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Assessment of an application for touchscreen devices to record calving-related events in dairy herds and monitor personnel performance

A. A. Barragan, J. D. Workman, S. Bas, K. L. Proudfoot, and G. M. Schuenemann[1]
Department of Veterinary Preventive Medicine, The Ohio State University, Columbus 43210

ABSTRACT

The objectives of the present study were to assess (1) the effectiveness of a calving training workshop and an application (app) for touchscreen devices to capture calving-related events, and (2) personnel compliance with calving protocols (time from birth to feeding of first colostrum and time that cows spent in labor). Calving personnel (n = 23) from 5 large dairy farms (range: 800–10,000 cows) participated in the study. Participants received training through an on-farm workshop regarding calving management practices and functioning of the app before recording calving-related events. Pre- and posttest evaluations were administered to each participant to measure their knowledge gain and satisfaction with the workshop. Calving personnel recorded calving-related events (n = 323) using the app for 7 d following training. Furthermore, the records collected with the app were used to assess missing and incorrect data and calving personnel compliance with calving management protocols (recording time that cows spent in labor and timing of feeding first colostrum to calves). Calving personnel reported that the information provided during the training was relevant (agree = 14.3% and strongly agree = 85.7%) and of great immediate use (agree = 33.3% and strongly agree = 66.7%). The presented materials and hands-on demonstrations substantially increased the knowledge level of the attendees (by 23.7 percentage points from pre- to posttest scores). The follow-up assessment with participants revealed that the app was easy to use (91.3%) and that they would continue to use it (100%). Frequency of incorrect (r = 0.77) or missing (r = 0.76) data was positively correlated with calving:personnel ratio. Furthermore, calving personnel compliance with calving protocols was significantly different within and between herds. These results substantiated the great variation in compliance with calving management protocols within and between dairy farms. Furthermore, the app may serve as a tool to monitor personnel compliance with first feeding of colostrum to calves and their awareness and recognition of amount of time that each cow spent in labor. This would allow decision-makers to adjust, reassign tasks, or plan the management according to actual calving rate to improve the overall quality of data (frequency of incorrect and missing data) and calf welfare (survival and performance).
Key words: dairy cattle, calving personnel, mobile application, records

INTRODUCTION

In large dairy herds, it is common to observe multiple first-calf heifers or multiparous cows calving at the same time. Although lack of communication at the time of shift change has been associated with stillbirth (Hunter et al., 2013), the effects of calving rate (number of births per unit of time) and number of workers on compliance with calving protocols and standard operating procedures (**SOP**) have not been documented. According to the National Animal Health Monitoring System (NAHMS), only 19.4% of dairy herds kept on-farm computer records, accounting for 56.9% of the total cow inventory in the United States (USDA, 2007). Approximately 60% of dairy operations had protocols on when to intervene during calving (for cows and heifers) and only 38.5% of dairy herds had a system for scoring calving difficulty (USDA, 2010). Furthermore, only 13% of dairy operations that hand-fed colostrum monitored immunoglobulin concentrations before feeding (7.6% for small herds and 45.2% for large herds; USDA, 2010). It is well documented that heifers and cows experiencing dystocic births raise welfare concerns due to the reduced odds of survival for both cows and calves (Lombard et al., 2007; Schuenemann et al., 2011). Lactating cows that have previously given birth to a stillborn calf have an increased risk for uterine diseases (e.g., retention of fetal membranes, metritis; Correa et al., 1993), culling (Bicalho et al., 2007), and decreased reproductive performance (Bicalho et al., 2007). Substantial knowledge exists to prevent calving-related losses, but the knowledge must be translated into on-farm applications to have a meaningful effect at the animal and herd levels. Prevention of calving-

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[1]Corresponding author: schuenemann.5@osu.edu

Table 1. Description of dairy herds according to size, housing, and calving management

