



Development of a bovine continuing education program for early-career veterinarians to address clinical service shortage

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ABSTRACT

There is currently a shortage of production animal veterinarians worldwide. Access to adequate continuing education (CE) increases retention of health-care workers in rural areas. However, little information is available about the preferences of bovine veterinarians in their first years after graduation. Our objective was to design a readily available CE program tailored for recent veterinary graduates working in bovine medicine. For this, we conducted a cross-sectional survey to identify early-career bovine veterinarian needs and their preferences to access CE conducted while practicing full time. Subsequently, we conducted a second survey to triangulate their responses with the opinions of experienced veterinarians, where the experienced veterinarians ranked the relevance of the CE topics that resulted from the early-career veterinarian survey. We received a total of 132 valid responses from US veterinarians in their first 5 years after graduation, and 32 responses associated with bovine veterinarians with 10 or more years of experience. Our results showed that a combination of distance education and workshops to practice hands-on skills was the preferred method for accessing CE among early-career veterinarians. Furthermore, recent graduates were willing to commit 1 to 2 h/wk to distance education. From the list of 20 topics identified by early-career veterinarians, the experienced veterinarians ranked “calf/heifer management” and “immunology and vaccinology” as the most relevant ones for practice. With the information gathered from these surveys, we designed, implemented, and piloted a 180-h CE program on bovine health management that is delivered over 2 yr through asynchronous distance education and annual hands-on workshops. Participant feedback has been very positive. Overall, the survey results will serve to develop CE programs targeted to bovine veterinarians in their first years of practice. Future

research is needed to evaluate this program’s success in retaining the bovine veterinary workforce within the United States, particularly in rural underserved areas.

Key words: dairy production medicine, professional development, veterinary shortage

INTRODUCTION

The veterinary profession faces a shortage of food animal veterinarians in many countries, including the United States, Canada, countries in the European Union, and Australia (Brown and Silverman, 1999; Prince et al., 2006; FVE, 2020; Arbe Montoya et al., 2021). The American Veterinary Medical Association predicts demands for food animal veterinarians to increase by an average of 12.6% concurrently with a reduction in food animal veterinarians by 4.6% annually (Andrus et al., 2006). There are 217 geographical areas in the United States with limited access to food animal veterinarians (referred to as USDA-designated veterinary shortage areas), 202 (93%) of which involve cattle industries (USDA National Institute of Food and Agriculture, 2020). Recruitment and long-term retention of food animal veterinarians are critical issues for the sustainability of the livestock industries located in regions with veterinary service shortfalls.

Providing access to continuing education (CE) is a major influencing factor for established rural health-care professionals to continue practicing in these areas (Henry et al., 2009; Gagnon et al., 2011; Campbell et al., 2012; Mbemba et al., 2016). Currently, food animal veterinarians represent only 5.2% of US veterinarians in clinical practice (AVMA, 2022), and the proportion of American veterinarians choosing a career in food animal practice upon graduation has continued to decline over the last decades (AAVMC, 2021). Furthermore, less than 50% of veterinarians who opted for farm animal practice at graduation remain in this field, with the largest dropout occurring in the first years after graduation (Lissemore and Stowe, 1989). The retention of veterinarians in rural practice is a complex and multifaceted issue (Navarre et al., 2020). However, both expert

