



Feasibility and acceptance of ready-made standard operating procedures in calf care on German dairy farms

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ABSTRACT

Calf loss continues to be a considerable problem on German dairy farms. Untrained personnel or the lack of best practice routines are potential reasons. Standard operating procedures (SOP) may increase process consistency and can improve animal health and animal welfare. We developed SOP for 8 important tasks in calf care and provided them online to interested dairy farmers and their employees. Five questionnaires were embedded to collect data on demographics, use, perception, and feasibility of SOP. Main objectives of the study were to investigate (1) if there is a gap between the existence of SOP and the wish for SOP, (2) if participants ($n = 301$) consider ready-made SOP as feasible for their farm and (3) suitable to train new personnel, and (4) if they state their confidence in task execution higher after the courses. We experienced a strong discrepancy between the existence (13.1%) and the wish for SOP (69.4%). Most of the participants rated ready-made SOP as feasible for their farm (66.5%). Eighty-five percent fully agreed or agreed to the statement that SOP are a suitable tool for training new employees. Interestingly, 64.2% of employees mentioned, that they wanted to be involved in the creation of SOP specific to their farm. The SOP-based e-learning courses increased the confidence in performing tasks in calf care, especially concerning tasks that were performed less often such as tube feeding, emergency care, and testing of colostrum quality.

Key words: standard operating procedures, training, calf care, employees, online courses

INTRODUCTION

Despite a large body of literature and a plethora of extension initiatives, calf morbidity and mortality are still unacceptably high worldwide (Mee, 2008; Tautenhahn et

al., 2020; Dachrodt et al., 2021), which is unacceptable from an ethical and economic perspective.

It is well accepted that management, particularly colostrum feeding, has a major effect on disease incidence and calf losses (Godden, 2008; Raboisson et al., 2016; Lombard et al., 2020). The challenge is to implement best practice care for every single calf regardless of labor issues such as poor training, language proficiency, and rapid employee turnover (Wenz, 2007; Durst et al., 2018).

Dachrodt et al. (2021) determined a high prevalence of morbidity in preweaning German dairy calves (42.0%), and Zablotki et al. (2024) reported a perinatal mortality rate of 6.1%, with the risk being higher for calves on large farms.

As elsewhere in western industrialized countries (Barkema et al., 2015), the number of dairy farms in Germany is decreasing and the farm size is increasing (Deutscher Bauernverband, 2022). Especially in East Germany, large farms prevail with a median of 200 milking cows (Federal Statistical Office, 2021; Dachrodt et al., 2021) and nonfamily labor with often low German proficiency.

As in the US dairy industry (Garry et al., 2007), a large proportion of the work is done by employees who do not have extensive prior experience in calf management. Communication between employees and supervisors is often challenging because of language barriers, and the employee turnover rate is high (Durst et al., 2018).

In-person training is time- and labor-intensive and can service only a fraction of farms. Language and cultural barriers lead to poor training or misunderstandings during training (Román-Muñiz et al., 2007) and consequently to errors in animal care activities and protocol drift. Often immigrant labor is trained by other employees (Erskine et al., 2015; Sischo et al., 2019; Alanis et al., 2022). Improper implementation of tasks is thus passed on.

Standard operating procedures (SOP) are written step-by-step instructions that are widely used in other industries. Ideally, they represent an accessible, visual, and easy-to-understand description of a given task and

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The list of standard abbreviations for JDS is available at adsa.org/jds-abbreviations-24. Nonstandard abbreviations are available in the Notes.

Table 1. Summary of relevant contents of the 8 online SOP-based courses on calf care

Course	Contents of the “How do I do it?” section
Neonatal care	Cleaning of airways and drying the calf. Transportation to a clean calf hutch with high nesting score. Navel disinfection. Feeding colostrum (timing, amount, temperature). Documentation (time of birth, weight, ear tag).
Emergency care	Monitoring vital signs. Resuscitation procedures (aspiration of mucus with vacuum pump, cold water pouring on neck, provoke sneezing, respiratory stimulants, artificial respiration). Warming.
Bottle feeding	Checking quality of colostrum and condition of bottle. Warming colostrum in water bath and temperature control. Timing and amount of feeding (multiple offerings). Documentation. Cleaning of equipment.
Tube feeding	Checking quality of tube feeder and colostrum. Checking the temperature of colostrum. Fixation of the calf. Placing the tube feeder correctly and controlling position. Slow administration of colostrum. Removing the tube feeder. Cleaning of equipment.
Colostrum quality	Using a digital Brix refractometer.
Disbudding	Sedation. Systemic analgesia. Corneal nerve block and control of effect. Disbudding with hot iron (checking quality of equipment, handling, placement, duration, depth). Examination of wounds.
Identification of sick calves	Daily health routine. Controlling of milk consumed. Examining of nose, eyes, ears, feces (health condition score), movement. Examining breathing, temperature, severity of dehydration, navel, joints, appetite. Documentation, separation, presenting to veterinarian if necessary.
Cleaning and disinfection	Precleaning of hutches and buckets. Cleaning (detergent and warm water, soaking if necessary, high-pressure cleaner for hutch). Drying. Disinfection (selection of disinfectant, exposure time, concentration). Checking of condition and replacing broken parts.

thereby provide concise guidance for an unexperienced person to conduct the task in a defined way without further training. Standard operating procedures are used to ensure consistency and quality in completion of a given task independent of the performing person. Once created, they save time in training new employees and can be used as reference materials. Concise and visual SOP can improve communication when the work force speaks different languages (Stup, 2002; Amare, 2012; Maunsell, 2012; Barbé et al., 2016; Mills et al., 2020).

