Dairy farmer advising in relation to the development of standard operating procedures

Katelyn E. Mills, , Katherine E. Koralesky, , Daniel M. Weary, , and Marina A. G. von Keyserlingk*

Animal Welfare Program, Faculty of Land and Food Systems, University of British Columbia, 2357 Mall, Vancouver, BC, Canada V6T 1Z4

ABSTRACT

Standard operating procedures (SOP) are increasingly required on farms participating in animal welfare assurance programs, such as the Dairy Farmers of Canada's proAction initiative and the National Dairy FARM Program in the United States. However, little is known about the use of SOP on farms and who is involved in their development. Literature from other industries shows the importance of including advisors when developing SOP. Despite veterinarians being viewed by many farmers as trusted sources of information, little is known about their involvement in SOP development. The aim of this study was to better understand: (1) what advice from researchers and veterinarians is considered when developing an SOP and (2) what factors affect advice adherence. Participants in this study were farmers ($n = 9$) from 6 dairy farms in the Fraser Valley region of British Columbia, Canada and their herd veterinarians ($n = 5$). Structured and semi-structured interviews and participant observation were undertaken from April to December 2018, and the resulting data were analyzed using thematic analysis. In relation to the first aim, we identified 3 main themes: (1) the purpose of the SOP, (2) developing an SOP, and (3) accountability and tracking of procedures. For the second aim, 5 themes emerged: (1) feasibility of the advice, (2) resources required, (3) priority of the advice, (4) other actors involved, and (5) the importance of data. Collectively, these findings suggest that a farm-specific SOP that actively tracks procedures is most beneficial, and that advice adherence is context dependent.

Key words: advisor, standard operating procedure, newborn calf care, veterinarian

INTRODUCTION

Standard operating procedures (SOP) are a set of steps that show how a process should be performed

(Gough and Hamrell, 2009). When implemented, SOP have the ability to harmonize practices among workers and can be used to train new or existing employees (Barbe et al., 2016; Sischo et al., 2019). With increases in farm size and the use of non-family labor (Barkema et al., 2015), and a move toward increased use of technology (Hagevoort et al., 2013), SOP are likely to be increasingly important on dairy farms. Standard operating procedures are now required by some welfare assurance programs, such as Dairy Farmers of Canada's proAction Initiative (Dairy Farmers of Canada, undated) and the National Dairy FARM Program in the United States (The National Dairy FARM program, 2019). Despite SOP being required by many animal welfare assurance programs, it is unclear whether they are consistently used and if they actually improve animal care practices on farm.

There is little research in the peer-reviewed literature on the use of SOP on dairy farms. Hesse et al. (2017) surveyed 248 German dairy farmers and found that only 54% had a written SOP. Although some protocols, such as those relating to antibiotic use, are viewed as important to farmers (Friedman et al., 2007; Kayitsinga et al., 2017), common procedures are often not written down (Stull et al., 2005), with farmers' citing reasons such as their dislike of additional paperwork (Bell et al., 2006). Additionally, articles in industry-oriented conference proceedings provide farmers helpful advice on how best to implement practices and employee training (Wenz, 2007).

Involving employees in the development of SOP can help improve employee buy-in (Amare, 2012). Also, having individuals outside of the writing process review an SOP can help improve clarity (Barbe et al., 2016). To date, no work has investigated who is involved in the process of creating SOP for individual dairy farms. Both knowledge (see Neu et al., 2011) and trustworthiness (see Strike, 2013) of external advisors may be significant in this development process; for instance, farmers may reject advice from experts who are not viewed as trustworthy (Garforth, 2015). In the dairy industry, veterinarians are viewed as trusted advisors by many dairy farmers (Sumner et al., 2020) and are frequently

Received March 8, 2020.

Accepted July 17, 2020.

*Corresponding author: nina@mail.ubc.ca

involved in developing health treatment protocols (Raymond et al., 2006). Boersema et al. (2013) found that 10% of veterinarians sampled in the Netherlands provided preset treatment protocols to their clients. To our knowledge, there has been no research regarding the involvement of veterinarians in the development of individualized SOP on dairy farms.