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opinion and survey studies reported that postgraduate professional development opportunities in food animal veterinary medicine are needed to guarantee the retention of practitioners (Prince et al., 2006; Jelinski et al., 2009; Lenarduzzi et al., 2009). Albeit now compulsory in all US states (Moore et al., 2003), access to CE is particularly challenging for veterinarians working in underserved areas. This is due to the time commitment required to travel to meetings or workshops, the cost of these activities, and the potential need to hire relief veterinarians to cover daily practice obligations (Dale et al., 2013; Moore et al., 2000). Beyond the licensing requirements, CE improves the confidence and competence of practitioners and patient care (Tait et al., 2006; Fletcher, 2007). In addition, participation in CE courses contributes to developing a professional support network that helps decrease burnout and compassion fatigue (Lovell and Lee, 2013). However, very few programs are available that are targeted toward food animal medicine that specifically addresses the CE needs of recent graduates. Previous studies showed that new graduates choose and need CE courses that are different from the ones senior veterinarians need (Routly et al., 2002; Gilling and Parkinson, 2009). Specifically, they seek courses that deal with their perceived weaknesses, focus on hands-on skills, and provide opportunities to meet other new graduates and share early professional experiences (Routly et al., 2002). A positive experience in the first years of practice is pivotal for the career of veterinarians (Gilling and Parkinson, 2009). Hence, it is essential to provide CE targeted to the areas that recent graduates identify as their greatest needs.

Given these identified gaps, our objective was to develop a bovine medicine CE program targeted to veterinarians in their first 5 yr of practice. To achieve this, we conducted a cross-sectional study using questionnaires. First, we conducted a needs analysis among recent food animal veterinary graduates to identify early-career bovine veterinarian CE needs and the best delivery methods. Subsequently, we triangulated their responses with data from surveying more experienced bovine practitioners. We also summarize our experience implementing the CE program that resulted from this investigation.

MATERIALS AND METHODS

To develop a CE curriculum that is both appealing to early-career veterinarians and relevant to rural practice and the cattle industries in these regions, we conducted a cross-sectional study using 2 questionnaires distributed to early-career and experienced bovine veterinarians. These activities were categorized as exempt human research by the Michigan State Univer-

sity Institutional Review Board (STUDY00000294 and STUDY00000534). Copies of the surveys are available from the corresponding author upon request. We piloted the questionnaires with 3 veterinarians external to the research team and 3 final-year veterinary students at Michigan State University to assess the respondents' answers and identify problematic questions. The surveys were subsequently revised before wider distribution. Pilot surveys were not included as responses. No incentives for participation were provided, and participation was voluntary.

Survey of Early-Career Bovine Veterinarians

We distributed a 10-question survey about the needs for bovine CE and the best ways for its delivery between February and March 2018. Distribution of the survey to all US early-career bovine veterinarians through a single organization (and, as such, a sampling frame) was not possible, so we used a multipronged approach for distribution to maximize participation. We estimated the sample size required to obtain representation of US early-career veterinarians to be between 110 and 200, with the assumption that 20% to 25% of veterinarians would have a preferred method of delivery (estimated prevalence), with 95% confidence level and 5% to 8% precision of the estimate. We distributed paper copies of the questionnaire to veterinarians attending the 2018 Recent Graduate Conference of the American Association of Bovine Practitioners (AABP). A link to an online version of the survey (Qualtrics) was also circulated among recipients of the USDA Veterinary Medicine Loan Repayment Program.

The questionnaire was structured in 3 blocks: demographic information (e.g., years since graduation, type of practice, and workload), preferences for accessing CE, and preferences for CE topics. For the topics, respondents were asked to identify up to 3 topics per production system where they saw the major needs for CE in their daily work. Subsequently, the responses to this open-ended question were analyzed by both authors using thematic analysis. For this, we followed the procedure proposed by Braun and Clarke (2006). First, responses were read several times in order for us to become familiarized with the data. Then, initial codes were generated independently by each author. After that, both researchers reviewed the codes and put them in themes, resulting in a list of 20 topics.

Survey of Experienced Veterinarians

To triangulate the information from the survey to early-career veterinarians and assess the relevance of the identified topics to bovine practice in the United

Table 1. Demographic characteristics of the respondents to the surveys targeted to early-career and experienced veterinarians

