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The Use of Telepathology in Veterinary Medicine: A Scoping Review Protocol

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Abstract

Background: Telepathology, as a subset of teleconsulting, is pathological interpretation performed at a distance. Diagnostics can be difficult to access by rural veterinary practices yet are vital to the health of production animal herds often serviced by these practices. The technology and availability of telepathology services has not been assessed to identify gaps in the literature and means of improving diagnostics services to rural veterinary clinics.

Objectives: The objective of this scoping review is to provide an overview of how telepathology is being used in veterinary medicine.

Eligibility criteria: Peer reviewed journal articles and grey literature in the English language and published after 2000 will be included in the study. It must be relevant to performing pathological interpretation at a distance in veterinary medicine. Literature about radiology, bacteriology, and relevant to human medicine will be excluded.

Sources of evidence: Searches will be conducted in CAB Abstracts and MEDLINE. Websites from national veterinary medical associations, veterinary pathologist membership organizations, and international animal health organizations will be searched for grey literature.

Charting methods: Data charting will include study characteristics, sector of pathology, technology used for communication, technology used for pathological interpretation, and a summary of the literature objectives and conclusions.

1. Introduction

1.1 Rationale

Teleconsulting is not a new phenomenon and is increasingly used as technology improves and veterinary clinics look for alternative means of consultation during COVID-19 (Bhadesiya, Patel, Anikar, & Gajjar, 2021). Telepathology is a subset of teleconsulting, defined as performing pathological interpretation at a distance (Chalhoub, 2020; Weinstein & Descour, 2001). This typically includes digital histopathology, digital cytology and hematology and necropsy interpretation through still images (Agnew et al., 2015; Farahani & Pantanowitz, 2015). In Alberta, Canada, many rural veterinary practices are geographically distant to the lab and veterinary specialists making teleconsulting of particular importance. These rural clinics serve many production animal farms where understanding cause of disease and death are paramount to the overall health of the herd (Agnew et al., 2015). Poor access to diagnostics can result in delayed treatment of the herd and increased risk of disease outbreak. Understanding the current technology available for telepathology will allow for identification of gaps in the research literature but also gaps in telepathology services. Understanding these gaps will hopefully lead to improved services and accessibility to diagnostics for the veterinary community.

1.2 Objectives

The objective of this scoping review is to provide an overview of how telepathology is being used in veterinary medicine.

2. Methods

2.1 Protocols and registration

This protocol was prepared using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis for Scoping Reviews (PRISMA-ScR) reporting guidelines (Tricco et al., 2018)

and will be published on the University of Calgary PRISM repository (https://prism.ucalgary.ca/). The protocol will also be available at SYREAF (www.syreaf.org).

2.2 Eligibility criteria

To be eligible for inclusion, articles and grey literature must be:

1. Available in English in full text, but can be any type of research article or relevant grey literature including blogs, websites, and information pamphlets.
2. Published after the year 2000.
3. Investigating veterinary telepathology, defined by "performing veterinary pathological interpretation at a distance", which includes digital or virtual gross pathology, histopathology, cytology, and hematology. This can be by digital still images, virtual microscopy, or video consulting.

2.3 Information sources

The following databases will be searched for relevant studies: CAB Abstracts and MEDLINE. The articles will be loaded onto Covidence for de-duplication and screening.

The following websites will be searched for relevant grey literature: national veterinary medical associations (such as the Canadian Veterinary Medical Association, CVMA), veterinary pathologist membership websites (such as the American College of Veterinary Pathologists, ACVP), and international animal health organizations (such as the World Organization for Animal Health, OIE).

2.4 Search

The search strategies were drafted by a librarian (Heather Ganshorn) with input from content experts (Drs. Jennifer Davies, Lindsay Rogers, Dayna Goldsmith, Angelica Galezowski, and

Carolyn Legge). The MEDLINE search strategy is found in Table 1. This strategy will be translated to CAB Abstracts.

