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Survey of work processes on German dairy farms

A. Hesse, S. Bertulat, and W. Heuwieser[1]
Clinic for Animal Reproduction, Faculty of Veterinary Medicine, Freie Universität Berlin, Königsweg 65, 14163 Berlin, Germany

ABSTRACT

The objective of this study was to conduct a survey to gain insight into the organization of work processes on commercial German dairy farms analyzing the use of standard operating procedures (SOP). Practices and routines were surveyed regarding the existence, creation, and use of SOP. A total of 250 survey forms were returned, and 248 could be used for final analysis. The existence of SOP was indicated by 82% of all respondents, but only 54% stated that these SOP were written down. Existence of SOP correlated with farm size such that larger farms were more likely to implement SOP than smaller farms. However, many farmers lacked the time (41%) or ability (42%) to create SOP to provide the employees with detailed instructions on how to perform a specific task. The majority of respondents (59%) were interested in using ready-made SOP that could be adjusted to their farm. An obvious discrepancy exists between the motivation of the farmers to improve the performance on their farm and their expertise in attaining these goals and intentions.
Key words: survey, protocol, standard operating procedure, quality management

INTRODUCTION

Quality assurance programs are designed to help companies improve and maintain process and product quality. Key elements of such programs are protocols and standard operating procedures (**SOP**). Protocols are company specific and provide information on what to do in certain situations, whereas the SOP within the protocols systematically describe how to do it (Barragan et al., 2016). These SOP define work processes in a detailed and step-by-step manner, providing the employee with clear instructions on how to perform a particular task (Amare, 2012). Consistency of work performance is increased because written instructions manage the variation that arises when individuals perform tasks in different ways (Stup et al., 2006). Consequently, fluctuations in product quality are reduced. Regular performance reviews and assessment of the compliance with a given SOP can ensure a high quality of work performance and productivity (Stup et al., 2006).

There exist different quality assurance programs (e.g., Total Quality Management, Six Sigma, Hazard Analysis Critical Control Points) as well as a management system standard of the International Organization for Standardization. The aim of these programs is to establish and implement standards of frequently performed work processes that are consistently reviewed (Manghani, 2011).

Quality assurance programs for industrial manufacturing were introduced a long time ago (Yu et al., 1999); however, such concepts are only starting to be developed in human medicine. Recently, SOP have been established for the improvement of cancer diagnostics (Keswani et al., 2015), for the treatment of intensive care patients (Friesecke et al., 2014), for orthopedics and trauma surgery (Ewerbeck, 2014), and for reducing the dose of pediatric X-rays (Kloth et al., 2016). The application-based SOP management program SOPHIA (SOPHIA, 2014) was designed particularly for hospitals to generate and manage SOP and make them available on mobile devices. The developers wanted to ensure the creation of SOP that are widely accepted and always up to date (Bauer et al., 2015). In human medicine, SOP implementation becomes highly important to ensure safety in the practice of medicine and pharmaceutical care (Amare, 2012). Many hospitals, however, still lack the awareness and conditions of strictly performed quality management (Ewerbeck, 2014). This likely applies even more to agriculture and veterinary medicine, even though farmers and veterinarians have major responsibilities in the food chain (Windhaus et al., 2007).

Critical issues such as animal welfare and agricultural sustainability (von Keyserlingk and Hotzel, 2015; German et al., 2016), animal health (Almeida et al., 2015), and the use of critically perceived drugs such as hormones and antibiotics (Bánáti, 2014; Pieper et al., 2016) are increasingly being discussed among the general public. Therefore, control, consistency, and