Item	Early-career (n = 132)	Experienced (n = 32)
Age (yr) of respondents [number of answers (%)]		
18–25	3 (2.3)	0 (0.0)
26–35	112 (84.8)	0 (0.0)
36–40	15 (11.4)	4 (12.5)
41–50	2 (1.5)	10 (31.3)
51–60	0 (0.0)	13 (40.6)
>60	0 (0.0)	5 (15.6)
Number of years practicing veterinary medicine [number of answers (%)]		
<1	39 (29.5)	0 (0.0)
1–2	41 (31.1)	0 (0.0)
3–4	52 (39.4)	0 (0.0)
5–6	0 (0.0)	0 (0.0)
7–8	0 (0.0)	0 (0.0)
9–10	0 (0.0)	0 (0.0)
11–15	0 (0.0)	5 (15.6)
16–20	0 (0.0)	8 (25.0)
>20	0 (0.0)	19 (59.4)
Practice area including a USDA-designated veterinary shortage area ¹ [number of answers (%)]		
Yes	106 (80.3)	16 (50.0)
No	20 (15.2)	12 (37.5)
Do not know	6 (4.5)	4 (12.5)
Percentage of work allocation per species [mean (SD)]		
Dairy	31.6 (36.30)	43.2 (30.40)
Beef	30.5 (29.30)	38.7 (27.20)
Equine	8.3 (12.80)	9.7 (8.22)
Small ruminants	7.3 (11.30)	2.8 (2.97)
Swine	3.8 (13.00)	0.44 (0.46)
Companion animals and others	18.4 (24.80)	24.7 (20.10)

¹Areas in the United States with limited access to food animal veterinarians that are approved by the USDA (<https://www.nifa.usda.gov/vmlrp-map>).

States, we conducted a second survey among experienced bovine veterinarians in the states of Michigan and New York. For this, a link to an online survey (Qualtrics) was distributed by the Michigan Veterinary Medical Association (East Lansing) and the New York State Veterinary Medical Society (Albany) to their members via their monthly e-newsletters in April 2018. The questionnaire included a section to capture demographic information and another section where respondents classified the 20 topics generated in the survey to early-career veterinarians according to their perceived relevance to bovine veterinary practice using a 3-point Likert scale (1 = not relevant; 2 = moderately relevant; 3 = very relevant). From the responses obtained, those associated with experienced veterinarians (≥ 10 yr of practice) who identified themselves as working in a rural area and had a significant workload of food animal medicine were used.

RESULTS AND DISCUSSION

Early-Career Veterinarians CE Needs and Preferences

A total of 152 veterinarians responded to this survey. However, 20 responses were associated with vet-

erinarians with more than 5 yr of experience and were therefore excluded from the analyses because they did not meet our definition of early-career stage. Thus, the responses from 132 veterinarians within their first 5 yr after graduation were used for analysis (Table 1). This group's age demographics reflected their junior professional career stage [median (range): 29 (25 to 47) yr], with approximately 85% of them falling in the bracket of 26 to 35 yr of age. Due to the target population of this survey and CE program, the majority of the respondents (n = 106, 80.3%) worked in a designated veterinary shortage area. There was a wide range in the estimated workload allocation to species (Table 1), although cattle (dairy and beef) predominated. Although all the respondents dedicated more than 50% of their time to production animal species, only 90 (68.2%) worked in an almost-exclusive food animal position, defined here as a workload greater than 80% dedicated to food animal species (data not shown).

The combination of distance education with an annual workshop to practice hands-on skills was the preferred option for accessing CE by this group of veterinarians (Figure 1A), followed closely by the same combination of distance CE and workshops taking place alongside a major national conference, and the participation in hands-on workshops only. These results

are in accordance with previous reports of early-career practitioners preferring CE opportunities that allow for the development of hands-on skills (Routly et al., 2002). Interestingly, only 4.5% of respondents selected attending a conference as a preferred method for accessing CE. Although conferences are a very common method of offering CE among professional organizations that are usually widely attended by veterinarians, the low response rate observed in this group could be attributed to the challenges associated with traveling to a conference for a few days (Moore et al., 2000; Dale et al., 2013) and the fact that within a veterinary practice, senior staff usually have priority to attend national conferences. Indeed, some relevant professional organizations, such as the AABP and the American Association of Swine Veterinarians, have recently started to organize conferences targeted to veterinarians in the first years after graduation because of the low attendance of this group at their regular annual meetings despite offering lower registration costs.