In the dairy industry, however, SOP are not widespread. On US and German dairy farms prevalence of written SOP was 22% (Espadamala et al., 2016) for fresh cows and 54% (Hesse et al., 2017) in general, respectively. A focus group approach with 9 farmers from Canada showed that participants did not prioritize creating SOP when other work had to be done such as harvest. Also, they lacked the technology or the ability to create SOP (Mills et al., 2020).

German farm managers stated a lack of time (41%) or ability (42%) to create SOP, respectively. Fifty-nine percent were interested in ready-made SOP for their farms (Hesse et al., 2017).

The sources of SOP for dairy farms were veterinarians, extension services, and universities (Raymond et al., 2006; Hesse et al., 2019; Mills et al., 2020; Alanis et al., 2022) as well as other stakeholders. Findings from the above-mentioned focus group suggested that farm-specific SOP are most beneficial compared with ready-made SOP (Mills et al., 2020). An evaluation if ready-made SOP are usable on most farms has not been conducted, yet.

To address this question, we developed ready-made SOP for 8 tasks related to calf care (Table 1) and pro-

vided them in online courses. A preliminary pilot study from our group showed that employees are highly engaged and interested in courses with ready-made SOP (Hesse et al., 2019). Also, they felt more confident in task completion and stated that they were convinced to work more accurately after having taken the course. That study, however, was based on only 3 courses about colostrum management and enrolled only 29 to 49 participants in the courses.

Therefore, the overall objective of this study was to evaluate the usability of ready-made SOP for tasks in calf care applied through online courses with a considerably larger number of courses and dairy farm employees and more comprehensive surveys including pre- and post-training comparisons. Specifically, we set out (1) to determine if the participants experience a gap between the existence of SOP and the wish for SOP, (2) if they perceive the SOP as feasible for their farm, (3) if they perceive them suitable to train new personnel, and (4) if the self-perceived confidence in task execution and importance of performing tasks consistently increased after taking the course.

MATERIALS AND METHODS

An ethics approval for the study was obtained from the Ethics Committee of the Charité Berlin with the application number EA1/254/19.

We revised and updated 3 online courses used previously (Hesse et al., 2019) and developed 5 additional online courses addressing different topics on calf health with a cloud-based authoring software (Gomo Learning, Brighton, UK). The courses were published sequentially from November 2019 until February 2020.

Selection of Topics

To identify the most important topics related to animal health and animal welfare of calves a 3-step procedure was implemented. (1) The first author (S.N.) spent 2 wk on a calf facility of a commercial dairy farm in Eastern Germany milking 1,600 Holstein cows and with own calf rearing. All tasks performed regularly with calves were recorded and described in detail. (2) In a focus group meeting conducted on the farm, the recorded procedures were presented and discussed with responsible employees, the herd and farm manager, the farm veterinarian, the nutrition consultant, and extension veterinarians from the Clinic for Animal Reproduction, Freie Universität Berlin. A total of 44 activities were identified as relevant for raising calves from birth to weaning. (3) A group of 7 calf specialists (extension veterinarians from our clinic, a former PhD student with expertise in SOP creation, and 2 industry specialists for heifer rearing) was asked to prioritize the activities considering their importance and potential for errors or procedural drift in task execution. Eight tasks emerged as most important: neonatal care, emergency care, measuring colostrum quality, bottle feeding colostrum, tube feeding colostrum, disbudding, identification of sick calves, and cleaning and disinfection (Table 1).

SOP Creation

According to Stup (2002) and Risco and Melendez Retamal (2011), the SOP consisted of 3 sections (What do I need? How do I do it? Why is it important?) that have been demonstrated to be important for training employees (Erskine et al., 2015; Hesse et al., 2019; Mills et al., 2020). A quiz and information “about the course” were added and a stand-alone course was created for each SOP. All sections were directly accessible through a 5-item menu. Each course was designed to be completed by a user within 8 min.

The content of the first 2 sections (What do I need? How do I do it?) was displayed in a step-by-step fashion based on images and videos for an easy understanding (Mills et al., 2020). To support this goal, textual information was reduced to a minimum and presented in 2 levels: an imperative title consisting of 2 to 4 words and a 1 to 3 sentence long description of the task.

The third section (Why is it important?) was designed as a list of 4 to 8 questions related to the task such as “Why is the first milk important?” or “Why is pain relief important during disbudding?”. This background information provided specific reasons why it was important to perform a given step of the task exactly as described. It was shown that such knowledge motivates employees to adhere to protocols (Liebenow, 2018; Mills et

al., 2020) and motivates to learn (Wlodkowski, 2008). To further support this goal, we used intuitive graphs, images, videos, short explanations and offered downloadable materials in that course sections according to Román-Muñiz et al. (2007). These authors suggested that “training sessions aimed at motivating and engaging dairy employees should be rich in visual aids and relevant examples.”

A quiz with 3 to 5 interactive questions (i.e., multiple choice, image choice, drag and drop) about the content allowed the participant to self-evaluate what should have been learned. Immediate feedback to an answer was given to facilitate learning.

The last section (about the course) provided information about the sources, the underlying study, the ethics approval, and a disclaimer.

