Dairy calving management: Description and assessment of a training program for dairy personnel

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ABSTRACT

The objective of this study was to assess the effectiveness of a comprehensive calving management program designed to enhance the flow of applied, research-based, calving information to dairy personnel. Calving personnel ($n = 70$), serving an estimated 18,100 cows from 18 Ohio dairies, attended the calving management program (~1 h of training and ~2 h of demonstration). Description of the birth canal, behavioral signs of normal parturition (stages I to III), dystocia (presentations, positions, and postures), hygiene practices during the assistance procedure, strategies for intervention (when and how to intervene), record-keeping, communication (when to call for help), and newborn care were discussed. Posttraining follow-ups (2/yr) were available for participating personnel. Educational materials were delivered through lectures followed by group discussions and hands-on demonstrations. Attendees were assessed using pre- and posttests of knowledge to determine the level of knowledge gained during the training program. Participants evaluated the program and provided feedback at the conclusion of the program. Dairy personnel reported that the overall program, presentations, and discussions were useful. The presented materials and demonstrations substantially increased the knowledge level of the attendees by 20.9 percentage points from pre- to posttest scores. Importance of open communication within the farm team, recognizing the landmarks for parturition, signs of calving progress, reference times for intervention, hygiene practices at calving, and strategies to correct abnormal presentation, position, or posture were listed as learned concepts with immediate field application. The follow-up assessment with participant personnel revealed that they were able to implement and apply their learned skills, communicate calving records with the farm team, and follow written calving protocols. Results indicated that the workshop was relevant and effective, offering information with immediate field application.

Key words: dairy personnel, calving management, education

INTRODUCTION

Economic losses associated with dystocic births can have severe consequences in dairy herds because of an increased incidence of stillbirth (Mee, 2004; Lombard et al., 2007; Schuenemann et al., 2011b), calf mortality within 30 d postcalving (Lombard et al., 2007; Mee, 2008), increased likelihood of trauma of the dam (i.e., paresis), uterine disorders (Sheldon et al., 2009), and decreased milk yield and reproductive performance (Dematawewa and Berger, 1997; Rajala and Gröhn, 1998). Dystocia has been defined as a difficult birth resulting in prolonged calving or severe assisted extraction of the calf at birth (Mee, 2004; Schuenemann et al., 2011b). The incidence of dystocia varies considerably between studies and countries (Meyer et al., 2001; Mee, 2008; Lombard et al., 2007; USDA, 2010), but it is generally higher in primiparous cows (19%) compared with multiparous cows (11%) in the United States (USDA, 2010). Fetal-maternal size mismatch and vulval stenoses are the most frequent causes of dystocia in primiparous dams (Meijering, 1984; Berger et al., 1992; Mee, 2008), whereas faulty fetal posture, or maternal-related causes (e.g., uterine torsion, birth of twins, hypocalcemia, cervical stenosis) are the most frequent causes of dystocia in multiparous dairy cows (Curtis et al., 1983; Meijering, 1984; Frazer et al., 1996; Mee, 2008). Prevention of dystocia should be a top priority for dairy herds. Despite best management practices, some cows or first-calf heifers will likely experience difficult births due to multiple births or malposture of the calf. These situations must be handled properly and in a timely manner by calving personnel to increase the likelihood of a successful outcome for the calf and dam.

Comprehensive training on calving management practices for dairy personnel has been reported as a top priority, especially to reduce the incidence of stillbirth, metritis, and injury to the dam during difficult births (Lombard et al., 2007; Schuenemann et al., 2011b). The following elements are critical components of educational programs for calving personnel: (1) description

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of behavioral signs of the cow or first-calf heifer before and during labor, (2) when and how it is appropriate to assist the cow or first-calf heifer, (3) strategies to correct abnormal presentation, position, or posture, (4) hygiene practices during assisted births, (5) accurate record-keeping of birth events, (6) best communication practices within the farm team (i.e., when to call for help), and (7) best newborn care practices (e.g., timing and amount of colostrum to be fed). Being able to recognize the landmarks and reference times for normal births (i.e., calving progress) as well as for difficult births (dystocia; Schuenemann et al., 2011b) is critical to determine the appropriate time for intervention under field conditions. Therefore, the objective of the present study was to assess the effectiveness of a comprehensive calving management program designed to enhance the flow of applied, research-based, calving practices for dairy personnel.

