



Comparison of Text versus Video as Thoracic Ultrasound Learning Strategies in a Veterinary Student Population

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Introduction

- In the medical field, point-of-care ultrasound education is rapidly expanding with exploration into the most effective methods for incorporating ultrasound into undergraduate medical education.¹⁻³
- Web-based learning is promptly becoming an integrated part of the teaching methods used in veterinary schools and continuing veterinary medical education with the common formats including video and written manuals.
- One prior study in veterinary medicine describes the value of using a simulator model in teaching ultrasound guided pericardiocentesis⁴ but there are no known studies in veterinary medicine to date that report on the impact of different teaching methods for thoracic veterinary point of care ultrasound (VPOCUS).

The objective of this study was to compare two different ultrasound teaching methods designed to help veterinary students with minimal prior training learn the basics of thoracic VPOCUS.

We hypothesize there will be a difference between text and video format teaching methods which will correlate with student performance and confidence in performing thoracic VPOCUS.

Materials and Methods

- A total of 40 University of Calgary Veterinary Medicine (UCVM) students from years 1-3 were recruited and randomized into one of two groups: video or written lab manual. The total UCVM year 1-3 student body is 90 students, indicating a 44% student participation rate.
- After completing an initial survey reporting their confidence, students performed an abbreviated pleura and lung ultrasound (PLUS) scan⁵ on a canine cadaver before viewing the learning resource material. Students then rotated through a series of 4 ultrasound stations before completing a final survey (See Figures 1 and 2). Each Station was graded using an Objective Structured Clinical Examination (OSCE) marking rubric by 4 different OSCE examiners (the same examiner remained at their respective station for all students).
- Calculated data: Stations 1, 2 and 5 included all graded data (anatomy, technique at all 4 sites, pathological diagnosis); Stations 3 and 4 included graded data limited to pathological diagnosis; confidence scores (Likert-like scale) on initial and final surveys.
 - Total Completion Score: Percentage of attempted points (correct or incorrect) out of maximum possible score
 - Total Attempt Score: Percentage of correct points out of total attempted points.
- Statistical analysis: Column statistics, Wilcoxon signed rank test, linear regression, linear regression with repeated measures.
- Statistical significance assumed when $p < 0.05$.

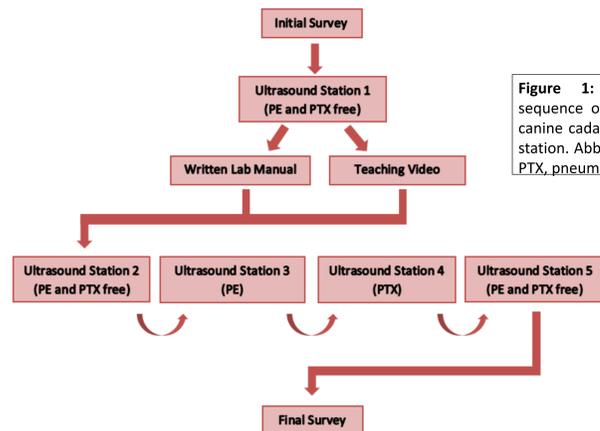


Figure 1: Flowchart describing the sequence of the study and status of the canine cadaver present at each ultrasound station. Abbreviations: PE, pleural effusion; PTX, pneumothorax.

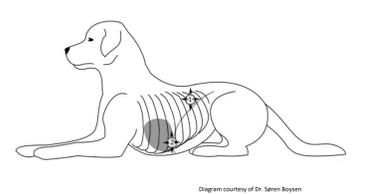
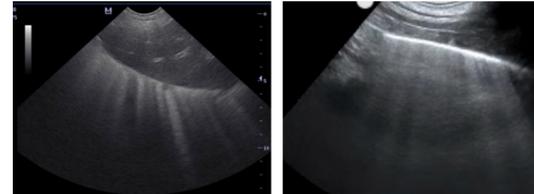
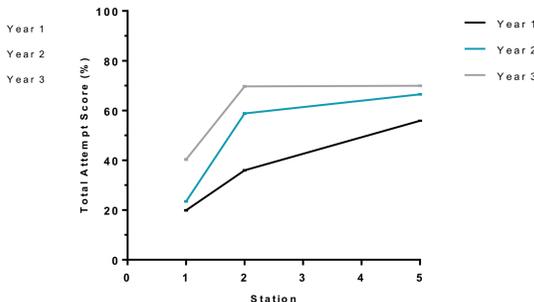
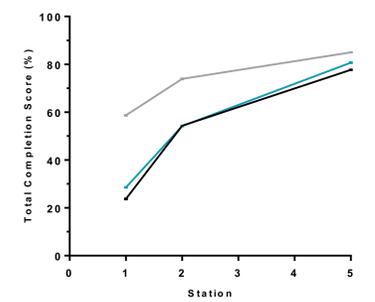


Figure 2: Illustration of the bilateral PLUS ultrasound sites used in this study. 1: Caudodorsal Lung site; 2: pericardio-diaphragmatic site⁵



Figures 3 and 4: Thoracic ultrasound screen capture images from video and text study learning resource materials illustrating numerous B-lines suggestive of interstitial-alveolar disease.