The courses were responsive and accessible by registered users via a URL after login with their email address and a password provided by the researchers. The courses as well as the sections within the courses could be viewed at the participant’s own discretion at any time after publishing and repeatedly during the study period. The learning management software allowed monitoring the user activity for each course such as time of access, pages, and questions viewed. Content, usability of the courses, and all questionnaires were pretested by a panel of 8 calf specialists from the Federal Agricultural Institutes of 5 eastern German states and by staff from the Clinic for Animal Reproduction, Freie Universität Berlin.

Questionnaires

Participants were asked to fill out a total of 5 questionnaires (see Appendix Tables A1, A2, A3, A4, and A5) presented at registration (Q1), during the course work (Q2–Q4) and 3 d before the end of the online period (Q5).

At registration (Q1) we asked questions covering the demographics and information about the farm.

When accessing a course, participants were asked about their experience with the task and the availability of an SOP for the task on the farm, whether the user felt confident in performing the task and whether the consistent execution of the task was important to them (Q2). After the section “How do I do it?” we asked whether the ready-made SOP would be feasible on the participant’s farm, if they wished to have such an SOP and in which language (Q3). At the end of each course (Q4) a questionnaire mostly identical to Q2 was presented with the goal to do a pretest and post-test comparison.

In the final evaluation (Q5) we asked whether the SOP were useful for training of new employees. We also inquired about the participants’ engagement in the development of SOP for their farm.

We used multiple choice questions and statements to be answered on 5-point Likert scales. Because the training could be interrupted at any time and resumed later, the number of answers varied between the questions of each course questionnaire. For a better usability the questionnaires Q2 through Q4 were designed dynamically such that some questions only appeared after the user had chosen a certain answer before. If the questionnaire was accessed more than once by a given user only the first answer of each question was analyzed.

Branding of Courses and Recruiting of Participants

The 8 courses were summarized under a memorable name (calf school; Kälberschule) and could be accessed after registration to a study website in German (www.kaelberschule.de). The objectives and contents were promoted at 7 continuing education (CE) events for dairy farmers and their employees between June and November 2019. Also, this information was distributed to dairy industry stakeholders, agricultural institutes, and farm magazines in October and November 2019. Three direct mailings and 4 print magazines promoted the study. To our knowledge the information was covered on 9 different websites and via social media channels (Twitter and Facebook) as well.

Interested persons registered on their own initiative via the study website. The study website summarized the project and provided sample SOP, promotional materials for download, and information of the study and contact persons. The page also obtained informed consent from all participants, showed a disclaimer, described the privacy policy, and presented a registration form (i.e., first questionnaire, Q1). The registration was pseudonymized. An email address was required for further communication. By submitting the form, participants agreed to participate in the study and provided informed consent. Participation was voluntary and participants did not receive an incentive. Courses were free of charge and course completion was not required.

Study Procedure

The courses were published sequentially. The first and last course were published on November 28, 2019, and on February 11, 2020, respectively.

Each course remained accessible throughout the whole study period. Course access ended on February 28, 2020. Participants received an email invitation each time a new course was launched with the URL to the e-learning platform and a short course description and instruction on how to launch the course. Follow up emails were sent 2 to 6 d later. Participants could ask questions about tech-

nical issues (e.g., sign up, log in) and the content via email during the whole study period.

Statistical Analysis

A total of 440 registrations were received. Of these 63 (14.3%) indicated that they did not work on a farm. The remaining dataset ($n = 377$) was screened for logical errors in the registration questionnaire (3.4%). Only participants who had accessed the course by November 28, 2019 (course start) were included in the analysis. Latecomers, users under 18 yr of age, and users with an incorrect email address were excluded from analysis. A total of 301 dairy farm employees (79.8%) remained in the dataset for final analyses. As noncompleted questionnaires were included, some questions have a sample size that differs from 301.

Two questions were categorized (“I have the following education...” and “I work on the farm as...”) and Likert scales were condensed from a 5-point into a 3-point plot.

All data were collected in Microsoft Excel (Microsoft Office 2021; Microsoft Deutschland Ltd.), in which we also performed descriptive statistical analyses and graphs. We used SPSS Statistics for Windows (version 26.0, SPSS Inc., IBM) for data management and descriptive analyses as mean, SD, and frequency tables. We used also R (version 4.2.1, R Core Team) and RStudio (version 2022.07.2, RStudio Team) for merging the datasets and creating the initial Likert plots, which we processed in a graphic processing program (GIMP, version 2.10.34) and Microsoft PowerPoint (Microsoft Office 2021; Microsoft Deutschland Ltd.).

RESULTS AND DISCUSSION

Demographics

The age of the participants was 36.6 ± 11.6 yr (mean \pm SD) with the youngest user being 18 yr old and the oldest 61 yr old. Among our participants, only 5.4% were older than 55 yr. This percentage is considerably lower compared with 37% of German farmers overall (Deutscher Bauernverband, 2022). The relatively low age in our study may indicate that young people are more receptive to online education or to innovative management practices. Also, young farmers are more accessible through social media (Roche et al., 2020) through which we did some of the marketing for the study.

One hundred eleven (36.9%) of the participants were male and 190 (63.1%) were female. Most of them (296; 98.3%) reported speaking German at home and 5 (1.7%) a foreign language. One-third of the workforce in the agricultural sector in Germany are seasonal workers

most of foreign origin (i.e., Romania, Poland, and other Eastern European countries; Deutscher Bauernverband, 2022). The proportion of seasonal workers in plant production is higher than in livestock farming, where permanent employees play a greater role. Therefore, the results cannot be transferred directly to dairy farming, for which reliable data are not available. However, employees of foreign origin, especially from Eastern Europe, are relevant for large dairy farms in Germany, which is also shown in the answers regarding the desired languages. Although in our study, the number of employees whose native language was not German was low compared with the actual number of employees on German farms. This may be due to the fact that all texts used for the promotion of the study and within the courses were exclusively in German.