MATERIALS AND METHODS

Rationale and Background

Dairy personnel who execute the calving management tasks at the farm level must update their skills and practices regularly with the latest advancements on dystocia management, prevention of stillbirth and dam injury, and newborn care. Implementing these practices at the herd level will likely enhance the economics of successful transition cow management by improving the survival, health, welfare, and productivity of the dam

and calf. Veterinary Extension within the Department of Veterinary Preventive Medicine at The Ohio State University has developed and implemented the Dairy Personnel School (**DPS**). The DPS is a comprehensive 3-h workshop with approximately 1 h of in-class training and an additional 2 h of hands-on demonstration regarding calving management practices (Figure 1). The program was designed for a limited number of attendees (8–10) per training session to maximize one-on-one interaction between the instructor and participants. The overall goal of the DPS was to effectively increase the knowledge level of dairy personnel, revitalize their skills, and motivate them to implement well designed calving practices.

Program Description, Educational Content, and Delivery Methods

For the calving management workshop, there was a registration fee of \$60 per participant. Additionally, participants from different farms covered their own transportation costs to the selected locations. No funding from external sources was received and the dairy calving workshop was fully funded by registration fees and Gustavo Schuenemann's Extension program funds (The Ohio State University). The calving management workshop was delivered in a 3-h session and the concepts were presented in a step-wise manner. Description of the birth canal, behavioral signs of normal parturition (stages I to III), signs of calving progress, dystocia (presentations, positions, and postures), hy-

Figure 1. Description of the activities and learning objectives developed for the calving management workshop. The educational materials were delivered to participants through oral presentation (~1 h) and hands-on demonstration (~2 h).

giene practices for assisted births, strategies for intervention (when and how to intervene), record-keeping, communication within the farm team (e.g., when to call for help, between work shifts), and newborn care were discussed (Table 1). Hands-on demonstrations were available to highlight key learning objectives and make any necessary clarifications to participants (Table 1). Two posttraining follow-ups per year were available for participating herd personnel. The calving management workshops were delivered in Ohio from August 2009 to May 2011.

The fetal presentations, positions, and postures at birth were provided to participants. Presentation refers to whether the calf is coming forward (anterior) with both front legs and head extended into the birth canal, backward (posterior) with both rear legs extended into the birth canal, or transverse with either all 4 legs extended into the birth canal or the back of the calf against the birth canal (Noakes et al., 2001). Forward or backward presentations are considered normal; however, forward presentation with a right-side up position, in which both front legs and head are extended into the birth canal, is the most common orientation. Position refers to the calf's position in relation to the cow (Noakes et al., 2001). If the back of the calf is up and parallel to the back of the cow, it is considered dorsal or right-side-up, which is the only normal position. Posture refers to how the calf's head and limbs are in relation with its body (Noakes et al., 2001). If the head or one or both limbs are retained, an abnormal posture, it needs to be corrected before delivery. Calving management practices for breech posture (backward presentation, a right-side-up position with both rear legs retained), hip-lock, transverse position, and multiple births such as twins were also discussed (Noakes et al., 2001; Mee, 2004).

A description of the activities and learning objectives developed for the calving management workshop is provided in Figure 1. These learning objectives were designed to help develop the instructional content and assessment instruments (e.g., tests of knowledge; Schuenemann et al., 2010, 2011a). The educational content was delivered through oral presentations using PowerPoint (Microsoft Corp., Redmond, WA) followed by group discussions and hands-on demonstrations (Schuenemann et al., 2010, 2011a). These learning methodologies were designed to encourage discussion and to emphasize key learning objectives. The hands-on demonstration was designed to train participants on critical skills such as interpretation of calving progress, hygiene practices, and correction of malpostures for difficult births and to engage participants in discussing their calving management practices. The hands-on demonstrations were available to all participants and to

make any necessary adjustment or correction in their skills and techniques. The calving workshop was delivered in Spanish or English. The instructor was available to assist and provide feedback to participants during and after the workshop.