Table 1 Scoping review search protocol for MEDLINE database

#	Searches	Results	Type
1	exp Remote Consultation/	5444	Advanced
2	exp Telemedicine/	37532	Advanced
3	("remote consult*" or "virtual consult*" or telemedicine).kf,tw.	18982	Advanced
4	1 or 2 or 3	44797	Advanced
5	exp Microscopy/	564882	Advanced
6	exp Image Processing, Computer-Assisted/	247450	Advanced
7	(patholog* or microscop* or cytolog* or cytopatholog* or "digital h?ematolog*" or imaging or scanning or (imag* adj2 analy*) or necrops*).kf,tw.	2628091	Advanced
8	5 or 6 or 7	3006517	Advanced
9	4 and 8	3636	Advanced
10	exp Telepathology/	894	Advanced
11	(telepatholog* or telecyto* or "remote patholog*" or "remote cyto*").kf,tw.	873	Advanced
12	10 or 11	1254	Advanced
13	9 or 12	4103	Advanced
14	exp Veterinary Medicine/	25612	Advanced
15	exp Livestock/	4459	Advanced
16	exp Cattle Diseases/ or exp Cattle/	360155	Advanced
17	exp Horses/ or exp Horse Diseases/	72548	Advanced
18	exp Sheep Diseases/ or exp Sheep/	124318	Advanced
19	exp Swine/ or exp Swine Diseases/	231100	Advanced
20	exp Poultry Diseases/ or exp Poultry/	159294	Advanced
21	exp Dogs/ or exp Cats/	448368	Advanced
22	(veterinary or livestock or cattle or horse* or sheep or swine or pig or pigs or poultry or chicken* or turkey* or dog? or cat? or canine* or feline*).kf,tw.	1097815	Advanced
23	14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22	1720449	Advanced
24	13 and 23	39	Advanced

2.5 Selection of sources of evidence

Relevant studies and grey literature will be selected by a team of two reviewers using Covidence to manage the literature. Articles will be independently reviewed by each reviewer. Any conflict

will be discussed by the reviewers after all articles have been reviewed. If no consensus can be reached, a discussion with the whole team will be initiated for consensus. The review process will be tested with the first 10% of articles and amended, if needed, for consistency. The same process will be applied to both published articles and grey literature, except where there is no abstract available. In that case, the criteria for the abstract will be applied to the whole article. There will be three stages to study selection.

1. Title review: this step will be intentionally left broad in order to capture as much relevant literature as possible. Titles containing key words indicating the article is explicitly about topics other than veterinary telepathology will be excluded. The key word indicator in Covidence will be used to assist selection. Key words for article exclusion are:
    a. Bacteriology
    b. Human medicine
    c. Radiology or teleradiology
2. Abstract review: the abstract will be reviewed and literature selected according to the following questions.
    a. Is the literature relevant to veterinary medicine?
        i. Yes or maybe: continue to question b.
        ii. No: exclude
    b. Is the literature about radiology, bacteriology, or in the context of human medicine?
        i. Yes: exclude
        ii. No or maybe: continue to question c.

c. Is telepathology, the performance of pathological interpretation at a distance, performed in the literature?
    i. Yes or maybe: include
    ii. No: exclude

3. Full text review: full text review of literature will be completed simultaneously with data extraction. Any articles found to not meet inclusion criteria applied to the abstract in step 2. will be excluded after discussion between the two independent reviewers.

2.6 Data charting process

Data charting will be done in Excel by the same two independent reviewers. The data charting process will be tested with the first 10% of articles to ensure clarity and consistency. Revisions will be made as necessary after the testing. Any conflicts will be resolved between the two reviewers. If consensus cannot be reached, the conflict will be brought to the other team members for review. A single reviewer will compile the charted data for synthesis.

2.7 Data items

The following data items are proposed for extraction from the literature. These may change as the study progresses to include additional or revised responses.

- Country of study or publication
- Type of literature (e.g., blog post, research article, pamphlet)
- Study design (if peer-reviewed research article)
- Purpose of study or publication
- Division of pathology
    - Gross pathology
    - Histopathology

    - Clinical pathology
    - Hematology
- Form of communication used
    - Telephone
    - Email
    - Video conferencing
    - Still images
    - Digital microscopy slides
- Technology used for interpretation
    - Digital or virtual still images
    - Digital or virtual microscopy slides
    - Real-time video
    - Post-procedural video
    - Written or oral description
- Summary of overall conclusions

2.8 Critical appraisal

A critical appraisal of the literature will not be performed as this is a scoping review.

2.9 Synthesis of results

Descriptive statistics will be used to summarize the findings, presented via a combination of tables, graphs, figures, and descriptive text. Gaps in the literature and potential novel means of telepathology will be identified and discussed.

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