Farm management advising is complex and how communication occurs between veterinarians and farmers has implications on management decisions. For example, veterinarians who use a mutualistic style of communication, compared with more traditional paternalistic communication, appear to see greater advice adherence (Bard et al., 2017, 2019). Svensson et al. (2019) found that on 169 dairy farms in Sweden adherence to advice was related to: (1) trust in the veterinarian, the advice given and the advisory process, (2) feasibility of the suggested measures and, (3) severity of the problem and perceived need to implement the suggestions. Bard et al. (2019) found that for advice to be enacted by farmers it must be seen as meaningful and compatible with their worldview. The realities on traditional family farms can create additional challenges when it comes to advising (for family business advising, see review by Strike et al., 2018) due to power struggles within the family (Glover, 2014; Taylor and Norris, 2000) or ambiguities in job titles or roles on the farm (Ballard-Reisch and Weigel, 1991; Deming et al., 2019). To our knowledge, advice adherence has not been explored in the context of SOP on the family dairy farm.

The Fraser Valley region of British Columbia, Canada, has a high density of dairy farms and was the region of interest for this study. The aims of this study were to better understand what types of advice from different advisors (researchers, veterinarians) are incorporated when developing a new SOP and what factors influenced advice adherence.

MATERIALS AND METHODS

This research was approved by the University of British Columbia's Behavioral Research Ethics Board (H18-00409). Data collection took place April to December 2018.

There are several SOP required by proAction for animal care on dairy farms in Canada, including for colostrum management and calf feeding, animal health practices, down cow management, and euthanasia. Although colostrum management was the initial focus of our study, we soon realized that farmers had SOP that reflected the first period of a calf's life, including colostrum management, navel dipping, ear tagging, and other procedures they viewed as being associated with

the first few days of life. Given the breadth of procedures we termed this SOP "newborn calf care" so that participant farmers could include tasks they deemed important. The focus of this paper is not the SOP content, but rather the use of the SOP on farm and how advisors (i.e., veterinarian, researchers) influenced the development process.

Recruitment

We recruited a convenience sample (Miles et al., 2014) of working dairy farmers in the Fraser Valley region of British Columbia through industry social media platforms and through information delivered directly to farmers (e.g., veterinary clinics, data management companies). Recruitment advertisements included a study overview and contact information for the study team. Farmers who reached out to researchers by phone or email were then provided further details about the study. Recruitment proved difficult through the methods stated above, so we also recruited additional participants via a local veterinary clinic and by word of mouth. After the initial contact, individuals that wished to participate were sent an email with a consent form and letter of introduction.

Study Design

This study was part of a larger research project examining SOP use and development on dairy farms in the region, with a total of 11 farms participating. This study was comprised of an initial meeting, a development meeting, and a follow-up meeting which resulted in each farm being visited 3 times. Repeat visits aided the researchers in establishing a deeper relationship with participants, a process that has been shown to result in richer discussions (Polkinghorne, 2007).

Initial Meeting. When participants indicated an interest in developing or modifying their colostrum management SOP, a meeting was scheduled. At this meeting the participants signed the previously emailed consent form and were offered one of these for their own records. Participants were then asked a series of structured questions regarding the farm (i.e., number of animals, number of employees), their perceptions of SOP, and how (or if) they currently used an SOP for newborn calf care (for full list of questions, see Appendix 1; Table A1). If they already had a newborn calf care SOP, a photograph was taken. All farms ($n = 11$) were then asked whom they would want to have at the subsequent meetings (i.e., farm staff, veterinarians, nutritionists). Participants that indicated that they would want to have their veterinarian present ($n = 6$)

were included in the current analysis. Though given the option, farmers did not ask that other advisors (e.g., nutritionist) be invited to participate.

Development Meeting. The development meeting was scheduled with the purpose of creating a new SOP or modifying the existing SOP for newborn calf care. The meeting started with the farm owner or manager describing what was currently done on their farm in regards to newborn calf care. Researchers (Mills and Koralesky) acted as participant observers during this process and provided examples of SOP in a variety of formats (e.g., flowcharts, text based, photo based, video) that depicted SOP designed for other procedures on dairy farms. At the end of this meeting, researchers offered to provide technical help in developing the new SOP (e.g., formatting and layout) due to farmers' self-described technological limitations; participants were responsible for the content of the final SOP. Once the authors received the final SOP from participants, farmers were asked to use the new SOP for 3 mo, after which the follow-up meeting was scheduled.

Follow-up Meeting. Participants were asked semi-structured interview questions regarding the use of the new SOP, including what worked for them and what did not (see Appendix 2; Table A2). Finally, a photo was taken of the new SOP.

