Evaluation of case definitions for neonatal calf diarrhea: A scoping review protocol

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Abstract

Background: A high proportion of calves suffer from diarrhea which results in productivity losses in dairy, beef, and veal systems. Extensive research has been conducted on neonatal calf diarrhea; however, various case definitions are used to diagnose the condition. A scoping review of the literature relevant to diagnosis, treatment, and prevention of calf diarrhea would help identify areas for evidence synthesis and move towards a consensus in creating a practical case definition for neonatal calf diarrhea in research settings.

Objectives: This scoping review protocol will describe the steps taken to address the question, “What case definitions are used in evaluation of neonatal calf diarrhea?”

Eligibility Criteria: The review will include primary research studies published in English since Jan 1, 1978. This will include randomized controlled trials, observational studies but exclude case studies/series and other systematic or narrative reviews. Diarrhea is broadly defined for this scoping review and may not be the primary outcome measured within the study. For example, studies might evaluate other calfhood diseases or relevant production metrics like weight gain or feed intake as the primary outcome. “Neonatal” will refer to unweaned calves that are less 2 months old or less than 8 weeks after arrival to a calf-rearing facility. Studies must be available in full-text (> 500 words) and in English. The initial search will include relevant terms in the title and abstract. Some studies reporting calf diarrhea may be missed by only screening the title/abstract, however, in these cases, diagnostic criteria would not likely be reported in detail and therefore such articles would contribute minimally to answering the research question.

Sources of evidence: Searches will be conducted in Medline, CAB Direct, and Agricola. A grey literature search will be not be conducted as articles will not likely conference proceedings will not be considered as they will not likely contain adequate information on diagnostic criteria.

Charting methods: Data will be collected including: Journal and date of publishing, broad study type (observational (cohort, case-control) vs RCT), broad objectives (e.g. risk factor identification, treatment evaluation), population description (veal, dairy, beef), all diagnostic
criteria used for diarrhea case definitions (clinical signs, hematological parameters, pathogen ID), personnel in charge of diagnostics (veterinarian, researcher, farmer), and if different levels of diarrhea severity are evaluated.

The target journal for publication of the manuscript is Preventive Veterinary Medicine

Introduction

Diarrhea is an important neonatal calf disease (NCD), with studies reporting 5-36% of calves affected across various production systems (Waltner-Toews et al., 1986; Windeyer et al., 2014; Murray et al., 2015; Pardon et al., 2015). The diagnostic criteria used in observational and randomized controlled trials to determine a diarrhea case is diverse, including various point systems (Larson et al., 1977; McGuirk, 2008; Kim et al., 2021) that account for fecal consistency along with other clinical parameters. The lack of consistency in NCD case definition and reporting makes comparison between studies difficult. Scoping reviews are valuable for evaluating the way research is being conducted (Peters et al., 2015). Thus, a scoping review would be a valuable to describe the diagnostic criteria being used for NCD and identify possible areas for evidence synthesis to determine an optimal case definition or develop a reporting guideline. Therefore, this protocol aims to describe the methods for conducting a scoping review to address the question: “What case definitions are used in evaluation of neonatal calf diarrhea?” We will follow the methodologic framework outlined by Arksey and O’Malley (1995).

Methods

Protocol development

This protocol will include the recommendations from the Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) (Tricco et al., 2018). Before the literature search begins, the protocol will be published on the University of Guelph Atrium.

Eligibility criteria

Studies will be eligible for inclusion if they meet the following criteria:

1. Available in English
2. Available in full-text of at least 500 words to increase the likelihood that diagnostic criteria are reported
3. Published after Jan 1, 1978. This is because reporting guidelines for calf diseases were published by Larson et al. in 1977, before which specific calf diarrhea case definitions were infrequently reported.
4. A primary research study including descriptive and analytic (experimental or observational) studies. Narrative, systematic or other scoping reviews will be excluded.
5. Investigating NCD in vivo (not in vitro or in situ studies will be considered).
6. Neonatal will include pre-weaned calves less than 8 weeks old, or less than 8 weeks after arrival to a calf-rearing facility.

**Information sources**

Databases and grey literature will be searched for eligible sources starting from Jan 1, 1978. Medline (via Ovid), Agricola (via ProQuest), and CAB Direct (via CABI) will be the primary resources while google and google scholar will be used to search for grey literature. Articles identified by the search string will be uploaded into Mendeley and de-duplicated. The resulting citations will be imported into DistillerSR for eligibility screening.