Assessment of Knowledge Level, Participant Satisfaction, and Calving Practices

For the calving management workshops, pre- and posttests of knowledge (Table 2) were administered to assess the level of knowledge gained by participants (Schuenemann et al., 2010, 2011a). The tests of knowledge were voluntary and conducted anonymously. At the beginning of the workshop, participants were asked to answer 5 multiple-choice questions related to the topics to be presented during the educational training. The same questions were asked again at the end of the workshop. This approach allowed us to determine the level of knowledge gained during the workshop and to engage participants in discussing their calving practices. During the group discussions and hands-on demonstrations, participants had the opportunity to discuss and provide their feedback regarding the reference landmarks such as appearance of the amniotic sac (AS) or feet of the calf outside the vulva and estimated times for intervention used to identify cows experiencing difficult births. Additionally, at the end of the workshop, participants had the opportunity to evaluate the program (e.g., educational materials, contents, and instructors) using a standardized Evaluation of Effective Extension Teaching form (Table 3; Spiegel, 1992) and to provide feedback (quantitative and qualitative) using a predesigned instrument (Table 4). The evaluation instruments were available in Spanish or English as needed. The evaluation instruments were reviewed by the Office of Responsible Research Practices at The Ohio State University, and determined as exempt from review by the Internal Review Board.

Statistical Analysis

Quantitative and qualitative data were collected to assess participants' reactions to the program. Quantitative data were acquired using a Likert-type scale from the evaluation instrument (e.g., educational materials, content, and instructor) and reported as frequencies and percentages. The estimated times for intervention by participants during difficult births were reported as percentages. Similarly, qualitative feedback on program content and benefits to participants from the comments section of the evaluation instrument were summarized and reported as text. The percentage of correct answers in each pre- and posttest was determined to quantify

Table 1. Description of the learning methods and topics discussed during the calving management workshop for dairy personnel

Learning method	Chronological order	Calving management topics ¹
Oral presentation	1	Description of birth canal, materno-fetal disproportion, and strategies to correct abnormal presentations, postures, or positions.
	2	Behavior of the cow and first-calf heifer before and during labor (Wehrend et al., 2006; Miedema et al., 2011), imminent signs of birth, assessment of calving progress, and time spent in labor (i.e., normal versus dystocic births; Gundelach et al., 2009; Schuenemann et al., 2011b).
	3 ²	Reference landmarks for normal births: (1) mean times from the appearance of the amniotic sac (AS; 70 min) or feet (65 min) outside the vulva to birth (Noakes et al., 2001; Schuenemann et al., 2011b), (2) mean time (≤ 2 h) that a cow or first-calf heifer spent in labor (straining; Gundelach et al., 2009; Schuenemann et al., 2011b), (3) signs of calving progress (evident every 15–20 min; Schuenemann et al., 2011b), and (4) frequency of observation (every 1–2 h; Gundelach et al., 2009; Schuenemann et al., 2011b).
	4	Reference landmarks to determine the appropriate time for obstetric intervention during difficult births (i.e., when and how it is appropriate to assist the cow or first-calf heifer). Guidelines provided (1) for first-calf heifers when the feet-nose of the calf are visible outside the vulva, help finish; (2) for backward presentations, help finish; (3) when malposture is evident (e.g., only one foot of the calf is visible outside the vulva) after the appearance of AS or for uterine torsion (where nothing is visible outside the vulva), immediate assistance is required; and (4) immediately after delivery, examine the cow or heifer to determine the presence of a second calf in case of multiple births (twins or triplets).
	5	Hygiene practices for assisted births (i.e., sanitation of perineum region, disinfection of the obstetric chains, use of lubricant, and disposable gloves).
	6	Best communication practices within the farm team (i.e., when to call for help, between work shifts) and with the herd veterinarian.
	7	Newborn care practices such as navel disinfection, assessment of calf vigor, and feeding of colostrum.
	8	Record-keeping (i.e., score of calving difficulty, sex of calf, identification of the dam and calf, birth date, start and end time of labor, and born alive or dead).
	9	Review of calving protocols (e.g., what to look for or monitor before and during calving and why it is important).
Hands-on demonstration	1	Strategies to correct malpostures (e.g., appearance of only one foot of the calf outside the vulva) and uterine torsion were discussed. Demonstrations were facilitated with the use of an obstetrical phantom and artificial uterus (developed by Eric Gordon, Department of Veterinary Preventative Medicine, The Ohio State University, Marysville) and a stillborn calf.
	2	Placement of obstetric chains and considerations for human or mechanical extraction (force).

