

Module title:	Diagnostic imaging of small animals	ECTS	3
Polish translation:	Diagnostyka obrazowa małych zwierząt		
Course:	Veterinary Medicine		

Module language: English		Stage: JM-FVM	
Form of studies: ☒ intramural ☐ extramural	Type of module: ☐ basic ☒ directional	☒ mandatory ☐ elective	Semester: 7 ☐ winter semester ☒ summer semester
Academic year: 2022/2023		Catalogue number:	FVM-V-JMSS-07W-D29_20

Module coordinator:	Małgorzata Domino DVM, PhD, DSc
Teachers responsible for the module:	Academic teachers of the Institute of Veterinary Medicine; Department of Large Animal Disease and Clinic; Visiting professors; PhD students in accordance to the internal legal acts; other specialists in the field of study
Unit responsible for the module:	Institute of Veterinary Medicine, Department of Large Animal Diseases and Clinic
Faculty in charge:	Faculty of Veterinary Medicine

Objectives of the module:	The course aims to familiarize students with common techniques for imaging physiological and pathological changes occurring in small animals. Radiology offers veterinarians several tools that significantly extend diagnostic options. The course aims to prepare students for the proper selection of common imaging techniques and the possibility of clinical applications through active participation in imaging examinations performed using technical solutions commonly used in clinical diagnostics. The content of lecture education provides the theoretical basis for the content of training exercises, the main purpose of which is practical preparation, conduction, and results evaluation of common imaging techniques. <u>Lectures (15x1 hour):</u> 1. Basics of radiological examination of small animals. Construction of X-ray tube. Radiation protection. Safety in radiology lab. X-ray image formation and interpretation. 2. Basics of computed tomography (CT) and magnetic resonance (MR) imaging. Construction of CT scanner and MRI scanner. Radiation protection. Safety in CT and MRI lab. CT and MRI image formation and interpretation. 3. Diagnostic imaging of head - skull, oral cavity, dental diseases. 4. Diagnostic imaging of head and neck- nasal cavities, sinuses, larynx, trachea. 5. Diagnostic imaging of spine. Myelography - contrast imaging. 6. Diagnostic imaging of thorax - Bronchi and lung radiodiagnosis. 7. Diagnostic imaging of thorax - Diaphragm, mediastinum, and pleural cavity radiodiagnosis. 8. Diagnostic imaging of thorax - Heart and blood vessels radiodiagnosis. 9. Diagnostic imaging of abdomen - Gastrointestinal tract radiodiagnosis. Contrast gastrointestinal tract examination. 10. Diagnostic imaging of abdomen - Glands radiodiagnosis. 11. Diagnostic imaging of abdomen - Urinary tract radiodiagnosis. Urography - contrast imaging. 12. Diagnostic imaging of abdomen - Reproductive tract radiodiagnosis. 13. Diagnostic imaging of limbs - Bone structure and trauma. 14. Diagnostic imaging of limbs - Bone diseases radiodiagnosis. 15. Diagnostic imaging of limbs - Joint diseases radiodiagnosis. <u>Clinical exercises (15x3 hours):</u> 1. X-ray - practice with x-ray tube and imaging of head 2. X-ray - practice with x-ray tube and imaging of spine 3. X-ray - practice with x-ray tube and imaging of limbs 4. X-ray - practice with x-ray tube and imaging of chest 5. X-ray - practice with x-ray tube and imaging of abdomen 6. Principles of CT imaging, clinical applications part 1 7. Principles of CT imaging, clinical applications part 2 8. Principles of MR imaging, clinical applications part 1 9. Principles of MR imaging, clinical applications part 2 10. Principles of MR imaging, clinical applications part 3 11. US - practice with scanner and probes and imaging of gastrointestinal tract 12. US - practice with scanner and probes and imaging of urinary tract and glands 13. US - practice with scanner and probes and imaging of reproductive tract and soft tissues 14. US - practice with scanner and probes and imaging of cardiovascular and respiratory systems 15. Rotation with the practical skills evaluation - practical test
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Teaching forms, number of hours:	a) Lectures: 15 hours b) Clinical exercises: 45 hours		
Teaching methods:	Lectures: original multimedia presentations prepared by academic teachers; Clinical exercises: preparation and conduct of diagnostic imaging protocols; clinical case presentations; analysis of examinations results; supplementary materials, discussion		