To compile a list of topics where the respondents felt the greatest need for CE in their daily work, we asked them to list up to 3 topics per production system in an open-ended question. Responses were analyzed via thematic analysis by the authors, resulting in a list of 20 topics (Figure 2). Unfortunately, the survey responses were anonymous and we could not request respondents' ranking by perceived relevance. However, this group was only allowed to submit 3 topics per production system, suggesting that only topics of high perceived relevance were reported.

Perceived Relevance by Experienced Veterinarians

We received a total of 36 responses to the survey targeting experienced veterinarians. Of these, 4 responses were associated with veterinarians with less than 10 yr of working experience and were excluded, resulting in 32 responses used for analysis (Table 1). Half (50%) of the respondents practiced in a designated shortage area and worked primarily in dairy or beef cattle practice. The ranked list of topics is presented in Figure 2, with "calf and heifer health," "immunology and vaccines," "nutrition and metabolic diseases," and "epidemiology and preventive medicine" being the 4 top-ranked topics for experienced veterinarians. The results from this survey also represent the different preferences of early-career and experienced veterinarians reported in the literature (Routly et al., 2002). Several of the 3 top-ranked topics listed by early career-veterinarians received primarily low relevance scores from the experienced veterinarians participating in this survey. This highlights the importance of being mindful of the different needs of various experience groups when designing