Analysis

In addition to the SOP documents, participant observation, and structured and semi-structured interviews, researchers also kept field notes of the meetings that were used to help explain the results of this study. All interviews were audio recorded, and recordings were transcribed by a professional transcription company and checked for accuracy by the lead author. After transcription of the audio recordings was complete, the transcripts were provided to participants to ensure that their thoughts were expressed accurately. Participants did not request any changes. All data sources (SOP documents, participant observation notes, and structured and semi-structured interviews) were included in the thematic analysis. This type of analysis involves the data being coded inductively to identify emergent themes that answered the study aims. An initial codebook (see Macqueen et al., 1998) was developed by the lead author (Mills) after coding all data. Subsequently, the first 2 authors (Mills and Koralesky) met to discuss the initial codes and themes, after which each coded a subset of the data before meeting again to discuss any discrepancies. The lead author then recoded the data, iteratively updating the codebook following discussions with Koralesky, before a final codebook that accurately reflected the data and participants' experiences was

decided upon. The lead author then recoded all of the data using the final codebook. After the first draft of the results was written, the 2 first authors met again to discuss and ensure accuracy. Quotes provided below were chosen to best exemplify the data; in some cases, quotes were modified with ellipses representing omitted text, or square brackets representing replaced or added text, for ease of reading.

Research Team

The authors of this study all conduct research in the Animal Welfare Program, Faculty of Land and Food Systems at The University of British Columbia. The first 2 authors (Ph.D. students Mills and Koralesky) have training and experience in conducting interviews and focus groups and were present for all interviews, but at each meeting one author acted as a facilitator and the other as a participant observer and note taker. This method of including multiple researchers has been shown to improve the reliability of the data collected (Berkwits and Inui, 1998). Given that the first 2 authors collecting the data for this study offered advice on the development of the SOP and acted as participant observers in this process, we also included ourselves in the role of advisor during analysis. This role of observers-as-participants, as defined by Gold (1958), acknowledges that participants are aware of the researchers' goal of data collection and participation in developing the SOP. Participant observers are intertwined in the process and accompany their participants in activities (Berkwits and Inui, 1998). This allows participants to build rapport with researchers and for researchers to better understand context (see review by Kawulich, 2005).

RESULTS

Six out of the 11 farms visited requested that their veterinarian be part of their SOP development. These 9 individuals (5 men and 4 women) and their herd veterinarian (3 men and 2 women; some farms had the same herd veterinarian) were included in the analysis. Herd size varied from 30 to 500 cows (average 209), number of employees (defined in this study as family members who worked on the farm, as well as part-time and full-time externally hired labor) ranged from 4 to 10 (average 5.5; Table 1).

The results are structured to show the themes that emerged that answer each of the 2 study aims: (1) what types of advice from different advisors (researchers, veterinarians) available to farmers are incorporated when developing a new SOP and (2) what factors influence advice adherence.

Table 1. Participants associated with each of the farms visited, the number of milking cows on each of these farms, and the number of employees, including family members, on each farm

Farm	Participant	Number of milking cows	Number of employees
A	Farmer 1	30	4
	Advisor 3		
B	Farmer 2	250	8
	Advisor 4		
C	Farmer 3	140	3
	Advisor 5		
D	Farmer 4	125	4
	Farmer 5		
	Advisor 6		
E	Farmer 6	500	10
	Farmer 7		
	Advisor 4		
	Advisor 7		
F	Farmer 8	210	4
	Farmer 9		
	Advisor 4		

Advice Offered to Farmers

Advice offered to farmers was centered around 3 main themes: (1) the purpose of the SOP, (2) developing an SOP, and (3) accountability and tracking of procedures.

The Purpose of the SOP. One theme that emerged from discussions with participants was the desire to know the purpose of an SOP, who an SOP is for, and why it is important. When it came to understanding the purpose of the SOP, some participants discussed the difference between a farm-specific SOP and one that reflects industry-wide standards. During one meeting, when a farmer was struggling with the distinction between farm specific versus industry wide, their veterinarian suggested, “we have our industry recommendations that we ideally are making our protocol around, but we don’t want to have a standard operating procedure on your farm that is not able to occur. Say you don’t have any powdered colostrum on your farm, so it’s not a backup source. There’s no point to us having that written in your protocol” (Advisor 3). Some farmers saw the purpose of SOP as a safeguard when the manager or owner was away and someone else needed to complete farm tasks. However, some viewed SOP as “pointless” (Farmer 9) or commented that they only make SOP to satisfy proAction requirements, arguing that no one was going to read them. For example, one farmer said that “you can write the SOPs...you can have everything written down, and you’re going to have 15 pages that nobody else is going to read” (Farmer 5).