Formal prerequisites and initial requirements:	Passing the courses: Animal Anatomy, Animal Physiology, Biophysics, Biochemistry, Veterinary pharmacology, and Pathomorphology.		
Learning outcomes:	Knowledge: 01 - the student knows the physical interactions used in common imaging methods; 02 - the student knows the principles of preparing the patient for imaging under sedation and general anesthesia ; 03 - the student knows the safety rules and procedures during the ultrasound examination; 04 - the student knows the safety rules and procedures during the X-ray and CT examinations including the rules of radiation protection and the use of contrast media; 05 - the student knows the safety rules and procedures during the MRI examination including the rules for the use of contrast media ;	Skills: 01 - the student can conduct an interview and a clinical trial aimed at selecting or excluding the use of common imaging techniques; 02 - the student can choose a common imaging technique for the clinical situation; 03 - the student can prepare the patient for ultrasound, X-ray, CT, and MRI examinations ; 04 - the student can conduct ultrasound, X-ray, CT, and MRI examinations; 05 - the student can assess the results of the ultrasound, X-ray, CT, and MRI examinations ; 06 - the student can use scientific sources in assessing the results of an imaging study.	Competences: 01 - the student is ready to choose a modern common technique based on specialist knowledge; 02 - the student is aware of their knowledge and the benefits of using common imaging techniques; 03 - the student is aware of the need for continuing education and is ready to deepen his/her knowledge using scientific sources ; 04 - the student acquires competence in cooperation with a radiologist in the selection and evaluation of the results of imaging examinations.
Assessment methods:	Effects - knowledge: 01, 02, 03 and skills: 01, 02, 03, 04, 05, 06 - written test in class; Learning outcomes - knowledge: 04, 05; skills: 01, 02, 03, 04, 05, 06; and competences: 01, 02, 03, 04 - written exam. Written tests (two in a semester) and written exam in the form of a mixed test, a total of 20 to 40 questions (open, to be completed and single/multiple choice). The exam covers all content of the semester. Students have to obtain a minimum of 51% points to pass the test and exam. The dates of the 1st and 2nd written test and the exam take place in the same form. Apart from the indicated methods of verification of learning outcomes, no additional are envisaged. In a top-down situation, suspending the implementation of classes at the university and the need for distance learning, other methods of verifying the learning outcomes implemented are appropriate to the situation.		
Formal documentation of learning outcomes:	Written test, written exam. Entry into the eHMS system and documentation contained in the 'Course File' (individual student assessment cards, attendance lists, the pool of questions for written and oral forms, students' essays)		
Elements impelling final grade:	To verify the learning outcomes: 1. attendance at lectures, 2. evaluation from the first test, 3. evaluation from the second test, 4. evaluation from the practical test, 5. final exam grade; For each of the elements (2-4), the result is pass (1) or fail (0). To take the final exam, each element (2-4) has to be passed. The final exam is a 30-question, multiple-choice writing test. Each answer is scored on a 0-1 scale. Maximum points: 30 points. A number of points is obtained for which a grade is given according to the given criteria - points / grade: 0–15 points – 2; 16–18 points – 3; 19–21 points – 3.5; 22–24 points – 4; 25–27 points – 4.5; 28–30 points – 5. A student who has not obtained the specified minimum an acceptable number of points from the evaluation of test does not obtain credit for the course.		
Teaching base:	Classrooms, lecture rooms, ambulatory rooms, X-ray room, CT room, MRI room.		
Obligatory and supportive materials ²³ ; Obligatory 1. Thrall D., Robertson I. (2023) Atlas of Normal Radiographic Anatomy and Anatomic Variants in the Dog and Cat, Elsevier 2. Coulson A., Lewis N. (2008) An Atlas of Interpretative Radiographic Anatomy of the Dog and Cat, Wiley-Blackwell 3. Wisner E., Zwingerberger A. (2015) Atlas of Small Animal CT and MRI, Wiley-Blackwell 4. Lisciandro G.R. (2008) Point-of-Care Ultrasound Techniques for the Small Animal Practitioner, 2nd Edition, Wiley-			