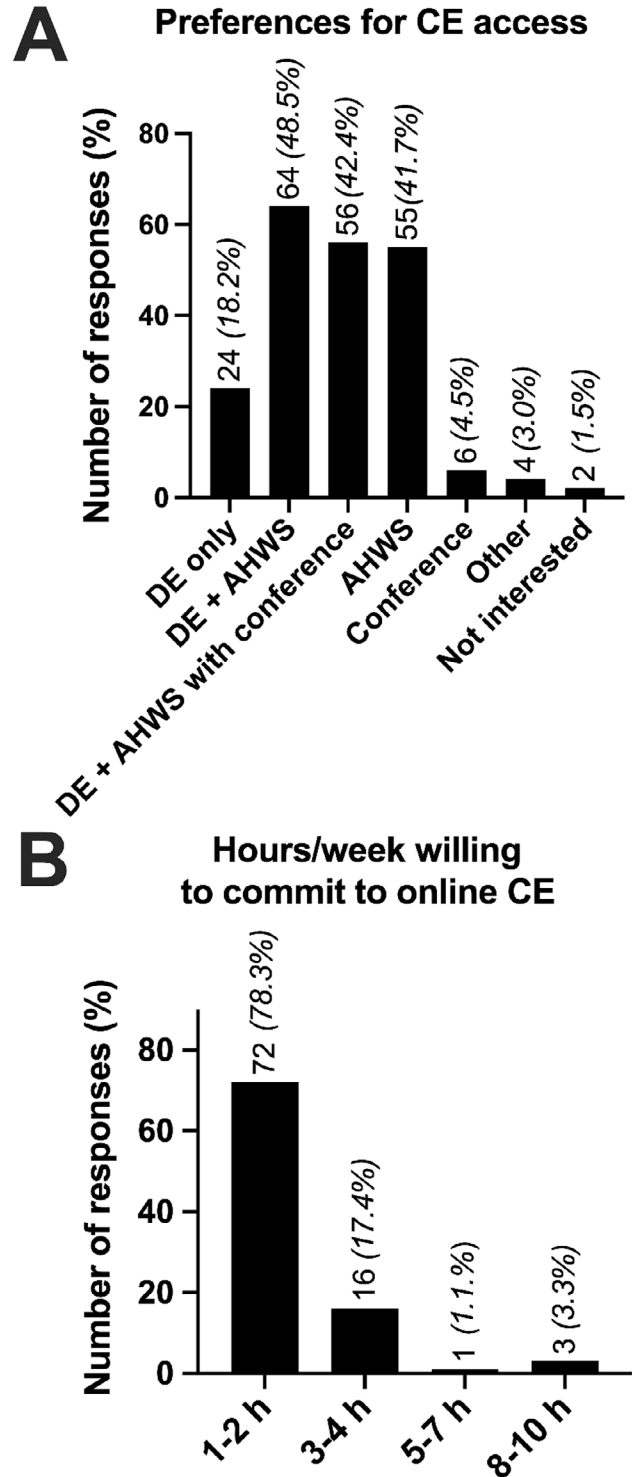


Figure 1. Distribution of responses to (A) preferred methods to access continuing education (CE) and (B) the number of hours per week respondents were willing to commit to online CE among bovine veterinarians within their first years of practice ($n = 132$). Respondents were able to select multiple options regarding methods for accessing CE. Only survey participants who selected an option including distance education were invited to respond to the question regarding time commitment to online CE. DE = distance education; AHWS = annual hands-on workshop.

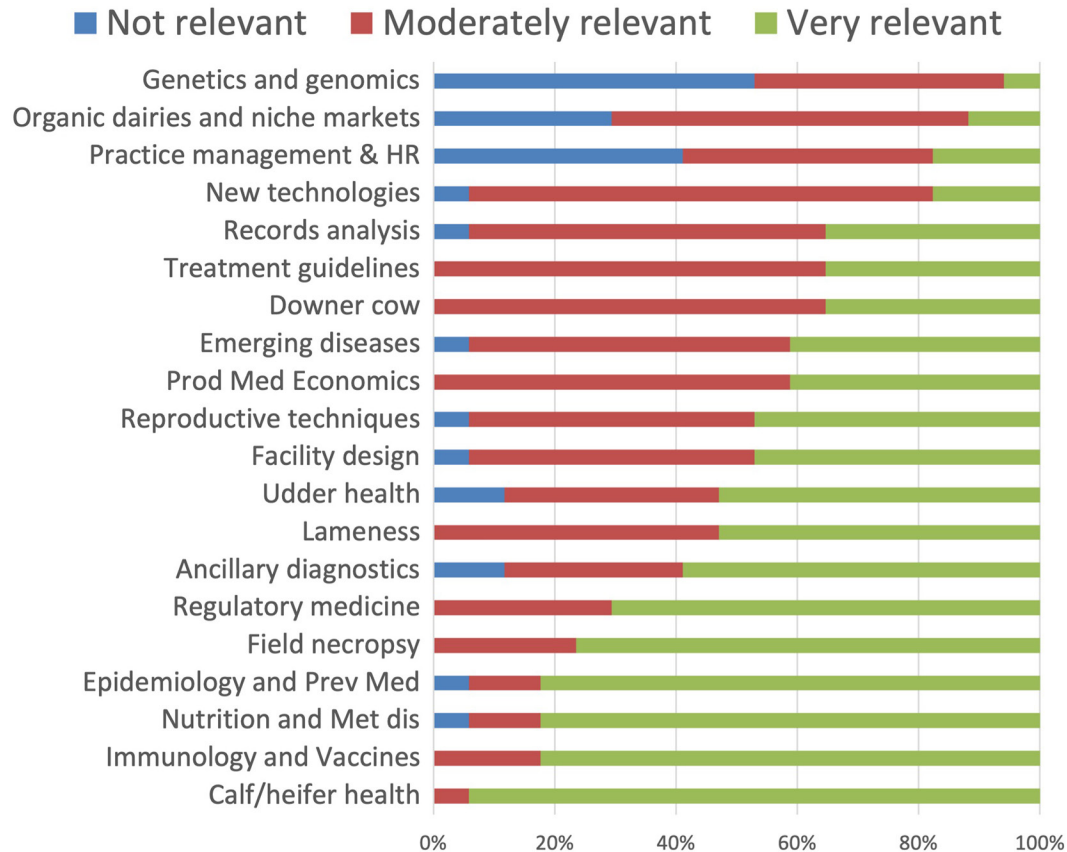


Figure 2. Ranking of perceived relevance of bovine medicine continuing education topics by experienced veterinarians. The list of 20 topics was generated from a survey of bovine veterinarians within their first 5 yr after graduation ($n = 132$). Subsequently, veterinarians with >10 yr experience ($n = 32$) were asked to rank the relevance of the topics to bovine medicine using a 3-point Likert scale. Results expressed as percent of responses. HR = human resources; prod = production; med = medicine; prev = preventative; met = metabolic; dis = diseases.