¹The Drost Project provides useful visual guides on bovine obstetrics and calving management (<http://www.drostproject.org/>).²The mean times from the appearance of the AS (70 min) or feet (65 min) outside the vulva to birth were estimated using the mean $\pm$ 2 SD (Schuenemann et al., 2011b).

Table 2. Tests used to assess the level of knowledge gained by participants during the calving management workshop^{1,2}

Test of knowledge	Description and purpose
1. How many stages does the parturition process have? (a) One, (b) Two, (c) Three	Participants learned the characteristics of the three stages of parturition and how the process of calving transitions from one stage to the next under normal conditions. Also, participants learned the estimated time from the appearance of the amniotic sac (AS) or feet of the calf outside the vulva to birth under normal and difficult births, including the signs of calving progress.
2. What image shows a normal delivery? (a) Image 1, (b) Image 2, (c) Do not know	During the oral presentation, two images were displayed to participants. Image 1 showed a standing cow sniffing the calf immediately after normal delivery. Image 2 showed the head-nose-tongue and only one foot of a dead calf outside the vulva (dystocic birth). Participants learned the imminent signs of normal delivery.
3. Are the obstetric chains placed correctly? (a) Yes, (b) No, (c) Do not know	An image showed the chains incorrectly placed on the front feet of the calf. During the oral presentation and hands-on demonstration, participants learned how to place the chains correctly before assisting births.
4. According to the image, are those the rear or front feet of the calf? (a) Rear feet, (b) Front feet, (c) Do not know	An image showed only the front feet of the calf outside the vulva. During the oral presentation and hands-on demonstration, participants learned how to recognize the front or rear feet of the calf outside the vulva based on the anatomical structures.
5. How soon after birth should I feed colostrum to the newborn? (a) Within 3 h, (b) After 12 h, (c) Do not know	Participants learned the importance of feeding colostrum immediately after birth to maximize the absorption of immunoglobins and prevent the failure of passive transfer.

¹The anonymous tests were provided to participants immediately before and after the delivery of the calving management workshop to assess the level of knowledge gained by participants.

²The following are the correct answers for the tests: (1) c, (2) a, (3) b, (4) b, and (5) a.

Table 3. Summary of frequency (% in parentheses) of the total responses per statement on the educational materials, content and instructors of the calving management workshop^{1,2}

The educational materials and content:	Strongly disagree	Disagree	Neither disagree nor agree	Agree	Strongly agree
1. Helped me better understand the issue surrounding this topic	0 (0)	0 (0)	1 (1.4)	8 (11.6)	60 (87)
2. Provided information relevant to my work	0 (0)	0 (0)	2 (2.9)	8 (11.8)	58 (85.3)
3. Were well organized	0 (0)	0 (0)	0 (0)	12 (18.5)	53 (81.5)
4. Were easy to understand	0 (0)	0 (0)	0 (0)	14 (20.3)	55 (79.7)
5. Will be of great immediate use to me	0 (0)	0 (0)	0 (0)	11 (16.4)	56 (83.6)
6. Stimulated me in wanting to learn	0 (0)	0 (0)	0 (0)	4 (6.3)	60 (93.7)
7. Gave clear explanations	0 (0)	0 (0)	1 (1.5)	3 (4.5)	63 (94)

¹This voluntary evaluation instrument was provided to participants to assess the effectiveness of the program and benefit to participants at the conclusion of the workshop.

²The evaluation instrument was adapted from the Evaluation of Effective Extension Teaching instrument (form II), The Ohio State University Extension (Spiegel, 1992).