**Search Terms**

The following search string will be entered into the databases. All searches will be limited to articles published after 1977 (as of Jan 1, 1978). All searches will be limited to the title/abstract. The search string will be evaluated for sensitivity by pre-selecting 20 relevant articles (see Appendix I) that must be identified. Ten of the pre-selected articles will be selected by the first author and the remaining 10 will be supplied by colleagues with expertise in NCD.

**March 1 Search**

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**Mar 10 Search**

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</table>
**Evidence Selection**

DistillerSR will be used by the research team to select relevant articles. Two reviewers working independently will screen articles based initially on their title and abstract and secondarily based on the full text. During initial screening, the reviewer agreement will be assessed based on the outcome of the selection form, whereas during full text screening agreement will be at the question level. Any disagreements will be resolved by consensus or through a third reviewer if it is not possible to reach consensus.

Given the broad scope of this review question and anticipated number of citations, DistillerSR’s AI ranking program will assist with study selection. After 1000 references are screened by two reviewers and eligibility is established, the remaining articles will be ranked by likelihood of eligibility. Re-ranking will be undertaken after every subsequent 1000 citations are screened. Once 500 citations are consecutively screened and are found to be ineligible, screening will be considered complete.

The following questions will be used for screening the title and abstracts of identified articles. These questions will be pre-tested with the research team using 100 randomly-selected articles from the initial list and revised if needed.

1. Is the title/abstract available in English?
2. Does the title or abstract describe an investigation of neonatal (<8 weeks or at a calf rearing facility <8 weeks) calf diarrhea?
   a. Yes (neutral)
   b. No (exclude)
   c. Unclear (neutral)
3. Does the title or abstract indicate this is a primary research study?
a. Yes (neutral)
b. No (exclude)
c. Unclear (neutral)
d. Yes (neutral)
e. No (exclude)
f. Unclear (acquire text and move on to secondary screening)

The following questions will be used for screening the full texts of identified articles. These questions will be pre-tested with 10, randomly-selected articles from the list of articles that passed initial screening and revised for clarity.

1. Is the article published in English?
   a. Yes (neutral)
   b. No (exclude)

2. Is the full text article available and does it contain at least 500 words?
   a. Yes (neutral)
   b. No (exclude)
   c. Unclear (neutral)

3. Does the article describe a primary research study?
   a. Yes (neutral)
   b. No (exclude)
   c. Unclear (neutral)

4. Does the article describe a study on diarrhea in neonatal (<8 weeks old or <8 weeks after arrival to a calf-rearing facility) calves (bovine)?
   a. Yes (include article in data extraction)
   b. No (exclude)

The number of articles excluded at each stage (initial search, after de-duplication, after primary and secondary screening) will be recorded. The reasons for excluding articles at the full-text screening stage will also be noted. This information will be reported in a flow diagram as per the PRISMA-ScR recommendations (Tricco et al., 2018).

Data extraction

Extracting data from the studies will be conducted by two reviewers working independently in DistillerSR. The data extraction form will be pre-tested using 5 studies and modified if needed. Conflicts in data extraction will be resolved by consensus or a third reviewer if needed. If multiple studies are described in one article, the data will be charted at the study level only if different methods are used, otherwise it will be charted at the article level. Only published data will be extracted, without contacting the researchers to gain additional information.
The initial information extracted is summarized in the following bullets. As the purpose of this review is to describe current research methods, as the review proceeds additional options could be added.

Study
- Location of study
- Year of publication
- Broad design (Observational (case-control, cohort, cross-sectional), RCT)
- Number of calves evaluated

Population
- Calf breed: dairy (Holstein, jersey, other) vs beef (Angus, Charolais, Simmental, etc.)
- Study location: dairy, veal, dairy beef, or research facility
- Calf age range

Primary study aims including broad categories
- Prevalence evaluation for disease or pathogens
- Description of risk factors
- Intervention evaluation
- Diagnostic test validation

Diagnostics
- Diarrhea case definition
- Source cited for diarrhea case definition
- Who performed diagnosis: farmer, researcher, veterinarian
- Methods to determine validity of diagnosis

Critical appraisal of articles
This step will not be conducted as the research question relates to identifying and describing methodology rather than evaluating the merit of the results.

Synthesis of results
The data will be summarized using descriptive statistics and presented using charts, figures, and text. Areas for synthesis of research will be evaluated and ideas for achieving consensus related to diagnostic criteria and reporting will be explored.

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References