CE events. Moreover, it also demonstrates that the relevance and importance of newer topics that received lower rankings (e.g., genomics, practice management, and new technologies) need to be better communicated to veterinarians who have been practicing for several years.

Development of a Bovine Medicine CE Program for Early-Career Veterinarians

With the information gathered from the surveys, we designed and implemented a bovine medicine CE program catering to the needs of rural veterinarians working with dairy and beef cattle, with the aim of improving retention in early-career bovine practitioners in the United States. The survey among recent DVM graduates identified a combination of distance education and annual practical workshops as the preferred CE method (Figure 1A). It also indicated that recent graduates are willing to commit to 1 to 2 h/wk of distance CE (Figure 1B). Thus, we have planned a 24-mo distance CE

program with a total load of 180 h (1 to 2 h/wk, 45 wk/yr) supplemented with an annual 1.5-d hands-on workshop that is recognized via the Registry of Approved Continuing Education of the American Association of Veterinary State Boards. The modules of the program were selected based on (1) the perceived relevance of topics for bovine practice among experienced practitioners (Figure 2), (2) a previously published expert Policy Delphi and farmer priority identification study (More et al., 2010), (3) the availability of other specific CE opportunities such as the AABP Practice Analysis Workshops, and (4) the availability of expertise at the institutions of the authors. This resulted in a program comprising 12 modules distributed throughout the 24-mo program (Table 2). The ranking of topic relevance was considered for determining the duration of each module, prioritizing those more relevant modules. Each module was led by a content expert responsible for organizing the instructional materials, and other instructors from within and outside the authors' institutions contributed to both the online CE and hands-on

Table 2. List of modules included in the online continuing education program

Year 1	Year 2
Epidemiology and Herd Health Concepts	Down Cow Management
Lameness and Facilities Design	Production Medicine Economics
Udder Health	Emerging Diseases of Cattle in the US
Dairy Cattle Reproduction	Nutrition and Metabolic Disorders
Beef Cattle Reproduction	Applied Immunology and Vaccinology
New Technologies in Cattle Production Systems	Calf Health Management and Diagnostics
Hands-On Workshop 1:	Hands-On Workshop 2:
Bull Breeding Soundness Exams	Nutrition Audit
Fracture Management	Field Necropsy
Parlor Performance Evaluations	Calf Health Diagnostics

workshops. A list of instructors is available at the program's website (<https://cvm.msu.edu/lcs/continuing-education/bovine-health-management-for-early-career-rural-veterinarians-online-distance-education>).

The online CE component was delivered via Michigan State University's virtual learning system. Each module's content was presented using recorded lectures for asynchronous learning. Discussions among participants and facilitators were encouraged for each module to contribute to creating a professional network among early-career veterinarians. In addition, modules were supplemented with scheduled videoconference meetings with topic experts where participants could ask for clarification and discuss cases. Also, each module included assessment tasks. Assessments were used not only to evaluate participants' acquisition of knowledge and skills but also to emphasize practical applications and enhance the participants' problem-solving skills. For example, by using case-based problems with real herd issues providing the necessary material, participants could show what they learned and demonstrate their ability to apply the knowledge gained to a real case. Peer-assisted assessment tools such as Eli Review (Drawbridge Inc.) were used to foster interaction among participants and assist in creating a supportive professional network, such as having participants comment on each other's vaccination protocols.