Table 4. Summary of responses (frequency; % in parentheses) regarding the satisfaction of participants with the overall calving management program¹

Program evaluation and inputs	Useless	Somewhat useful	Useful	Quite useful	Very useful
How do you rate the overall program?	0 (0)	0 (0)	5 (10.2)	7 (14.3)	37 (75.5)
Please rate the instructor presentations and discussions?	0 (0)	0 (0)	2 (4.6)	8 (18.6)	33 (69.8)
Please rate the hands-on demonstration?	0 (0)	0 (0)	4 (8.2)	6 (12.2)	39 (79.6)

¹This voluntary evaluation instrument was provided to participants to assess the satisfaction of participants with the overall calving management workshop at the conclusion of the educational training.

knowledge change, taking into account the total number of tests of knowledge obtained per workshop using a weighted average. Because all tests were voluntary and conducted anonymously, it was not possible to identify pre- and posttest scores individually for each participant. Thus, the test scores at the 2 points in time were considered independent and results from the tests conducted before and after the educational modules were analyzed using the GLIMMIX procedure of SAS (2009; SAS Institute Inc., Cary, NC). A model procedure that included the question outcome (correct or incorrect) was used to assess the proportion of correct answers between pre- and posttests. Workshop was used as random effect. Differences in individual least squares means were adjusted using the Tukey-Kramer method. A $P < 0.05$ was considered statistically significant.

RESULTS

Assessment of Knowledge Level and Satisfaction with the Program

The workshops ($n = 8$) reached 70 calving personnel, servicing an estimated 18,100 dairy cows distributed in 18 herds throughout Ohio. Calving personnel from small (<100 cows), medium (100–499 cows), and large dairy herds (≥ 500 cows) attended the workshops. According to the tests of knowledge (Table 2), the educational materials and delivery methods (in-class presen-

tation, hands-on demonstration, and group discussion) substantially increased the knowledge level of dairy personnel (20.9-percentage-point increase from pre- to posttest scores; Table 5). Dairy personnel indicated that the overall information provided was relevant, with immediate field application (Table 3). Additionally, the information presented and hands-on demonstrations followed by group discussions were ranked as useful learning methods by participants (Table 4).

Assessment of Educational Content and Hands-On Demonstration

At the conclusion of each calving workshop, participants assessed the educational materials presented and their perceived usefulness under field conditions. Participants indicated that the information presented was relevant to their work, easy to understand, and of great immediate field application (Table 3). Participants indicated that the hands-on demonstrations were useful and provided them with an opportunity to observe and understand the actual birth canal (i.e., pelvic bone), the uterus and the calf, and how to properly correct abnormal postures of the calf during delivery. Most of the qualitative statements collected referred to the attendee's satisfaction with the program, the value of instructor presentations or discussions (e.g., what is normal, what to look for, and why it is important), and the hands-on demonstrations. The program did not receive any negative comments by participants, and the

Table 5. Percentage of correct responses to pre- and posttest questions from a comprehensive education workshop on calving management for dairy personnel

Calving workshop questions ¹	Pretest	Posttest	P-value
1	55.7	73.4	0.03
2	73.2	87.7	0.03
3	49.2	92.2	<0.0001
4	73.4	89.2	0.02
5	75.8	89.2	0.04
Overall ²	65.5	86.4	<0.0001

¹Percentage of correct answers was calculated from 70 pre- and posttests.

²Percentage of correct answers was calculated taking into account the total number of tests obtained per workshop using a weighted average.

reported written statements were very positive about the program, topics, and instructor.

Assessment of Calving Management Practices

During the group discussions, reference landmarks and estimated times for intervention during difficult births were extensively discussed (Table 1). Participants indicated that they assisted cows or first-calf heifers between 30 min (28%) and 1 h (54%) immediately after the appearance of the AS outside the vulva. The remaining 18% of participants assisted cows or first-calf heifers ≥ 2 h after the AS appearance outside the vulva. Additionally, participants were asked to list something (e.g., practices or skills) they learned during the educational program that could be applied to their individual farm. Several learned skills or practices were listed by participants immediately after each calving workshop, such as identification of cows in need of calving assistance (e.g., only one foot of the calf is visible outside the vulva, backward presentation), landmarks and reference times for intervention (i.e., calving progress), hygiene practices during assisted births, calving events for record-keeping, and communication within the farm team (e.g., when to call for help, and between work shifts). During the training workshop, participants discussed common field situations that were associated with their calving management practices (Table 6). The follow-up assessment with participant herd personnel revealed that workshop participants were able to implement the learned skills, communicate calving records within the farm team, and develop written calving protocols.