Determining who the SOP is for was an important factor for participants. For example, as one participant stated “it totally depends on who your audience is... Is it for the farmer or the farm manager who is ultimately responsible for the care? Is it for the individual who, in the moment, may or may not be there? Each individual is so different in how they learn and what they follow” (Farmer 1).

Finally, understanding the why of the SOP was also viewed as important, as one vet explained: “Because if [employees] understand that it matters to you and it’s important... the colostrum management gets done, and it gets done well... It’s giving people the reason why it’s important, because a lot of people don’t necessarily see that. They just think it’s one extra step” (Advisor 3).

Developing an SOP. All farms had an existing SOP or multiple SOP when we began this study. In some cases, the SOP that farmers had on file was a general template provided by assurance programs. In other cases, the veterinary clinic provided the existing SOP to clients; in many instances these were not farm specific. In one case, the farmer did not know they had a farm-specific SOP developed by their veterinary clinic:

Farmer 3: This is just a generic one from [veterinary clinic].

Advisor 5: He has a better one.

Advisor 1: You have a better one?

Farmer 3: It’s in my head.

Advisor 5: No, it’s on your... computer.

Farmer 3: Oh, really?

Advisor 5: Yeah, you have an account.

Farmer 3: Oh, on the vet thing.

Advisor 5: Yeah. On the portal thing.

Farmer 3: I don’t know my account number so—

Advisor 5: I figured.

When it came to creating a customized SOP for the farm, numerous factors were considered, including the balance between how simple or complicated to make the SOP. For example, one farmer stated that “I think we needed to update our protocols. But I think—you start

adding so many things, right? If I want to add something... it's going to keep getting longer" (Farmer 2). There was variation across farms in the level of detail that was considered ideal with many farmers stressing that "simpler is always better... It has to be simplified" (Farmer 1). When describing their procedure for cleaning colostrum equipment, one farmer was frustrated with the amount of detail in some SOP and stated that "we have a pretty simple process. In my opinion, if you can't wash a [colostrum] bag, you shouldn't be working here. (Laughs) I don't know. It's harsh, but can you not wash dishes? Just do it." (Farmer 9). Although the level of detail was varied, there was agreement across participating farms that SOP should be tailored to reflect current practice on the individual farm, despite this not being the case at the outset of this study.

Much of the discussion during the development of the SOP centered on the format it should take. All the SOP in this study began as text, but having been made aware of alternative options, many farmers elected to use different formats. Farmers valued different formats for different reasons. For example, including pictures in an SOP allowed for specific equipment to be highlighted; a point viewed to be beneficial for workers who spoke English as a second language or were not comfortable reading English. Additionally, photos were thought to help with providing guidance for practices such as ear tagging calves, as explained in this exchange between a veterinarian and 2 farmers.

Farmer 5: Yeah, that's something that I was trying to work on for tagging calves, pictures. So, it's like—

Advisor 6: Where do you put the tag. That's a good spot. A picture's a good place to use there.

Farmer 4: It's worth a thousand words.

Other formats such as decision trees and videos were viewed as beneficial by some participants, but for different reasons. Decision trees were thought to be effective in relaying important information in a concise way. For example, when discussing the difference between decision trees and a text-based SOP, one veterinarian said that they "always liked the flow diagrams because I do think they're easy... I'm a skimmer. And so, I see something like that [gesturing to text-based SOP] and that's three or four lines long, I skim it, so I'm not really reading it" (Advisor 4). This format also allowed for it to be posted, for example on the wall of the calf barn, for ease of access. Videos were viewed by some as beneficial for training of new employees. Interestingly, many farmers stated that multiple formats on

the farm would be helpful. For example, one farmer felt that these would provide "different resources to suit the learning style of the person that you have hired" (Farmer 1).

Accountability and Tracking of Procedures. One of the most important aspects of the SOP described by participants was how best to ensure compliance. Employee accountability was discussed in relation to what tools could be used and the many factors that could affect employee accountability. For example, education level and language of employees was frequently raised as an important factor. As one farmer explained, one of their employees has "worked here about four years. He can't read or write. I can't leave him any written instructions. I pretty much have to be here on the days [he's here]" (Farmer 1). Similarly, the experience of the employee was important. Although some farmers were finding that new employees did not have agricultural experience, the opposite sometimes proved to be more problematic when it came to SOP compliance. For example, when discussing the changes to their new SOP one farmer remarked "I'll have to show everybody... Of course, it's going to be the easiest for the newest employees" (Farmer 2). In situations such as this, where habits have been formed with long-term employees, veterinarians stressed the importance of employee meetings or ongoing training. For example, when Farmer 2 was discussing their struggle with incorporating new steps into their SOP, their veterinarian stated that "something that might help with that is once you have the protocol is for us all to sit down with it. And sometimes having one of us explain why you've made the decisions [to your staff], then it makes it easier for them... because it's not just you telling them new rules" (Advisor 4).