Two-thirds (207; 68.8%) of the participants had an agricultural degree (apprenticeship, animal science degree) and 41 (13.6%) other degrees (other degree or apprenticeship). The remaining 53 (17.6%) had no further education (elementary/secondary school, secondary school diploma, high school diploma, no agricultural training).

Ninety-six (31.9%) of participants were owner/farm managers and 205 (68.1%) farm employees. The courses of the calf school were clearly aimed at the employees. The number of farm owners was higher than expected and probably due to their presence at the CE events where we promoted the study. Another explanation is that farm managers wanted to explore the training tools for their employees first before encouraging them to participate. Furthermore, it is possible that they did not sufficiently motivate their employees to participate.

Forty-nine participants (16.3%) worked with calves most of the time, 222 (73.8%) worked with calves, but also in other areas, and 30 (10.0%) worked with calves little or not at all.

Sixty-eight (22.6%), 173 (57.5%), 38 (12.6%), and 22 (7.3%) participants worked on a farm with less than 100, 100 to 500, 500 to 1,000, and more than 1,000 cows in milk, respectively. The majority of the participants (77.4%) worked on farms with more than 100 cows in milk. This is consistent with farm demographical data according to which 75% of cows are kept on farms with more than 100 cows (Deutscher Bauernverband, 2022). Also, larger farms have more nonfamily employees, more employee turnover, a higher training demand, and therefore are more interested in SOP (Hesse et al., 2017).

Online Courses: Response Rate

The number of participants per course ranged from 105 to 247. The average response rate (people invited divided by people opening the course) for all courses was 55.2%. This is slightly higher than the overall response rate in

the study of Hesse et al. (2019), where it was 48%. Only 13.3% did not open a single course.

Frequency of Task Performance

In each course (Q2), we asked how often the task was performed by the participants. This allowed us to categorize the tasks into 2 classes. The tasks that were done by more than 50% of the employees “very frequently” or “frequently” (class 1) included identification of sick calves (81%, $n = 126$), bottle feeding (77%, $n = 161$), neonatal care (69%, $n = 243$), and cleaning and disinfection (64%, $n = 103$). The tasks performed by less than 50% of employees “very frequently” or “frequently” (class 2) included emergency care (46%, $n = 186$), disbudding (34%, $n = 146$), determining colostrum quality (30%, $n = 113$), and tube feeding (22%, $n = 152$).

Tube feeding of calves is conducted only on 23.8% of German dairy farms (Hayer et al., 2021).

Disbudding, however, is a common practice in the dairy industry and is performed by the majority of farms with 82% in the European Union (Cozzi et al., 2015; Winder et al., 2016) and 95% in Germany (Hayer et al., 2021). The relatively low frequency in our data indicates that the employees, who cared for the calves and were interested in our courses were not involved in the regular disbudding. On some farms, this procedure is conducted exclusively by the servicing veterinary practice.

Testing colostrum quality is rarely conducted both on US (10%) and German dairy farms (23.8%; Hayer et al., 2021; Wilson et al., 2023), although the positive effects of feeding high-quality colostrum are well documented (Windeyer et al., 2014; Urie et al., 2018). This finding is reflected in our data on the frequency of task performance.

Pre- and Post-Test Comparison

Plotting the frequency of task execution against perceived confidence before taking the course reveals an interesting association (Figure 1). Before the courses, the participants' confidence in performing a given task was lowest for tube feeding, disbudding, testing colostrum quality, and emergency care (Figure 1, class 2). These tasks were conducted less frequently. Also, these tasks are more complex or require special equipment that was not available on the farm (e.g., Brix refractometer) and could therefore be unfamiliar. By taking our courses with detailed step-by-step instructions, the perceived confidence for the 4 tasks in class 2 increased significantly (18%–34%, Figure 2).

For such tasks our findings are indicative of opportunities for employees and improvement of animal welfare. Particularly, for procedures that can cause stress or pain

if not performed correctly such as disbudding (Stafford and Mellor, 2005). Furthermore, morbidity and perinatal mortality can be prevented through implementing consistent emergency care routines (Mee, 2008), testing of colostrum quality (Windeyer et al., 2014), or tube feeding of colostrum (Lateur-Rowet and Breukink, 1983; Godden et al., 2009). Standard operating procedures can facilitate the learning process for example in emergency care where weak calves are rare to occur at a time that is convenient for employee training events.

For disbudding, fact sheets and online training videos “may be used as the sole resource for a producer who is unable or unwilling to acquire training through a veterinarian” (Winder et al., 2017). In our study, perceived confidence increased, however, only moderately for all participants taking the course (Figure 2). This might have been caused by the invasive nature of the hot-iron method which can cause concerns among employees of inducing pain. This could result in discomfort if hands-on training is lacking. Although SOP are an essential tool to achieve consistency (Strey et al., 2011), further hands-on training and practice to improve skills are important for calving personnel and milkers (Schuenemann et al., 2013; Heuwieser et al., 2024). Furthermore, it has been shown that online learning was surprisingly effective for a psycho-motor skill (i.e., cornual nerve block), but best practices should include hands-on training as well (Winder et al., 2017) to demonstrate the skills to the

employees and correct any misunderstandings that may be present. Simulator-based clinical skills training supported by SOP, as described by Aulmann et al. (2015) and Schlesinger et al. (2021), should be considered to practice certain tasks such as emergency care, disbudding, and tube feeding to optimize animal welfare. Restrictions on German farmers using veterinarian-prescribed drugs might have been another cause for the moderate increase in the perceived confidence in disbudding.