Figures 4 and 5: Total Completion and Total Attempt Scores of Year 1 (n=12), Year 2 (n=16) and Year 3 (n=12) students at Stations 1, 2 and 5. Mean +/- SD.

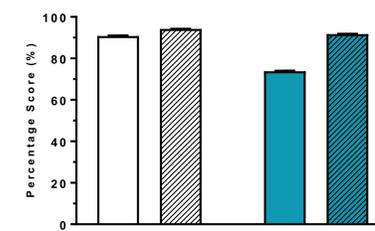


Figure 6: Station 3 percentage score (total correct over total attempted) of the identification of the presence or absence and quantification of B-lines in the written manual (n=20) and video (n=20) groups. Mean +/- SD.

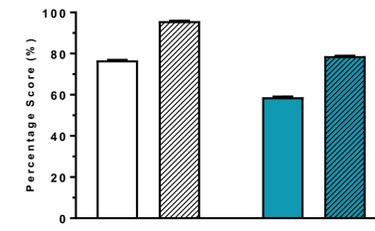


Figure 7: Station 4 percentage score (total correct over total attempted) of the identification of the presence or absence and quantification of B-lines in the written manual (n=20) and video (n=20) groups. Mean +/- SD.

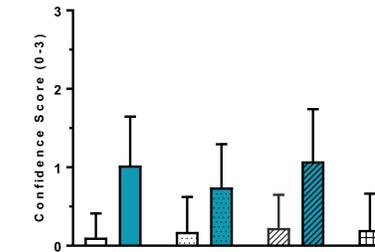


Figure 8: Student confidence score on completing a PLUS examination and diagnosing pleural effusion (PE), pneumothorax (PTX) and interstitial-alveolar disease (IAD) on the initial and final surveys (n=39). Mean +/- SD. Responses were captured using a Likert-like scale (0-3) to capture confidence (0 = not confident; 1 = somewhat confident; 2 = confident; 3 = very confident).

Results

Significant differences in Total Completion and Total Attempt Scores within and across Stations 1, 2 and 5 (Figures 4 and 5).

- Year 3 students scored significantly higher than Year 1 students at Stations 1, 2 and 5.
- Significantly greater scores for all students between Stations 1-2 and Stations 2-5.

Significant differences in identification of the presence or absence and quantification of B-lines in Stations 3 and 4 between the written manual and video groups (Figures 6 and 7).

- Significantly greater score in quantification of B-lines in video group at Station 3.
- Significantly greater score in identification of the presence or absence of B-lines in video group at Station 4 with a trend toward significance in the quantification of B-lines.

Significantly higher reported confidence on the final survey compared to the initial survey in all areas (Figure 8).

- Performing a PLUS examination.
- Diagnosing pleural effusion, pneumothorax and interstitial-alveolar disease.

Discussion

- Both the learning resource material and the experience of performing an ultrasound examination multiple times contributed to a greater rate of completion (total completion score) and accuracy (total attempt score) as the students progressed through Stations 1, 2 and 5.
- No differences between teaching formats in overall completion and total score is supported by similar findings in a study looking at text vs. video for teaching laparoscopic knot-tying in medical students.⁶
- Differences between the identification and quantification of B-lines at Stations 3 and 4 may be attributable to the presence of coalescing B-lines at each of these stations, though the severity of interstitial-alveolar disease within each cadaver was not recorded and is a limitation of this study.
- The dynamic examples of coalescing B-lines moving to-and-fro with respiration within the video may have contributed to a higher rates of success in their identification and quantification as opposed to still images.
- A previous study analyzing video- vs text-based teaching of the Dix-Hallpike test to medical students for diagnosing vertigo found no differences in theoretical knowledge between the two formats⁷, however diagnostic imaging knowledge and interpretation may prove different.
- Significantly increased student reported confidence levels across all areas could be the result of the learning resource material and/or experience of performing multiple ultrasound examinations, though a limitation of the study is the inability to differentiate between these two factors.
- Another limitation of the study includes insufficient time provided for reviewing the teaching material leading to unknown completion rates of the video and the manual, which was not recorded.

References

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