The hands-on workshops were planned based on the "flipped learning" pedagogy strategy, which required participants to prepare learning before meeting in person and engaging in activities, thereby focusing on participants' application of conceptual knowledge rather than just the straight transfer of information. Thus, the participants were presented with the concepts during the online CE, and the workshops focused on developing and practicing the clinical skills associated with that content. Each workshop was composed of 3 half-day topics (Table 2). The topics were selected based on the ranked relevance of topics generated through the needs assessment surveys and upon consultation with the first cohort of participants.

Other similar food animal CE programs are face-to-face courses requiring participants to travel to the venue several times for 2 to 4 d of intensive modules, such as the Dairy Certificates from Ohio State University or Pennsylvania State University. However, this approach requires a significant amount of time away from veterinary practices, limiting rural veterinarians' availability, especially recent graduates, to attend CE. Hence, our program was delivered primarily online, which allowed for individualized access to CE materials by the participants when it suited them best, permitting better self-directed learning of recorded materials and discussion platforms, and only required time away from work to participate in the annual workshops. An additional feature was these annual workshops, designed to support the development of hands-on clinical skills. This is an area where early-career bovine practitioners desire more CE (AABP, 2018), and our survey identified that recent graduates want a combination of online CE and workshops (Figure 1A).

With the support from a Veterinary Services Grant Program educational grant from the USDA, we enrolled 2 cohorts of 20 early-career (within 5 yr from graduation) veterinarians each in this program in 2020 and 2021, respectively. This program is offered at no cost to the participants, and a stipend was provided to help defray travel costs to attend the hands-on workshops. The program has gained great interest among early-career bovine veterinarians, receiving 90 to 120 applications each year for the 20 positions offered after just advertising the program through the listserv of the AABP. Due to the conditions of the grant supporting this program, participants are required to be US citizens, work in predominantly bovine practice within the United States, and be within 5 yr from graduation from their veterinary studies. For each cohort, participants were selected by a faculty panel based on a statement of interest, favoring those working in a USDA-designated veterinary shortage area. To date, participants have been graduates from 18 different colleges of veterinary medicine from the United States or Canada, work in 15

different US states, and include all years of experience possible, from recent graduates up to 5 yr at the time of application.

Feedback from Participants

Participant feedback has been very positive to date, as exemplified by the statements that follow.

Participant A: “I just wanted to let you know I had a producer say to me ‘Wow, you’re learning a lot in this class’ after discussing some floor grooving options with him. I have only been his herd vet for 6 mo so building his trust is very important to me. All of the work you have put into this class is already helping and making a difference!”

Participant B: “This module has been fantastic. I ABSOLUTELY LOVED IT! It was extremely practical, and it has helped me approach things differently in my daily work. The case studies were SUPER helpful! They got me thinking about a lot of things that I hadn’t previously considered and now I feel more confident about approaching a herd problem.”

Participant C: “This course has been exactly what I was needing to further my career. The modules have been well organized and are taught by some of the industry’s most respected faculty. I’ve learned in this course what I wish I would have learned during vet school. It has increased my knowledge base and has allowed me to have conversations with my producers that I never felt confident enough to have before.”

Participant D: “The course has been amazing so far! You get to meet many other new grads that you can relate to and due to geographical differences in practice area and clientele, it creates great discussion. The topics are extremely applicable and there are many live sessions with content experts so there is ample opportunity to get advice on situations with your own clients or just ask for information clarification. The modules are well spread out so you have a lot of time to complete the required readings and assignments. It is easy to work at your own pace while balancing practice and personal life.”

Future work includes continuing to revise and improve the program and evaluating its impact on the retention of veterinarians in bovine practice by tracking the participants’ careers and comparing them to the national trends.

CONCLUSIONS

This study provides valuable information for outreach and education professionals to develop future CE programs. We identified the delivery methods desired by early-career bovine veterinarians in the United

States and the topics where they see the greater need for professional development opportunities. Moreover, we developed and implemented a 2-yr CE program based on the results from this needs assessment study that has gained great interest among recent veterinary graduates and received good feedback from practitioners. Future studies are needed to evaluate this program’s success in long-term retention of the US bovine veterinary workforce.

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