Taking the courses had almost no influence (mean increase 4.5%) on the participant’s attitude regarding consistent execution of a given tasks (“It is important to me that the task is performed in the same way every time”). The importance of a consistent execution, however, was already shared by the majority of participants in all courses before taking the courses (81% to 94% strongly agreed or agreed, $n = 80\text{--}199$). Improvement of consistency in task performance is aimed to reduce errors (Stup, 2002) and one of the main reasons for using SOP as cattle thrive on consistency and then perform better (Maunsell, 2012).

SOP-Related Questions

Proper training of dairy employees is important (Moore et al., 2020), but occurs rarely (Durst et al., 2018). Creating and using SOP can help to mitigate this challenge (Maunsell, 2012) with benefits as discussed above. Re-

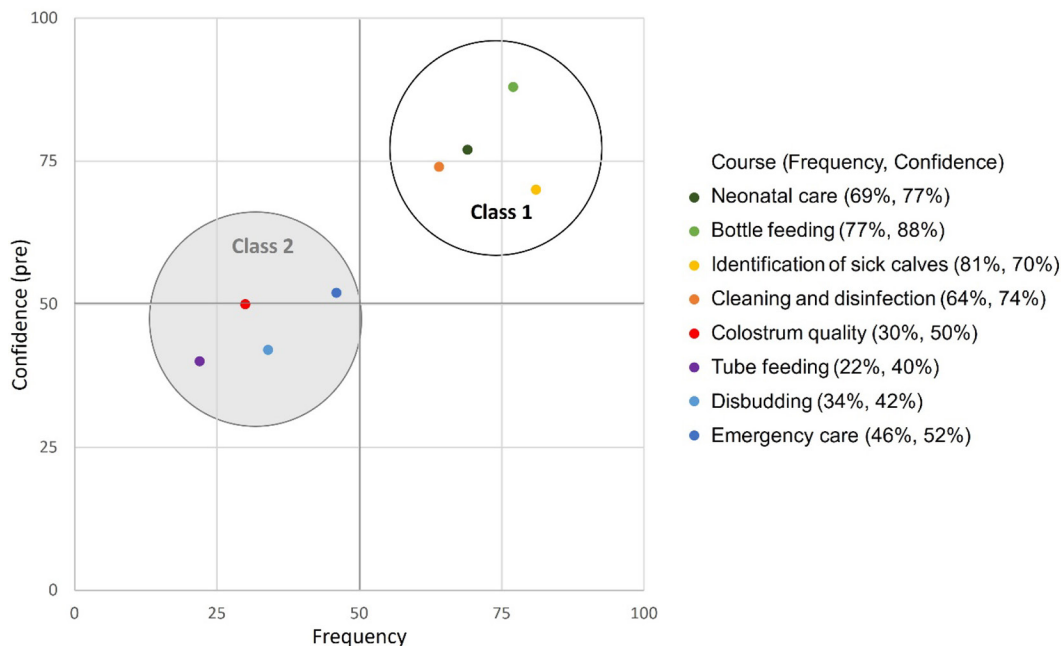


Figure 1. Relationship of perceived confidence (agreement in percentage to the statement “I feel confident in performing the task”) before the course and frequency of performance (% of participants who answered with “very frequently” or “frequently” to the statement “I perform this task...”) for 8 tasks in calf care.

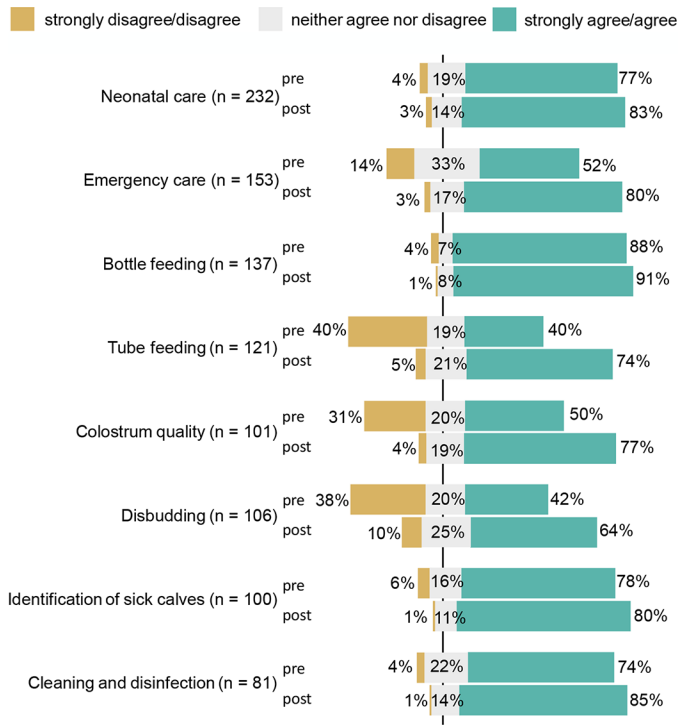


Figure 2. Agreement in percentage with the statement “I feel confident in performing this task” before (pre) and “I NOW feel confident in performing this task” after the course (post) on a 3-point Likert scale, presented as a stacked bar chart considering 8 courses on calf care. Only users who answered both questions were included.