Tools for tracking employee compliance with SOP included video cameras in the barns, checklists, and calf cards. For example, one farmer spoke about installing cameras in their barns so that even if "there's no boss around... you are being watched. Just always remember that" (Farmer 6). Checklists and calf cards were viewed as a way to turn an SOP into an active protocol and ensure that the steps were being followed. As one veterinarian explained:

"I do find the checklists are extremely helpful, especially for larger farms where there's more employees. So, having the time the calf is born, when they got the first feeding, and that employee that feeds them has to initial that they fed them that much. Time at second feeding, and how much they got, whether they got vaccinated, and it's all initialed by employees. And it does make sure that each calf gets done. And if you are doing any total proteins on calves, then you can relate back, 'Oh, this calf

didn't get fed for 12 hours. That's why it failed" (Advisor 3).

Similarly, calf cards were viewed as helpful in providing information on individual calf hutches or pens. Both checklists and calf cards were incorporated as single use or laminated for reuse.

Factors Influencing Adherence to SOP Advice

Five themes emerged relating to the adherence to the advice offered: (1) feasibility of the advice, (2) resources required, (3) priority of the advice, (4) other actors involved, and (5) the importance of data.

Feasibility of the Advice. Some farmers found that the advice given for their new SOP was not feasible given their farm or management routine. For example, when discussing the location of calf cards, one farmer realized that although they liked the idea of placing the cards on the calf pens, the calves made this a challenge:

"Well, we had little cards that was working good. We could laminate them and stuff, but the calves eat them. So, we can't really—we stopped using them, because the cards are [bigger than the stand] and so, the babies, they see them, and they lick them, and we've lost a bunch of them" (Farmer 7).

Additionally, when it came to developing new or revised SOP, some aspects were deemed to be successful but others were not. To start, although participants liked the idea of using decision trees in their procedures, some stated that these proved to be difficult to implement. For example, when one farmer sat down to write out the decision tree they found that the resulting tree was becoming too complicated to be useful: *"That would have been—well, we could have put it in there, but I don't know how big that decision tree would have got"* (Farmer 2). The length of the SOP or level of detail required meant that some formats did not work for farmers, despite these formats seeming attractive in earlier discussions.

In some cases, the new SOP and the associated advice was simply not effective. For example, although initially some farmers used powdered colostrum as a backup source for their calves, several changed to using frozen colostrum once they learned that powdered colostrum was associated with lower success as assessed through blood tests. These participants changed their SOP to use frozen colostrum and only used powdered colostrum as a last resort.

Resources Required. Adherence to a new SOP was also influenced by the additional resources required. For example, in all cases the development of the new SOP

required the use of some form of technology (e.g., creating documents using a computer). This proved difficult for some farmers. One farmer described why a decision tree SOP was not completed: *"I would love to do it on the computer. I just don't know how to make the bubbles and the arrows"* (Farmer 4). In many cases farmers did not have the needed software on their computer. Additional resources identified as barriers included the time needed to develop the SOP and economic constraints. Along with the extra time required to complete the task, some identified the challenge of including the extra steps in the new SOP in their day-to-day routine, something that farmers did not always remember to do. For example, when describing the inclusion of a checklist in their calf management one farmer explained: *"I'm sure once you've been doing it for every calf, or once you get going, then it's easy. It's just getting into that rhythm of doing it"* (Farmer 3). Similarly, some participants stated that there was some training or convincing required for older employees who did not see the value in the change: *"my dad, I'm trying to convince him of another step. Have to kind of buy in their support that if they calve a cow to test the colostrum"* (Farmer 1).

Priority of the Advice. When it came to making a new SOP, one theme that emerged was the priority that this took in the lives of the farmers. Other priorities (such as harvest) and constraints (such as lack of employees) affected the priority accorded to developing, maintaining, and using the SOP. In some cases, farmers did not complete their new SOP because *"nothing was broken, right? It's not like, 'Oh, we were screwing up here all the time.' We seem to have most of the bases covered"* (Farmer 4). However, these farmers did acknowledge that there were some things that they still wanted to change or include in their SOP, as their current SOP did not reflect their true management practices or were outdated.

