

# Duration of recumbency and quality of nursing care of non-ambulatory cows affects the outcome of flotation therapy

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## Introduction

The objective of this study was to evaluate the effect of recumbency duration and nursing care provided to non-ambulatory cows on the outcome of the flotation therapy, and to assess the physiological responses to stress related to the flotation therapy. Recumbent cows that are unable or unwilling to stand and remain in a lying position for  $\geq 12$  h are defined as non-ambulatory cows. Care and management of recumbent cattle is considered a major animal welfare concern, particularly in the dairy sector. Regardless of the primary cause, an extended period of recumbency initiates secondary damage to the muscles and nerve tissue, causing a condition described as secondary recumbency, which greatly hinders cows' ability to recover. Flotation therapy has gained interest as a means to promote recovery in non-ambulatory cows and is based on the concept that by floating the cow in warm water, secondary pressure damage to muscles and nerves will be reduced.

## Materials and Methods

Commercial farms that reported a non-ambulatory cow were visited and 34 eligible Holstein cows were subjected to flotation therapy. Of the 34 animals, 17 recovered and resumed normal standing and lying behavior, whereas 17 cows failed to recover. The duration of recumbency (hours) and nursing care provided before the flotation treatment were assessed based on producer responses to survey questions, and from on-site observations by the researchers. Nursing care was classified as good or poor based on 5 factors: bedding, access to feed and water, housing conditions, relocation, and repositioning of the downer cow. A veterinarian examined all cows before flotation therapy began. Prior to treatment, a heart rate monitor was attached to each cow's chest and set to record each inter-beat interval. The treatment was divided into 5 phases: baseline (before filling), manipulation (placing the cow into the tank), filling (the tank was filled with water), flotation (the cow is confined in

the filled tank), and draining (water was removed from the tank). Heart rate variability measures related to stress during the flotation therapy phases, excluding the manipulation phase, were assessed using paired t-test. Univariate logistic regression was conducted to test the effect of recumbency duration, and Fisher Exact Test was used to assess the effect of the nursing care on the outcome of the flotation therapy.

## Results

The high frequency component of heart rate variability (HF normalized units) decreased during the filling and draining phases ( $2.8 \pm 0.2$  and  $3.1 \pm 0.4$ , respectively) compared to the baseline and floating phase ( $5.1 \pm 0.6$  and  $4.9 \pm 0.3$ , respectively). The reverse pattern was observed for the low frequency (LF) component and the LF-to-HF ratio. These results suggest that the stress related to flotation therapy is greatest during the filling and draining phases of the treatment, when cows likely make increased effort to transition to a standing position (filling phase) and remain standing (draining phase). The flotation therapy was less likely to be successful on cows that had been recumbent for longer periods (OR=0.96; 95% CI: 0.93-0.99, for every 1 h increase in time recumbent before the therapy began). Higher quality of nursing care increased the chance of recovery. Almost 65% of the cows that received good nursing care while recumbent recovered after flotation therapy, while approximately 90% of the cows that were provided with poor nursing care failed to recover after treatment.

## Significance

Non-ambulatory cows subjected to flotation therapy were more likely to recover if the treatment began within 24 h, and recovery was unlikely if treatment began after more than 48 h. Recovery was also more likely if cows received good nursing care while recumbent, including careful relocation to a segregated sick pen with provision of adequate bedding, access to feed and water, and regular repositioning.