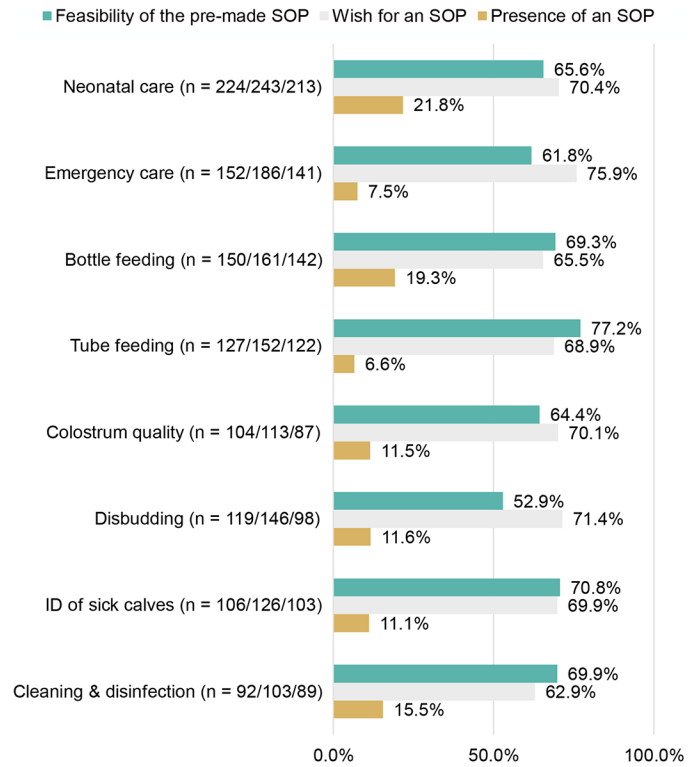


Figure 3. Agreement in percentage to the questions “Is this SOP feasible on your farm?” (feasibility), “Do you want to have an SOP for this task for your farm?” (wish), and “Do you have a written SOP for this task on your farm?” (presence) considering 8 courses on calf care. Number of total answers per question in parentheses.

sponses to the questions “Do you have a written SOP for this task on your farm?” and “Do you want to have an SOP for this task for your farm?” showed a considerable discrepancy between the presence of and the wish for an SOP. While on average only 13.1% of respondents had written SOP for a given task (Table 2) the majority of respondents wanted SOP for these tasks (69.4%).

Tasks with the highest prevalence of SOP were neonatal care (21.8%) and bottle feeding (19.3%; Figure 3). These were also the most frequently performed tasks in our study (Figure 1). On larger farms, they are conducted on a daily basis but sometimes performed by poorly trained employees (Garry et al., 2007). Although the execution of these tasks is per se simple, the consistent

administration of sufficient high-quality colostrum on time is critical to the health of the newborn calf and future herd performance (Stanton et al., 2012; Raboisson et al., 2016). Managers seem to have a strong interest in ensuring that such tasks are performed according to best practice particularly when calving events occur in poorly staffed night shifts (Garry et al., 2007; Wenz, 2007; Durst et al., 2018). Written instructions are then considered helpful tools which explains the relatively high prevalence of SOP for both tasks in our study.

Prevalence of SOP for emergency care (7.5%) and tube feeding (6.6%) were low even though their correct performance can be considered lifesaving for calves.

Table 2. Frequency distribution of answers to SOP-related questions

Question	Number of answers	Average of 8 courses (%)		
		Yes	Neutral	No
Do you have a written SOP for this task on your farm?	1,230	13.1	— ¹	86.9
Is this SOP feasible on your farm?	1,074	66.5	25.5	8.0
Do you want to have an SOP for this task for your farm?	995	69.4	15.2 ²	17.3

¹This option was not available.

²Based on 7 courses as the option was added after the first course was published.

However, for calf feeders proper use of an esophageal feeder to administer colostrum, “prior training and consistent adherence to protocols is necessary” (Risco and Melendez Retamal, 2011). Nevertheless, prevalence of SOP for these tasks was low which could be caused by the lack of special expertise which could be provided by a veterinarian as described by Mills et al. (2020). Veterinarians should advise dairy farmers and their employees in how to tube feed calves and how to provide proper care to newborn calves, respectively (Godden, 2008; Mee, 2008). Interestingly, in a Dutch survey only 10% of veterinarians reported providing preset SOP to their clients (Boersema et al., 2013) indicating a huge opportunity to improve on veterinary support.

The wish for an SOP was strongest for the task emergency care (75.9%) and lowest for cleaning and disinfection (62.9%). Obviously, there is a desire to provide proper support in a critical situation that could otherwise result in suffering or the death of a newborn calf. The benefit of a concise description of the necessary steps for such an emergency situation is obvious, even for small farms (Maunsell, 2012). In addition to the importance of an SOP for this task, hands-on training has a need to demonstrate the skills required (Schuenemann et al., 2013). Cleaning and disinfection may be considered too mundane and commonplace by the participants to feel that guidance is necessary (Mills et al., 2020) even though approximately two-thirds wanted to have such an instruction.

The participating farms were a convenience sample and their employees motivated to learn new aspects of calf care and to revise current practice. This might have introduced a bias toward the wish to have an SOP. Furthermore, one has to keep in mind that the availability of an SOP does not necessarily lead to its consistent implementation because changing routines is hard (Raymond et al., 2006).