Some farmers were determined to improve their newborn calf management and viewed updating their SOP as a way to assist in this process. For example, one farm had a goal of feeding colostrum to their calves within 3 h of birth. Although this was not always achieved, they were making progress toward their goal as the farmer discussed: *"probably the biggest change was the three hour [goal]...it's worked on some and others it hasn't. It's getting in there... starting this whole thing, we've been able to get that window down"* (Farmer 2). Additionally, data acquired through changes made during this study, such as tracking colostrum quality or passive transfer success, resulted in farmers using this data to plan for further changes in management.

Other Actors Involved. When making the new SOP farmers described benefits and detriments in including external advisors such as their veterinarian. Veterinarian-

ian involvement was often viewed as important for the management changes to occur and in some instances, farmers remarked that changes only happened due to veterinarian involvement.

Some farmers remarked that the changed SOP also benefited the veterinarian in terms of advising for their herd. For example, when describing the utility of the checklist for calf management, one farmer remarked that “[Advisor 4]’s going to find it the most useful. Because she’s got her data, too, so she can put it up against this” (Farmer 2). However, some farmers felt that after the development meeting with the veterinarian, they did not discuss this further and the vet was not involved in implementing the new SOP. For example, when asked if their veterinarian was involved after the meeting, one farmer stated: “not really, no. (Laughs) He’s a smart guy, he knows his stuff. But—yeah, he’s just so busy with everything else” (Farmer 3). In some cases, the farmer and veterinarian never followed up about the suggested changes.

Employee considerations were also a factor that affected adherence. For example, some farmers felt that they were asking too much of employees to incorporate additional steps into their SOP, whereas others lacked manpower to make the desired changes. The need for additional training was also discussed as explained by one farmer: “Our two newest calf feeders are not dealing with testing or trying to get the colostrum in the calves. I haven’t gotten them to that point. Usually we have enough people around that somebody who’s been here for a while just does it” (Farmer 2). Finally, differences in opinion and lack of communication with employees was thought to affect SOP adherence. For example, during the development meeting on Farm D, the farmer and herd manager showed us 2 completely different sets of SOP for the same farm.

Importance of Data. When farmers began tracking information (e.g., calf cards, checklists, colostrum quality, or passive transfer success), they remarked on the value of this data. Some felt that collecting data was reassuring, particularly when good results were seen and others felt that recording information was important regardless of outcome. Others felt that this was good information to have but they did not do much with it. For example, one farmer expressed that due to his small herd size (30 cows), tracking information would not be important: “. . . if I had a really large 2000 cow dairy. . . you could actually use that data” (Farmer 1). Others did not continue tracking certain data that they viewed as unnecessary. However, several felt that tracking information over time gave them the ability to see trends and make management decisions based on those trends. For example, on one farm over the course

of a single month the rate of passive transfer success went from 40 to 90%. As the farmer described:

“We thought about that for a long time. ’Cause that’s significant. . . . [we think it is because of] no hired help. . . . Our last guy finished, and we had no hired help after the end of August. So, our protocol’s always been, at birth, first feeding of colostrum right away. . . . So, we assumed that was happening, the protocol was in place, but we think it probably wasn’t.” (Farmer 8)

DISCUSSION

To our knowledge, this is the first study to explore the development of SOP on dairy farms. A recent systematic review of farmer participatory extension argued that these types of interventions were growing in popularity, however only 15% took place in developed countries (Knook et al., 2018). Dairy farmer discussions, such as the ones we facilitated during this study, have been shown to decrease SCC at the herd level (Dillon et al., 2016), improve farm efficiency (Lapple and Hennessy, 2015), and allow for collective work on a shared goal (Vaarst et al., 2007). From the results of this study, we would recommend more work on the value of regularly scheduled meetings between farm personnel and advisors.

Advice offered to farmers regarding the development of the SOP focused on the purpose of the SOP, the format that would best fit the farm, and employee accountability. Farmers said that they were required to have SOP to be compliant with the assurance program; in many cases SOP were created only as a requirement for proAction, but these were not farm specific and were rarely used. This may speak to the limited understanding of the purpose of SOP or the limited perceived necessity from the perspective of the farmers. Additionally, we recommend that future research explore the link between SOP compliance and animal welfare indicators (i.e., benchmarking or reports given to farmers). We also recommend that the purpose of SOP in welfare assurance programs be explored further, specifically from the perspective of those that develop these programs

Another important aspect of the SOP identified by the participant farmers was how to ensure employee accountability. Farmers who were concerned about this, and incorporated some form of accountability or tracking, viewed this as a beneficial step. Accountability, whether in the form of a checklist or calf card, was then used to predict trends or understand their management in a new way. The collection of data in this manner

by some farmers was evident in the follow-up meetings when they showed us their checklists and discussed how they were using that information. We recommend that further research investigate how tracking of data on the farm effects management decisions.

