 goals (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve herd fertility</td>
<td>33 37 15 7 5 97</td>
<td></td>
</tr>
<tr>
<td>Fertility and pregnancy diagnostics</td>
<td>45 25 7 5 2 83</td>
<td></td>
</tr>
<tr>
<td>Improve general herd health</td>
<td>15 17 38 3 8 82</td>
<td></td>
</tr>
<tr>
<td>Increase herd longevity</td>
<td>3 2 13 17 12 47</td>
<td></td>
</tr>
<tr>
<td>Improve udder health</td>
<td>2 3 7 12 8 32</td>
<td></td>
</tr>
<tr>
<td>Reduce calf diseases</td>
<td>0 2 5 7 15 28</td>
<td></td>
</tr>
<tr>
<td>Improve production</td>
<td>2 5 3 10 7 27</td>
<td></td>
</tr>
<tr>
<td>Improve nutrition</td>
<td>0 3 2 7 7 18</td>
<td></td>
</tr>
<tr>
<td>Improve milk quality</td>
<td>0 3 7 2 2 13</td>
<td></td>
</tr>
<tr>
<td>Other1</td>
<td>2 0 0 2 3 7</td>
<td></td>
</tr>
</tbody>
</table>

1Other goals mentioned: maximize profitability, hoof health, new research and ideas.
lactating cows; perhaps structure and topics of HHPM farm visits would differ on farms larger than this.

In this study, structure, focus, and content of HHPM visits differed by farm and veterinarian. However, transrectal pregnancy and fertility diagnostics were a dominant part of all visits. Similarly, in a previous study (Derks et al., 2012), fertility was part of every herd health visit for 84% of farms. Therefore, it can be questioned whether these farm visits generally fit the definition provided by Green et al. (2012) or whether they are mainly conducted to provide technical pregnancy and fertility services.

Although HHPM topic discussions took place in only 17% of the total HHPM visit duration, the remaining 83% of the visit was not spent in silence, as much of that time was allocated to social talk or short statements including instructions (Ritter et al., 2018a). Future studies could expand on the investigation of prioritization of topics and individual animal health versus herd health in HHPM visits using qualitative and quantitative methods. The observed cluster effect by veterinarian implied that they prioritized herd health topics to a different extent compared with individual animal issues. Further, although several studies have assessed the role of veterinarians during herd health farm visits (Hall and Wapenaar, 2012; Relun et al., 2013), farmers’ perception of veterinarians’ value as a herd health consultant in addition to their role in curing individual animals, and the extent to which veterinarians show their added value in HHPM farm visits and in reaching short- and long-term goals, would benefit from more detailed investigations.

Veterinarians focused substantially more often on herd-level topics compared with farmers. This may not be surprising because veterinarians were less likely to be aware of specific individual animals’ issues when they arrived for an HHPM visit. However, in a previous study (Hall and Wapenaar, 2012), both farmers and the veterinarian regarded treatment of individual animals as the veterinarian’s major role. Nevertheless, this does not imply that farmers do not consider herd health to be a very important aspect of the dairy operation. For example, Svensson et al. (2018) demonstrated that farmers conduct a wide variety of tasks to prevent disease while not offering many suggestions for how veterinarians might contribute to herd health management. Farmers in the study by Svensson et al. (2018) primarily associated herd health and prevention of disease with being their main task and not the veterinarian’s task.

The importance of knowing farmers’ goals has been acknowledged in previous research, as farmers are more likely to adhere to goal-oriented advice, whereas veterinarians often fail to identify these goals (e.g., Kristensen and Jakobsen, 2011; Derks et al., 2013b; Svensson et al., 2019). In this study, the top-ranked HHPM visit goals of farmers were related to fertility and reproduction as well as overall herd health and animal care. Regarding the latter, Hall and Wapenaar (2012) reported a similar image, where respondents indicated that “disease control” and “supporting animal health and welfare decisions” were major roles of veterinarians on dairy farms. Although Hall and Wapenaar (2012) did not assess farmers’ perceptions of the importance of fertility and reproduction specifically, participants in this study raised the topic “fertility” most often. This was aligned with the farmers’ goals for HHPM visits, and improving fertility was an important short-term goal. In contrast, misalignment of farmers’ and veterinarians’ beliefs was reported by Duval et al. (2016). In that study, organic dairy farmers and their veterinarians experienced difficulties establishing an advisory relationship due to disagreements about what they considered good animal health practices.

The open-ended question regarding HHPM visits highlighted the farmers’ need for information, as many participants mentioned receiving information or having questions answered and identifying and discussing problems. In a Q-factor analysis, Kristensen and En-evoldsen (2008) identified knowledge dissemination to be important for farmers, after teamwork and animal welfare, whereas veterinarians in that study regarded it as less important than production and animal welfare. Furthermore, Bard et al. (2019) highlighted that various routes (e.g., written, verbal) for giving advice and information provided further opportunities for engagement and understanding.

The question remains whether veterinarians provide herd health visits that are adequately tailored to the goals of their clients, as Bard et al. (2019) reported that farmers had a desire for a working relationship in which the veterinarian respected and was compassionate toward the farmers’ needs and goals. In our study, 55% of the farmers indicated that the HHPM farm visits were “absolutely” tailored toward their goals, showcasing that many veterinarians were seemingly successful in fulfilling the needs of their clients and building a working relationship. Forty-two percent felt that visits were “mostly” tailored toward their goals. Is “mostly” enough? As the recordings with farmers who were less positive also contain fewer discussions and 68% of farmers in the current study do not always voice their wishes and needs, we agree with Jansen et al. (2010) that there is room for improvement in veterinarians’ communication to initiate conversation about farmers’ goals and how veterinarians can support those goals.