Blackwell Supportive 1. Mannion P. (2008) Diagnostic Ultrasound in Small Animal Practice, Wiley-Blackwell 2. Penninck D., D'Anjou M.A. (2015) Atlas of Small Animal Ultrasonography, 2nd Edition, Wiley-Blackwell 3. Elliott I., Skerritt G. (2013) Handbook of Small Animal MRI, Wiley-Blackwell 4. Wolvekamp P. (2005) Atlas of Radiology of the Traumatized Dog and Cat, Schlütersche 5. Thrall E. (2020) Textbook of Veterinary Diagnostic Radiology, Saunders 6. DuPont G.A., DeBowes L.J. (2008) Atlas of Dental Radiography in Dogs and Cats, Saunders Indicated by the teacher of scientific publications in the field of discussed content of education and scientific research conducted in the unit ANNOTATIONS -
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Quantitative summary of the module:

Estimated number of work hours per student (contact and self-study) essential to achieve presumed learning outcomes of the module - base for quantifying ECTS:	90 h
Total ECTS points, accumulated by students during contact learning:	3 ECTS

Learning outcomes of the module relative to the learning outcomes of the subject:

Outcome category	Learning outcomes:	Learning outcomes relative to the course outcomes	Impact on the each for course outcomes
Knowledge	01 - the student knows the physical interactions used in common imaging methods;	B.W.4, B.W.6	for each 3
Knowledge	02 - the student knows the principles of preparing the patient for imaging under sedation and general anesthesia;	B.W.4, B.W.5	for each 3
Knowledge	03 - the student knows the safety rules and procedures during the ultrasound examination;	B.W.4, B.W.6	for each 3
Knowledge	04 - the student knows the safety rules and procedures during the X-ray and CT examinations including the rules of radiation protection and the use of contrast media;	B.W.4, B.W.6	for each 3
Knowledge	05 - the student knows the safety rules and procedures during the MRI examination including the rules for the use of contrast media;	B.W.4, B.W.6	for each 3
Skills	01 - the student can conduct an interview and a clinical trial aimed at selecting or excluding the use of common imaging techniques;	B.U.1, B.U.2, B.U.3	for each 3
Skills	02 - the student can choose a common imaging technique for the clinical situation;	A.U.1, B.U.7	for each 3
Skills	03 - the student can prepare the patient for ultrasound, X-ray, CT, and MRI examinations;	A.U.1, B.U.1, B.U.7, B.U.11	for each 3
Skills	04 - the student can conduct ultrasound, X-ray, CT, and MRI examinations;	A.U.1, B.U.1, B.U.7	for each 3
Skills	05 - the student can assess the results of the ultrasound, X-ray, CT, and MRI examinations;	A.U.1, B.U.7	for each 3
Skills	06 - the student can use scientific sources in assessing the results of an imaging study;	A.U.1, B.U.7	for each 3
Competences	01 - the student is ready to choose a modern common technique based on specialist knowledge;	KS.1, KS.2, KS.5	for each 3
Competences	02 - the student is aware of their knowledge and the benefits of using common imaging techniques;	KS.1, KS.2, KS.4, KS.5	for each 3
Competences	03 - the student is aware of the need for continuing education and is ready to deepen his/her knowledge using scientific sources;	KS.4, KS.8	for each 3
Competences	04 - the student acquires competence in cooperation with a radiologist in the selection and evaluation of the results of imaging examinations;	KS.3, KS.5, KS.6, KS.7, KS.9	for each 3