DISCUSSION

The assessment of the calving management workshops provided evidence that the information delivered (1) significantly increased the knowledge level of participants, (2) offered relevant information with immedi-

ate field application, and (3) motivated participants to adopt best calving practices.

A comprehensive educational program must be able to (1) provide new knowledge for immediate field application, (2) encourage discussion, (3) collect feedback, and (4) allow follow-up with participants after program delivery (Schuenemann et al., 2011a). Regardless of herd size, calving personnel enrolled in the calving workshops shared common calving management challenges and needs. Recognizing and integrating experiences from calving personnel into educational programming may help motivate individuals to adopt well-designed calving management practices for difficult births.

Four levels of summative evaluation have been reported (Andreasen et al., 2001; Moore et al., 2004; Schuenemann et al., 2011a). The present study assessed participant perceptions about the program (level 1), competence with new knowledge or skills (level 2), and adopting the calving practices learned (behavioral change; level 3). The on-farm effect (e.g., incidence of stillbirth; level 4) will require further investigation. The overall results of the pre- and posttests indicated that participants acquired new calving management knowledge. Being able to recognize the stages of parturition (question 1), signs of normal and difficult births (questions 2 and 4), and correct placement of obstetric chains for assisted birth (question 3) are critical skills to determine both the appropriate time for intervention and how to assist difficult births, thus reducing the risk for stillbirth or injury to the dam. Also, the timing and amount of colostrum to be fed to the newborn calf (question 5) is critical for calf survival.

Dairy personnel indicated that the overall information provided was relevant for their work, and the hands-on demonstrations followed by group discussions were ranked as useful learning methods. The hands-on demonstration component of the workshop was designed to highlight key learning objectives, build confidence by applying the newly learned concepts, and to make any necessary clarification of learned practices or skills. The

Table 6. Summary of the feedback provided by dairy personnel during the training workshop on issues associated with their calving management practices¹

Item description
Importance of open communication within the farm team (e.g., between workers at the time of work shift and when to call for help)
Need for new or additional obstetric chains to assist difficult births
Need for additional help to be able to assist severe or multiple cows experiencing dystocia at the same time
Importance of having established and written calving protocols (e.g., hygiene practices, what to look for, why it is important, and when it is appropriate to intervene)
Animals with unknown anticipated calving dates (e.g., missing records or bull bred first-calf heifers)
Use of defined events for record-keeping (e.g., scale used for ease of calving, stillbirth, retained fetal membranes)
Proper maintenance of calving or maternity pen (e.g., broken water hose or gate)

¹During group discussion and hands-on demonstration, dairy personnel listed common situations encountered under field conditions that were associated with their calving management practices.

use of an obstetric phantom with a cloth uterus and stillborn calf as a teaching aid was very useful to convey the message and make any necessary clarification during the training session.

The assessment of knowledge gained by participants is important as a precursor to achieve behavioral or practice change and adoption of newly learned practices (Bennett, 1975). The questions in the tests of knowledge were developed to assess the program learning objectives through cognitive recall data or information (multiple choice items; Jacobs, 2004; Schuenemann et al., 2011a). The tests of knowledge were developed using visual images (questions 2–4) that describe common situations encountered by calving personnel under field conditions as well as sampling of content (questions 1 and 5) during the short evaluation period (15 min for the pre- and posttests). Although no single evaluation method or instrument is sufficient to assess the knowledge gained by participants (Ho et al., 2003), the taxonomy of learning presented by Bloom et al. (1956) provides useful information on writing educational objectives, designing instructions, and assessing educational learning. In the present study, the evaluation efforts were focused on both satisfaction of participants and demonstrated knowledge change. It is important that participants are not only very satisfied with the content and learning achieved from the educational programming (tests of knowledge), but also that they understand and demonstrate a mastery of new knowledge (during the hands-on demonstration and group discussion). In practice, research-based knowledge (e.g., calving practices) must be applied at the farm level and actually used to have a substantial effect on the dairy farm. This higher level of assessment requires the collection of evidence (change in stillbirth or herd performance) to measure program success long after programming has ended (Schuenemann et al., 2011a). In future educational workshops, efforts will focus on developing instruments to monitor within-herd calving management practices (i.e., human resources and facilities), the effects of dystocia over time (e.g., stillbirth, injury to the dam, metritis, herd performance), and prearranged follow-up visits with participant herd personnel. This will allow the assessment of the adopted calving practices by dairy personnel within farms, taking into account the human resources and facilities.