Possible reasons for not participating in the study could include (1) the notion that it is not necessary to explain a simple task in detail particularly for personnel with many years of experience, (2) rejection of possibly text-heavy documents in otherwise hands-on environments or illiteracy, (3) belief that processes on animals cannot be standardized (Mills et al., 2020).

Overall feasibility of our ready-made SOP was rated high for all tasks (66.5% agreement; Table 2). This result provides evidence that the statement that calf rearing on different dairy farms is too diverse to use ready-made SOP is not valid.

The feasibility of SOP for disbudding was approximately 10 to 20 percentage points lower than for the other 7 SOP (Figure 3). This might be due to the fact that methods to control pain at the time of disbudding

and afterward vary greatly between farms (Fulwider et al., 2008; Cozzi et al., 2015) including a nonsteroidal anti-inflammatory drug, a sedative and a local anesthetic (cornual nerve block) in different combinations or sometimes none. In Europe, pain relief is regulated by law, but economic reasons can affect implementation thereof (Gottardo et al., 2011). We showed a combination of all 3 options for pain control in our SOP, with the use of a local anesthetic being an important component of the “How do I do it?” section. However, in Germany a local anesthetic is used on only 20% of the farms as part of the disbudding routine (Hayer et al., 2021) which can be explained by legal provisions in Germany, which limit the application of local anesthesia only to veterinarians (Federal Ministry of Justice and Consumer Protection, 2009).

The most requested language for ready-made SOP was German (98.8%). Polish (15.9%), Romanian (9.5%), other languages (6.9%), Russian (4.9%), and Bulgarian (2.5%) were less frequently selected ($n = 60$ to 153). These results could represent the percentage of countries of origin of employees who frequently performed the tasks for which we offered SOP or for future employees for whom farm managers wanted to acquire training materials.

In our data we saw a predominant wish for SOP in German. According to Wiest (2016) and Traikova et al. (2018), a rural-out migration in Eastern Germany also affects dairy farms. Thus, it becomes necessary not only to recruit qualified workers from abroad, but also to consider lateral entrants without experience in livestock management. Training materials in German would be needed to train this group of people.

Eighty-five percent ($n = 119$) fully agreed or agreed to the statement that SOP are a suitable tool for training new employees. It is noteworthy that 77 employees (64.2%, $n = 120$) mentioned, that they wanted to be involved in the creation of SOP specific to their farm. This finding shows opportunity for a consistent use of SOP, because the best way to implement an SOP is to increase employee engagement by involving them in a participatory development process (Stup, 2002; Maunsell, 2012; Amare, 2012).

Our study confirmed the assumptions of the preliminary study from Hesse et al., (2019) with an adequate number of dairy farm employees. The broad promotion and user-friendly study website with easy self-registration was an advantage for this purpose. The strength of the current study is, that we can make inferences about the use of SOP describing relevant tasks of the preweaning period, whereas Hesse et al. (2019) focused solely on colostrum management. Our findings are also more reliable because we used a pretest and post-test approach whereas Hesse

et al. (2019) estimated an increased feeling of confidence only once after the courses without a pretraining comparison. The focus of this study was on the presence, wish and feasibility of calf care SOP, which the first study did not cover at all. Although some limitations were present in our study such as a convenience sample, voluntary participation and availability of the course were only in German. Therefore, we lacked non-German speaking employees and those without an intrinsic motivation in CE. The participants were also not representative of the German dairy industry as a whole as we had a relatively young participant base from mainly large farms. Further research is warranted including different sizes and cultures of farms and particularly the diverse backgrounds of dairy employees considering language and ethnicity. Also, it should be investigated if a behavior change occurs after training in calf care related tasks as recently shown for milking procedures (Heuwieser et al., 2024).

To improve animal health and animal welfare in calf rearing qualified and engaged employees are needed. As they are a limited resource, we have to provide efficient solutions for proper training. Motivating SOP could be a core element in strategic on-farm training (Stup, 2002) to improve calf care for their known benefits in teaching inexperienced personnel. Knowing that practical training will remain important for some tasks (Winder et al., 2017). Our data provide evidence for a strong acceptance of SOP among dairy farm employees. Finally, we have shown that a high feasibility for ready-made SOP in frequently conducted tasks in calf care shows that it is not always necessary as previously described (Mills et al., 2020) to create farm-specific SOP. It is well known that having SOP does not necessarily lead to consistent implementation (Bauer, 2023). Regular revision (Amare, 2012; Barbé et al., 2016) and science-based evidence are important to ensure that outdated routines are not perpetuated or farm blindness occurs. Therefore, further research is warranted to investigate the implementation and long-term compliance of SOP on dairy farms as well as their effect on measurable outcomes of calf health and well-being.

CONCLUSIONS

Only a minority of German dairy farms have written SOP in place for calf care. The majority of employees, however, wanted to use SOP. In a pre- and post-training comparison, step-by-step instructions increased confidence in task performance. Overall, ready-made SOP were feasible on the majority of the farms. Some differences in the feasibility of ready-made SOP for different tasks were observed. Dairy producers and other stakeholders should use SOP more intensively to increase animal health and animal welfare in dairy calves.

NOTES

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Nonstandard abbreviations used: CE = continuing education; Q1–Q5 = questionnaire 1 to 5; SOP = standard operating procedure(s).



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APPENDIX

The following tables show the questionnaires used in the study considering aim, localization, and responses.