This study adds to the growing body of literature that aims to understand farmer decision making and advice adherence. In the present study, many factors affected adherence to advice such as feasibility of the advice, resources required and priority of the advice. Although some of the results presented in the current study may seem intuitive, we caution advisors that common sense perspectives are likely to vary considerably among their clients; a clear process of communication will help avoid misunderstandings resulting from conflicting assumptions. Svensson et al. (2019) found that adherence to veterinary advice was dependent on trust in the veterinarian and the advice, feasibility and priorities for Swedish dairy farmers. Kauppinen et al. (2013) found that perceived ease of implementation and importance were both factors that influenced management decisions on Finnish dairy farms. Lack of time and limited finances were identified as barriers to following procedures targeting antibiotic use for farmers in South Carolina (Friedman et al., 2007). Factors that affect adherence will vary depending on context, though we can see some similarities between our results and the findings from the above studies. Advice adherence is largely contextual and differences in farmer attitudes toward a certain practice will influence adherence. Future research should determine what practices are of priority to farmers in an effort to find research opportunities that would best allow for increased adherence and farmer buy-in. Lapple and Hennessy (2015) found that financial incentives encouraged participation in agricultural extension activities in Ireland; similar strategies could be employed in this context as well.

An important consideration affecting advice adherence was the involvement of other stakeholders in this process. This study included the farm owners/managers, researchers and veterinarians. Participating in this study required that both farm managers and veterinarians set aside time to have a conversation around newborn calf care practices on their farm, something that was not done on a regular basis outside of the context of this study. Sumner et al. (2020) found that having farmers sit down with their veterinarian led to conversations around calf management for the first time. Additionally, in many cases suggested changes to the SOP required veterinarian involvement (e.g., collecting blood samples). The veterinarian's involvement greatly influenced advice adherence as evidenced by veterinarians following through on collecting blood samples or

not. Similarly, Svensson et al. (2019) found that if farmers felt that veterinarians did not fulfill a promise (e.g., supply needed information) then adherence to advice was poor. The lack of initiative to make changes to the SOP by some of our participants could speak to the priority of the practice to not only the farmer, but the veterinarian as well. Given this finding, we recommend that further research seek to understand the veterinarians' perceptions of SOP. In addition to the veterinarian, some farm staff were expected to complete the new procedures on the farm, but were not actively involved in the SOP development process. Involving employees in the development of SOP can increase buy-in (Amare, 2012) and this is considered a best practice (Barbe et al., 2016). Although this option was given to participants in this study, it was only selected once (by a farm owner who invited their herd manager to participate); we suggest that future research include employees in the SOP development process to assess buy-in and SOP compliance.

Finally, we included ourselves as advisors in this process. We view this as a strength of this study as researchers are an important component of the dairy system and building relationships with industry stakeholders is an important step to creating change.

In some cases, farmers elected to make no changes to the SOP. This may be a reflection on the advice offered; farmers may have found the advice not meaningful for their farm (Bard et al., 2019). This also may reflect the lack of importance of SOP or specifically the SOP that we chose to focus on for this study. Past research has shown that record keeping for calf health on some farms is poor (Ellingsen et al., 2012). Newborn calf care was chosen as it is required by proAction, but it appears that many farmers did not rank calf care as a high priority. Other SOP (such as one focused on udder health) may have engendered more interest.

There were several limitations to this study. The sample for this study was small; recruitment was hampered due to pragmatic constraints (i.e., length of time to recruit, small population of farmers to sample from, and the exhaustion of all recruitment methods). We cannot generalize our results to all dairy farmers, or even all farms within the same region. As with any study that employs qualitative methods, context is important. For this study we focused on farmers in the lower Fraser Valley region of British Columbia, Canada. Farmers in this region are familiar with the UBC Dairy Education and Research Centre (Agassiz, BC, Canada), perhaps making them more open to research and outreach opportunities. Additionally, we can conclude from this study what advice was incorporated into the SOP for the farm, but this may not directly translate into day-to-day operations. We suggest that

further research explores how SOP use on farm translates into measurable animal welfare outcomes.

CONCLUSIONS

Standard operating procedures are becoming common on dairy farms due to increased farm size and oversight from assurance programs. To our knowledge, this study is the first to try to understand the role of the advisor in the development of a farm-specific SOP and the factors that influence adherence to advice in this context. This article adds to the literature on farmer decision making and advice adherence, and to the limited literature on SOP use and development on farms. The findings of this study suggest that a farm-specific SOP that actively tracks procedures is most beneficial, and that advice adherence is context dependent.