This study adds to the existing literature highlighting the importance of both the veterinarian and the farmer
taking more responsibility in opening the discussion concerning the farmers’ goals instead of assuming that they have a shared understanding (Bard et al., 2019). It is imperative for both the farmer and the veterinarian that the latter knows the goals of the former and is able to cater content, form, timing, and quantity of advice to the specific situation of the farm and the information-seeking behavior of the farmer and to offer farm-specific added value and services. To achieve that, veterinarians should be less reluctant to initiate the HHPM conversations, and farmers should feel safe to express their needs and goals in case their veterinarian refrains from doing so. However, besides training the veterinarians on effective communication and HHPM advisory, farmers and veterinarians need to believe in the importance of a paradigm shift of the veterinary role and assess individually on each farm how this can be achieved.

Farmers who stated that they “always” voice their wishes or needs had higher odds of answering that the HHPM farm visits were “absolutely” tailored toward their goals compared with their peers. However, Svensson et al. (2018) reported that farmers expect the veterinarian to initiate the discussion regarding HHPM visits, and Derks et al. (2013b) reported the reluctance of veterinarians to ask their clients about their goals and that the majority of farmers “sometimes” or “seldom” actively approached their veterinarian with specific topics they wished to discuss. When Hall and Wape-naar (2012) asked who initiated discussions on herd health management topics, veterinarians and farmers seemed to be misaligned, as 26% of the veterinarians claimed that they initiated discussion, whereas 15% of farmers considered the veterinarians to be the initiator of discussions and 41% of farmers stated that they initiated the discussions.

Although dairy-specific discussions were relatively short and infrequent throughout the farm visit, there is especially an opportunity to engage in more conversation during preparations, transitions, and leaving. During these activities, the veterinarian is not required to perform clinical services and can focus on the farmer. It was argued that most farmers are interested in and motivated to improve herd health if approached in the right way and offered the right services (Derks et al., 2013a; Svensson et al., 2018). However, the only way to achieve an effective advisory relationship is to ask questions and engage in conversation (Jansen and Lam, 2012). Dairy-specific conversations during preparation, transition, and leaving could benefit both parties; farmer and veterinarian can ask questions and receive information while not prolonging the farm visit, which might be especially advantageous if the farmer pays the veterinarian per hour. For the veterinarian, it creates an opportunity to provide additional advice and offer their services, as offering veterinary services is the most important step in creating demand (Jansen and Lam, 2012). If the veterinarian and the farmer agree to expand on these discussions in a more formal manner after the practical herd-specific tasks, it would provide the opportunity for veterinarians to highlight their role as herd health advisor as part of the paradigm change on modern dairy farms. However, Bard et al. (2019) argued that by adhering to the “cultural script of informality” and offering services that account for the farmers’ priorities and restrictions instead of aiming to maximize veterinary profits by demanding structured consultations, veterinarians can indicate an understanding of the farmers’ needs. Ideally, veterinarians could find a balance between these seemingly contradictory viewpoints by structuring the conversation and motivating farmers to more formally discuss herd issues in detail while offering farm-specific services and leaving space for informality.

Because of the unique research methods used to reach our study objectives and lack of previous studies assessing communication patterns, there was very limited guidance in the literature regarding coding of discussions and activities. However, the use of a codebook and discussions between coders resulted in an interrater agreement that was deemed acceptable. Because study participants were aware of being recorded, there is a risk of the Hawthorne effect (i.e., participants changing behavior when knowing that they are observed; Carroll and Groarke, 2019). In particular, participants could have avoided certain topics that they felt were personal or portrayed the farm in a negative light (e.g., farm finances, lameness). However, due to farmers stating that they could be themselves in front of the camera and their perception that the recorded HHPM visit was representative of other visits, we concluded that, overall, data collected during the recorded HHPM visits represented a valid view of a general HHPM visit of the sample. However, selection bias could have been introduced into this study through inclusion of veterinarians who are more motivated and capable of providing comprehensive HHPM advisory and through veterinarians being more likely to select farm visits for the recordings if they have a good relationship with the farmer. However, it can be assumed that farmers engage in regular HHPM farm visits only if they have a good relationship with the veterinarian.

**CONCLUSIONS**

Structures of HHPM visits varied substantially across farms. However, overall, the topic of fertility, including transrectal diagnostics, was a dominant part of the
visits. The farmers’ hope for constructive discussions was highlighted in the questionnaire answers. However, only 17% of the HHPM farm visit was spent discussing dairy-specific topics, and those discussions were relatively short. The importance of finding common ground through conversations was highlighted by the result that the farmers who believed that visits were “absolutely” tailored toward their goals also had more discussions. Time during activities, such as preparing for the visit or transitioning between barns, could be used for additional discussions without prolonging the farm visit. This study demonstrates that there is much opportunity to open a conversation on specific questions and goals farmers have and offer the veterinary services that align. Therefore, the key to a satisfied farmer who has their needs met regarding HHPM lies in asking questions and showing added value of veterinary services.

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REFERENCES