Table A1. Q1. Registration form on study website; aim: demographics, prior e-learning experience

Item no.	Item	Response option
1	Gender	Male Female
2	Age	Open text field
3	I work on the farm as ^{1,2}	Employee Temporary employee Trainee Family member Herdsman Supervising employee Owner or farm manager Veterinarian
4	I work...	...with calves most of the time ...with calves, but also in other areas ... with calves little or not at all
5	I have the following education ¹	Elementary or secondary school Secondary school diploma High school diploma Agricultural apprenticeship Agricultural science degree No agricultural training Other study or apprenticeship
6	At home I speak...	...German ...Other
7*	When I need technical information, I... ¹	...ask a colleague ...ask my foreman or chief ...have a look on the internet ...have a look in trade journals or books ...search for them on training events ...ask our veterinarian ...ask consultants ...ask on other farms

Continued

Table A1 (Continued). Q1. Registration form on study website; aim: demographics, prior e-learning experience

Item no.	Item	Response option
8	How many cows in milk do you have?	<100 100–500 500–1,000 More than 1,000
9*	I have worked on the farm for	1–6 mo 7–12 mo 1–2 yr 2–5 yr >5 yr
10*	Are you allowed to use your smartphone at work?	Not at all Only during breaks Actually always When there is time There is no rule
11*	My last training was	In the last 6 mo 6–12 mo ago 1–2 yr ago More than 2 yr ago
12*	Have you ever done online training before?	I never had any training on the job. Yes No
13*	Why do you participate? ¹	I am curious. My boss asked me to. My colleagues also participate. I would like to continue my education. I would like to check my knowledge. I would like to get better. Just for fun.
14*	If the calves I care for are healthy, I'm proud!	5-Point Likert scale ³
15*	My supervisor doesn't give me special recognition when the calves are healthy!	5-Point Likert scale ³
16*	I also talk to my family about my calves!	5-Point Likert scale ³
17*	I get stressed when I see others not taking proper care of the calves!	5-Point Likert scale ³
18*	Anything else you want to tell us?	Open text field

¹Multiple selection was possible.

²Another option "other" was possible, but not chosen in the final sample.

³Strongly agree; agree; neither agree nor disagree; disagree; strongly disagree.

*The results of these questions are not included in this paper.

Table A2. Q2. Before the SOP in each course; aim: experience with the given task, presence of an SOP for the given task, pre-test confidence in performing the given task

Item no.	Item	Response option
19	I perform this task...	Very frequently Frequently Sometimes Seldom Not at all
20	I feel confident in performing this task.	5-Point Likert scale ¹
21	It is important to me that the task is performed in the same way every time.	5-Point Likert scale ¹
22	Do you have a written SOP for this task on your farm?	Yes No

¹Strongly agree; agree; neither agree nor disagree; disagree; strongly disagree.

Table A3. Q3. After the section “How do I do it?” in each course; aim: feasibility of the SOP, wish for an SOP for the task

Item no.	Item	Response option
23	Is this SOP feasible for your farm?	Yes Neutral No
24	Do you want to have an SOP for this task for your farm?	Yes Neutral ¹ No
25	In which languages? ²	German Polish Rumanian Bulgarian Russian Other

¹“Neutral” was added after the first course was published.

²Multiple selection was possible.

Table A4. Q4. After each course; aim: learning effect, learning environment, post-test confidence in performing the given task

Item no.	Item	Response option
26*	It was difficult to find time to work on the course.	5-Point Likert scale ¹
27*	When did you take the course?	At work In my leisure time
28	I now feel confident in performing this task.	5-Point Likert scale ¹
29	It is important to me now that the task is performed in the same way every time.	5-Point Likert scale ¹
30*	The course was a good repetition for me.	5-Point Likert scale ¹
31*	I’ve learned a lot with the course.	5-Point Likert scale ¹
32*	What was the most important thing you learned?	Open text field
33	Would you recommend this course?	Yes No

¹Strongly agree; agree; neither agree nor disagree; disagree; strongly disagree.

*The results of these questions are not included in this paper.

Table A5. Q5. Final evaluation emailed 3 d before the courses were set offline; aim: technical issues, appreciation of the courses, perception of online training post-training, user engagement

Item no.	Item	Response option
34*	Did you have any technical problems?	Yes No
35*	If Yes, what type?	Open text field
36*	The courses were easy to use.	5-Point Likert scale ¹
37*	The courses were easy to understand.	5-Point Likert scale ¹
38*	The courses have covered topics from my everyday work.	5-Point Likert scale ¹
39	The courses are suitable for training new employees.	5-Point Likert scale ¹
40*	Online training is a good way for me to continue my education.	5-Point Likert scale ¹
41	I'd love to be involved in the creation of SOP specific to my farm.	Yes No We already have SOP.
42*	Have you shared your access to the courses with others?	Yes No
43*	Have you talked to colleagues about the content of the courses?	Yes No
44*	Would you like to participate in more courses in the future?	Yes No
45*	How should we notify you? ²	Email Cell phone
46*	In what form would you like to have the content permanently?	"What do I need?" and "How do I do it?" printable. "What do I need?" and "How do I do it?" and "What is important?" printable. Continued access to online courses.
47*	In the future, there should be a certificate of participation.	Yes No
48*	Is there anything else you would like to tell us or do you have any suggestions for other topics?	Open text field

¹Strongly agree; agree; neither agree nor disagree; disagree; strongly disagree.

²Multiple selection was possible.

*The results of these questions are not included in this paper.