Item[1]	Dairy herd				
	A	B	C	D	E
Herd size, no.	10,000	2,100	1,200	1,000	800
Breed	95% H, 5% H×J	H	H	95% H, 5% H×J	H
Housing type	FS + DL	FS	FS	FS + DL	FS
Length of dry-off, d	60	42	60	60	50
Written calving protocols	Yes	Yes	Yes	Yes	Yes
Calving personnel, no.	9	4	3	4	3
Shift length,[2] h	10	12	12	10	8
Calving-related events recorded with app, no.	224	25	14	40	20

[1]A predesigned voluntary survey instrument was provided to herd owners or managers to assess the calving management practices used in their dairy operations. H = Holstein cows, H×J = crossed Holstein and Jersey cows, FS = freestall barn, and DL = dry-lot barn. Herd A had 1 maternity facility and postpartum cows were distributed to 3 contiguous large dairy herds.

[2]All employees worked 6 consecutive days and rested 1 d.

related losses at the herd level requires a constant effort with effective coordination of the animals, feed and water, environment and facilities, as well as personnel.

In dairy herds, protocols and SOPs are essential management tools for guiding decisions and criteria used for diagnosis and treatment of specific health conditions (e.g., metritis, mastitis) as well as to standardize management practices (e.g., milking routine, colostrum administration to calves). For instance, a written protocol provides information on what to do (e.g., treatment for a specific disease) and the SOP within the protocol describes, systematically, how to do it (operational steps and resources needed to perform a given protocol). At calving, dairy personnel are often responsible for assisting cows experiencing dystocic births and feeding colostrum to newborn calves. Under field conditions, personnel must follow the written protocols and keep accurate records. Dairy producers, consultants, and veterinarians often troubleshoot calving-related losses (e.g., stillbirth) within herds; however, the lack of meaningful records makes it difficult to implement corrective measures. Implementing an effective recordkeeping system at the cow and herd level is essential, not only to monitor the overall herd performance over time, but also to make any necessary management adjustments. The objectives of the present study were to assess: (1) the effectiveness of a calving training workshop and an application (**app**) for touchscreen devices to capture calving-related events, and (2) personnel compliance with calving protocols (time from birth to feeding of first colostrum and time that cows spent in labor).

MATERIALS AND METHODS

Animals and Facilities

The study was conducted using 5 large Holstein dairy herds (800–10,000 cows) located in Colorado and Ohio (Table 1). A TMR was offered once (n = 3) or twice per day (n = 2) to pre- and postpartum cows. Pregnant cows and replacement heifers were housed separately in freestall barns (n = 3) or in freestall barns with access to a contiguous dry lot (n = 2). Pregnant animals were grouped approximately 21 d before their expected calving date and moved into prepartum pens. The prepartum pens included freestalls with sand bedding (n = 3) or loose straw pens with access to a dry lot (n = 2). Calving personnel (n = 23) monitored all cows and replacement heifers for signs of imminent birth. Animals showing imminent signs of birth were moved into a contiguous single straw maternity pen (n = 3) or into a separate grouped loose-straw dry lot (n = 2) until birth.

Educational Training

Calving personnel (n = 23) attended a training workshop for best calving management practices (described by Schuenemann et al., 2013). During training, participants also learned how to assess and record BCS, using a 5-point scale (Ferguson et al., 1994), and calf vigor, using a 4-point scale (modified from Murray et al., 2015). In addition to the traditional content, personnel learned how to correctly use the app for touchscreen devices. The training workshop consisted of an oral presentation (~1 h) followed by hands-on demonstrations and supervised practice (~2 h). For the portion of the workshop dedicated to the app, the following areas were covered: (1) app login screen, (2) description and sequence of calving-related events, (3) the color-coded alarm associated with amount of time that cows were in labor, and (4) the information associated with colostrum administration. Immediately following completion of the workshop, calving personnel had the opportunity to record calving-related events using the app for 7 d. During this period, a member of the research team

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