ACKNOWLEDGMENTS

We thank our participants for their contributions to this study, without them this research would not have been possible. We thank our colleagues in the UBC Animal Welfare Program for their continued help and support throughout this study. This project was funded in part by Agriculture and Agri-Food Canada (Ottawa, ON, Canada) and the Government of British Columbia (Victoria, BC, Canada) through programs delivered by Agriculture and Agri-Food Canada, the Government of British Columbia, and the Investment Agriculture Foundation of BC. This project was also funded by the Dairy Industry Education and Research Committee. Opinions expressed in this publication are those of the authors and not necessarily those of the funders. M. A. G. von Keyserlingk and D. M. Weary are supported by Canada's Natural Sciences and Engineering Research Council (NSERC; Ottawa, ON, Canada) via the Industrial Research Chair Program, with partnership from Dairy Farmers of Canada (Ottawa, ON, Canada), Saputo Inc. (Montreal, QC, Canada), British Columbia Dairy Association (Burnaby, BC, Canada), Alberta Milk (Edmonton, AB, Canada), Intervet Canada Corporation (Kirkland, QC, Canada), Boehringer Ingelheim Animal Health (Burlington, ON, Canada), BC Cattle Industry Development Fund (Kamloops, BC, Canada), the Semex Alliance (Guelph, ON, Canada), Lactanet (Sainte-Anne-de-Bellevue, QC, Canada), Dairy Farmers of Manitoba (Winnipeg, MB, Canada), and the Saskatchewan Milk Marketing Board (Regina, SK, Canada). Funding for Katelyn Mills was provided by the Social Science and Humanities Research Council of Canada (Ottawa, ON, Canada) Doctoral Fellowship and the Canadian Dairy Commission (Ottawa, ON, Canada) Scholarship. Funding for Katie Koralesky was

provided by the University of British Columbia's 4YF Doctoral Fellowship program. The authors have not stated any conflicts of interest.

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ORCIDS

- Katelyn E. Mills <https://orcid.org/0000-0001-7296-9214>
- Katherine E. Koralesky <https://orcid.org/0000-0002-7347-7745>
- Daniel M. Weary <https://orcid.org/0000-0002-0917-3982>
- Marina A. G. von Keyserlingk <https://orcid.org/0000-0002-1427-3152>

APPENDIX 1

Table A1. Meeting 1 questions

Question	Response
What is your role on the farm?	
Number of milking cows	
How many people (including part-time employees) work on this farm?	
What are their roles?	
Who is your veterinarian?	
How often are they here?	
Who is your nutritionist?	
How often are they here?	
Do you have SOP ¹ ?	
How would you define SOP?	
What does your SOP for colostrum look like? (take a picture)	
Are the other SOP written down?	
Are they created together with other employees?	
Are the employees trained on them?	
Do you ever make modifications to existing SOP?	
and why?	
Who helped you create your SOP?	
Is there variation in how employees complete processes?	
Why?	
What do you think of SOP in general?	

¹SOP = standard operating procedure.

APPENDIX 2

Table A2. Meeting 3 questions

Theme	Item	Question
Implementation	Question	What steps were taken to implement this SOP ¹ ?
	Prompt	What did not go well?
Use of SOP	Prompt	What went well?
	Question	Has the new SOP changed your colostrum management?
	Prompt	In what way?
	Question	Have you changed anything in the SOP since it was developed?
	Prompt	Do you plan on changing anything in the SOP?
	Question	Did you follow the SOP every time?
	Prompt	Why or why not?
	Prompt	What was different? What did you do differently?
	Question	What was your outcome or goal?
	Question	Do you think this outcome was achieved?
Stakeholder involvement	Question	What do you think about SOPs after this process?
	Question	Did you involve additional stakeholders in the SOP development?
	Question	If yes, would you use this stakeholder involvement again in SOP development?
	Question	If no, why not? Do you wish that you had?
General	Question	How has each stakeholder been involved in this process?
	Probe	Could you tell me more about that?
	Probe	Could you walk me through that?
	Probe	What do you think was going on there?
	Probe	Would you mind explaining that again so that I can understand?
	Question	What are other challenges that have not been mentioned?
	Question	Of all the things we discussed what do you believe is the most important?
	Question	Do you have any questions for me?
	Final question	Do you have anything else to add?

¹SOP = standard operating procedure.