

Metritis severity score misclassification underpredicts consequence cost of disease

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Introduction

The objective of this research was to determine the impact of disease misclassification on the estimated impact of metritis on milk production and time to pregnancy. Differential misclassification introduces bias that usually results in underestimating the true association.

Materials and Methods

A convenience sample of DairyComp305 data representing 1 year of calvings ($n=3,485$) from 1 midwestern Holstein herd was used. This herd was chosen because it had good recorded incidence of both mild and severe metritis cases. The original dataset included metritis recorded as mild or severe, or “not recorded” (NR) where no metritis was observed, and was considered to contain the metritis true severity (TS). First, to evaluate the impact of misclassification bias, we retrospectively randomized 40% of mild metritis to be classified as NR to represent inconsistent disease recording (IR); then, all mild metritis cases were changed to NR to represent poor disease recording (PR). The TS, IR, and PR datasets were analyzed separately in JMP. ANOVA was conducted for second test 305 day mature equivalent (2nd305ME), and a multivariate Cox proportional hazards model was conducted for time to pregnancy, censoring at 300 DIM. Non-significant variables were removed when $P>0.10$, but the variable metritis was forced into all models.

Results

Based upon the TS model, adjusting for effects of lactation group, month fresh, early lactation mastitis, and displaced abomasum, a case of mild metritis was associated with 891 lb (405 kg) less 2nd305ME and a case of severe metritis was associated with 2,433 lb (1,106 kg) less 2nd305ME compared to no metritis. For the IR model, a case of mild metritis was associated with 827 lb (376 kg) less 2nd305ME and a case of severe metritis was associated with 2,310 lb (1,050 kg) less 2nd305ME compared to no metritis. For the PR model, severe metritis was associated with 2,178 lb (990 kg) less 2nd305ME compared to NR. The IR and PR models underestimated 2nd305ME loss for severe metritis cases by 123.2 and 255.2 lb (56 and 116 kg)/cow, resulting in 19,186 and 39,615 lb (8,721 and 18,007 kg) of milk loss unaccounted for at the herd level, respectively, compared to TS. For the TS model, cows that did not have metritis were 1.31 times more likely to get pregnant than cows with severe metritis ($P=0.01$). The risk ratio difference in IR and PR models were 0.03 and 0.08, respectively.

Significance

Overall, misclassification of metritis cases results in greater bias and largely underestimates the true association between metritis and consequence costs of the disease.