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[1]Corresponding author: w.heuwieser@fu-berlin.de

transparency of production processes are important to ensuring consumers' trust (McCrea, 2005) and satisfying their needs and expectations (Manghani, 2011). On the other side, dairy farm managers, herdsmen, and workers can benefit from SOP because they provide direction and improve communication and work consistency (Streyl et al., 2011), which lead to predictable results and increase workers' confidence (Stup, 2001; Erskine et al., 2015). Furthermore, the agricultural sector is observing a trend toward larger farms (Moore et al., 2016) with more animals and consequently a higher percentage of nonfamily labor (Bewley et al., 2001; Reynolds et al., 2013; Barkema et al., 2015). In this context, challenges on large dairy farms are caused by communication difficulties, particularly with foreign workers (Stup et al., 2006), and insufficient training of the workforce (Barkema et al., 2015). Those farms could benefit from the implementation of SOP (Cummins et al., 2016), which can help standardize work processes and minimize errors that occur as a result of misinterpretation or miscommunication (Amare, 2012). Thus, fluctuations in product and work quality can be reduced and labor efficiency can be increased.

Currently, little information is available about the utilization of SOP and challenges related to training the workforce on commercial dairy farms. Therefore, the objective of this study was to gain insight into the organization of work processes and to analyze the current use, development, and utilization of SOP and related challenges on German commercial dairy farms.

MATERIALS AND METHODS

A comprehensive questionnaire was developed that consisted of 16 questions and 9 statements focusing on general farm data; the generation, implementation, and handling of SOP; and assessment of challenges in handling work processes on the farm (Supplemental Figure S1; https://doi.org/10.3168/jds.2016-12029). The questionnaire was distributed in different ways using 3 convenience samples. The first sample included farmers who attended different continuing education events during the third and fourth quarters of 2015. Approximately 100 farmers attended each of the 3 continuing education events. For the second sample, the survey form was sent by mail to farms mainly in the eastern, northern, and southern regions of Germany. Farms were contacted via mail in cooperation with 2 German breeding organizations (Rinderallianz GmbH, Woldegk, Germany; Rinderunion Baden-Württemberg e.V., Herbertingen, Germany) and a German agricultural publishing company (DLG AgroFood Medien GmbH, Bonn, Germany). Overall, approximately 8,000 farms were contacted. Participation in the survey was voluntary, and the forms were returned anonymously by mail or collected after the education events. The survey form contained a link and a quick response code that offered participants the option to anonymously fill out an online version of the questionnaire developed with the survey software QuestBack (QuestBack GmbH, 2016). Farmers who answered the questionnaire online composed the third sample.

The questionnaire started with a question referring to the types of employment positions. The participant could choose 1 of 4 answers: owner or manager, herdsman, employee, or trainee. The first 6 questions covered general farm information, such as the number of cows, number of employees, annual milk yield, reproductive performance, and bulk milk SCC. Ten questions addressed the development, implementation, and handling of SOP. The last part consisted of 9 statements that participants had to rate on a 5-point Likert scale ranging from fully agree (1) to fully disagree (5).

After the education events, 1 question (question 15) was added to the test instrument. Therefore, the number of questions on the forms differs. The data were entered into Excel spreadsheets (version 2013, Microsoft Inc., Redmond, WA) and statistically analyzed using SPSS Statistics for Windows (version 22.0, IBM Deutschland GmbH, Ehningen, Germany).

Data were screened for plausibility, resulting in the exclusion of implausible answers from the analysis (n = 1). Normality of distributions of continuous parameters was assessed by plotting and visually examining the data, calculating a quantile–quantile plot, and using the Shapiro–Wilk test. Means and corresponding standard deviations as well as the interquartile range (**IQR**) were computed for continuous and ordinal variables, respectively. The IQR is the difference between the third and first quartiles in a data set and is a measure of how the data spread around the median. Frequencies were calculated for categorical variables. Percentages were rounded to the nearest whole percentage point.

The interrelation between 2 categorical variables was summarized using cross-tabulations, Cramer's V, and Spearman correlation. Binary logistic regression models were calculated to verify the association between various parameters and binary outcome variables. Odds ratios and 95% CI were estimated to determine the association between different management procedures and opinions of the farmers. Further analyses on continuous variables (i.e., annual milk yield, first-service conception rate, SCC) were carried out applying a linear mixed-model ANOVA. All models were built according to the model-building strategies provided by Dohoo et al. (2009). The effect of individual param-