J. Dairy Sci. 98:1–22
http://dx.doi.org/10.3168/jds.2014-8053

A multiarm randomized field trial evaluating strategies for udder health improvement in Swiss dairy herds

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ABSTRACT

The aims of this study were to quantify the effectiveness of specialist advice about udder health in Swiss dairy herds and to compare 3 different udder health improvement strategies against a negative control group. In 2010, 100 Swiss dairy herds with a high (between 200,000 and 300,000 cells/mL) yield-corrected bulk milk somatic cell count (YCBMSCC) were recruited for a 1-yr multiarm randomized field trial. The herds were visited between September and December 2011 to evaluate udder health-management practices and then randomly allocated into 1 of 4 study arms containing 25 herds each. The negative control study arm received neither recommendations for improving udder health nor any active support. The remaining 75 farmers received a herd-specific report with recommendations to improve udder health management. The positive control study arm received no further active support during 2012. The veterinarian study arm received additional support in the form of monthly visits by their herd veterinarian. Finally, the study group study arm received support in the form of bimonthly study group meetings where different topics concerning udder health were discussed. One year later, implementation of recommendations and changes in udder health were assessed. Of the recommendations given, 44.3% were completely implemented, 23.1% partially, and 32.6% were not implemented. No differences in implementation of recommendations were noted between the 3 study arms. At study enrollment, farmers were asked for the study arm of their preference but were subsequently randomly assigned to 1 of the 4 study arms. Farmers that were assigned to the study arm of their preference implemented more recommendations than farmers assigned to a study arm not of their preference. No decrease in the within-herd prevalence of cows that had a high (≥200,000 cells/mL) composite somatic cell count was observed in herds that had a YCBMSCC ≥200,000 cells/mL at the start of intervention. However, the 3 study arms with intervention (positive control, the veterinarian, and the study groups) prevented an increase in the within-herd prevalence of cows that had a high somatic cell count in herds with a low YCBMSCC at the start of the intervention compared with the negative control study arm. In the year after sending the report, herds assigned to the study group study arm had a reduced incidence rate of treated mastitis cases in comparison with the year before sending the report.
Key words: mastitis, herd health management, peer support, intervention

INTRODUCTION

Mastitis is defined as the inflammation of the mammary gland and is the most frequent and costly disease in the dairy industry (Halasa et al., 2007; Hogeveen et al., 2011). Mastitis is a multifactorial disease (Harmon, 1994) for which many risk factors have been identified. These include management practices such as milking hygiene, milking technique, housing, general herd health management, and individual cow factors (e.g., Barkema et al., 1999; Breen et al., 2009; Dufour et al., 2011). Distributions of mastitis-causing pathogens and implementation of preventive management practices differ considerably among dairy herds, and a herd-specific approach is needed to ensure that improvements made are sustainable (Lam et al., 2013).

The greatest improvement in udder health can be expected when as many beneficial management practices as possible are implemented. In a UK intervention study (Green et al., 2007), similar to the one reported

Received February 14, 2014.
Accepted September 30, 2014.
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here, data about mastitis management and herd environment were collected during herd visits. Herd-specific recommendations were subsequently given to farmers to optimize mastitis management. After 1 yr, the proportion of cows affected with clinical mastitis and the number of cows with new SCC elevations were both reduced by 22% (Green et al., 2007). This strategy is now being rolled out in a nationwide mastitis-control program in the United Kingdom. However, herds were only visited to assess the mastitis management in the current study. No further support was given to farmers, even though continued knowledge transfer is assumed to improve farmer compliance with respect to implementing management changes and sustainably improving the herd's overall health status (Main et al., 2012; Lam et al., 2013).

Generally, farmers see their veterinarian as the first source of knowledge for dealing with udder health problems (Jansen et al., 2009; Lam et al., 2011; Pothmann et al., 2014). However, farmers rarely ask their veterinarian for advice if they do not think that they have a mastitis problem (Lam et al., 2011). Farmers should be made aware of potential problems and improvements should be implemented before serious udder and herd health problems arise. Veterinary herd health management is becoming increasingly important, and modern veterinarians need to be knowledgeable advice-oriented consultants who provide evidence-based preventive advice (LeBlanc et al., 2006; Lam et al., 2011). The quality of the advice and the relationship with the farmer plays an important role in the level of farmer compliance with veterinary recommendations (Sorge et al., 2010). A trusting relationship between a proactive veterinarian and a farmer is assumed to be effective for animal health improvement (Derks et al., 2012).

Bringing dairy farmers together and letting them share and discuss their udder health experiences in peer study groups is another udder health-improvement strategy. Farmers may be more willing to accept knowledge from peers than from their private veterinarians (Vaarst et al., 2007; Lam et al., 2011) and this might contribute to their willingness to improve the mastitis management in their herds. Peer study groups have been shown to decrease herd level SCC in national mastitis-control programs in Australia and The Netherlands (Brightling et al., 2009; Lam et al., 2011) and have resulted in reduced antimicrobial usage in organic dairy herds in Denmark (Bennedsgaard et al., 2010). However, randomized study designs were not used in these studies. In the Dutch study, herds participating in study groups had a lower herd-level SCC than herds from nonstudy group participants at the beginning of the study (Lam et al., 2011). The effectiveness of using study groups as an udder health-improvement strategy in dairy herds therefore remains uncertain.

Our study was designed as a multiarm randomized field trial to provide strong evidence for clinical decision making (Lavori and Kelsey, 2002). The aims of our study were to quantify the effectiveness of 3 udder health-improvement strategies by comparing them with a negative control group (**NC**). The 3 udder health-improvement strategies evaluated were (1) personalized advice (as a positive control group; **PC**), (2) personalized advice plus veterinary support (**VET**), and (3) personalized advice plus participation in study groups (**SG**). It was hypothesized that written, herd-specific udder health improvement advice combined with a support strategy (either veterinary support or participation in a study group) would improve the mastitis management in dairy herds, resulting in improved udder health compared with negative control herds that did not receive udder health advice or support.

MATERIALS AND METHODS

Five trained veterinarians [L. Kretzschmar, B. Berchtold, F. Wohlfender, M. Harisberger, and A. Tschopp] visited each of the 100 participating herds during milking time from September to December 2011 and wrote herd-specific advice reports for the 75 herds assigned to 1 of the 3 study arms with an intervention (PC, VET, and SG). The reports included recommendations for improving udder health management. From January to December 2012, herds received the additional support according to their study arm assignment. After 1 yr, 3 veterinarians (L. Kretzschmar, D. Heiniger, A. Tschopp) visited all participating herds to reassess udder health management practices and to evaluate the implementation of the recommended management changes in the herds belonging to the 3 study arms with intervention.

Sample Size

Sample size calculation was based on the study of Green et al. (2007). In that study, the SD of the proportional change in mastitis outcome was 0.25 across all study participants. Together with a power of 80%, a type 1 error of 5%, an effect size of 20% reduction in within-herd prevalence of cows with an elevated composite SCC, and 4 study arms, 19 subjects were needed per study arm according to Power Analysis and Sample Size 12.0 (PASS; NCSS LLC, Kaysville, Utah) software. The final sample size was set to 25 participants in each study arm to compensate for loss to follow up and for multiple comparisons between the 4 study arms.