Prevention of disease at the farm level requires a constant ongoing effort and excellent coordination of the whole system (the animals, the environment, and humans). Substantial knowledge exists to prevent many diseases or conditions (e.g., stillbirth, metritis); however, it must be translated into on-farm applications or practices to have a measurable effect at the herd

level. Human resources play a critical role in the application of best management practices within herds. Calving personnel need sufficient time to practice and gain confidence (learning-by-doing approach) to successfully apply the newly learned skills under their situations or systems. Unlike other experts in the dairy industry, practicing veterinarians regularly visit their clients and are ideally placed to identify at-risk dairy herds likely to benefit from calving management training and development of standard operating procedures (SOP). It is well documented that dairy cows experiencing difficult births results in increased incidence of stillbirth (Lombard et al., 2007; Schuenemann et al., 2011b) and reduced productivity (milk yield and reproductive performance; Rajala and Gröhn, 1998). Typically, the job of training new calving personnel goes to the experienced individual or herd manager. An increase in stillbirth incidence may be related to a lack of understanding of calving SOP or communication; therefore, the critical components of properly handling difficult births are appropriate training and motivation of personnel to implement appropriate calving management practices.

Although on-farm SOP are essential management tools that summarize critical information or steps involved in a particular task or procedure (e.g., management of dystocic births), they should not be used as the only source of information for dairy personnel. Learning from a set of descriptive bullets, as in most SOP, carries a real risk for mistakes because calving personnel might not understand the whole process. During the training and hands-on demonstrations, dairy personnel shared examples of unclear recommendations such as “wait 2 h and assist cows experiencing difficult births” or “if there is no calving progress call for help.” The SOP for calving management must provide clear reference landmarks for time zero (when to start counting) and signs of the normal progression of calving; otherwise, most calving personnel would not be able to follow the above recommendations.

Finding well-qualified workers is a challenging task for dairy farmers and it is painful to lose them. The tests of knowledge and hands-on demonstrations may serve as valuable instruments to identify those participants that are skilled and able to follow the on-farm SOPs. It is critical that herd managers or owners spend time finding the right task for the right worker. Identifying cows in need of calving assistance, following the proper milking routine, and consistent delivery of TMR among others are critical tasks that require well-trained workers and established SOPs for optimal outcomes. The performance of dairy personnel following the training sessions and tests of knowledge needs further investiga-

tion, especially for those workers who scored the same between pre- and posttests for 2 consecutive training sessions.

The overall objective of this comprehensive calving workshop was to increase the skills of dairy personnel to identify the imminent signs of birth and calving progress as well as to properly handle cows experiencing difficult births. During the calving workshop, participants learned the imminent signs of birth, signs of calving progress (every 15–20 min), reference times for intervention during difficult births (i.e., time spent in labor and frequency of observation), and strategies for assisted births (e.g., showing feet and nose of the calf in first-calf heifers and backward presentations). Furthermore, participants provided relevant information on common challenges regarding their calving management practices. Although communication within the farm team, especially between workers or family members, was ranked as the top priority to effectively identify and assist cows experiencing difficult births, most of the challenges were managerial in nature (e.g., need for new obstetric chains or additional manual help, written calving protocols, unknown anticipated calving dates, and maintenance of calving or maternity pens). It is important to note that the guidelines (Table 1) provided during the workshops work best if calving personnel monitor periparturient cows around the clock (24 h, 7 d/wk). The frequency of observation (calving personnel walking the pen and actually observing cows every 1–2 h) is critical to determine the onset of the AS or feet of the calf outside the vulva.

CONCLUSIONS

The assessment of the participant feedback and the tests of knowledge provided evidence that the calving workshops were relevant and offered information with immediate field application. The program substantially improved the knowledge of dairy personnel on calving management practices. Findings from this study, including the qualitative feedback, provide critical information for planning future workshops. For the program to be considered entirely successful, impact outcomes such as calf or dam survival, herd performance (fertility), and long-term adoption of practices require further investigation. This program may serve as an effective model for others desiring to organize and implement a comprehensive calving management workshop for dairy personnel.

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