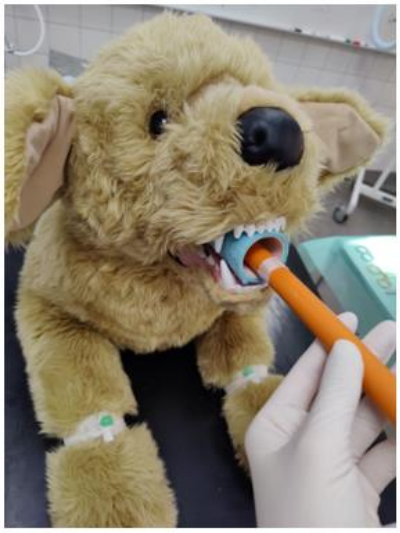
UNIVERSITY OF COPENHAGEN
FACULTY OF VETERINARY CLINICAL SCIENCE

Development and content validation of a Canine Gastric Dilatation and Volvulus simulator for practical training of Veterinary Students



Master's Thesis in Veterinary Medicine

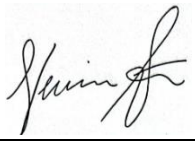
Laura Buchwald (kdr435) & Veronika Stark (wxr852)

Supervisor: Rikke Langebæk

Co-supervisor: Michelle Brønniche Møller Nielsen

Submitted on 14th of June 2023

Name of department:	Department of Veterinary Clinical Science
Faculty:	Health and Medical Science, University of Copenhagen
Authors:	Laura Buchwald and Veronika Stark
Project:	Master's Thesis in Veterinary Medicine
ECTS:	30 ECTS
Title:	Development and Content Validation of a Canine Gastric Dilatation and Volvulus simulator for practical training of Veterinary students
Main supervisor:	Associate professor Rikke Langebæk Section for surgery, neurology, and cardiology Department of Veterinary Clinical Science
Co-supervisor:	Assistant professor Michelle Brønniche Møller Nielsen Section for surgery, neurology, and cardiology Department of Veterinary Clinical Science
Submission date:	June 14th, 2023
Front page picture:	The Maverick simulator by Laura Buchwald & Veronika Stark



Laura Buchwald

Veronika Stark

Preface

This master's thesis, "*Development and content validation of a Canine Gastric Dilatation and Volvulus simulator for practical training of Veterinary students*" was conducted at the University Hospital for Companion Animals at the University of Copenhagen between February 2023 and June 2023. The thesis corresponds to 30 ECTS points.

Our wish was to carry out a research project within the area of surgery and emergency medicine with emphasis on clinical training of veterinary students. The overall idea for the study was developed by our main supervisor, Rikke Langebæk and the study design was collaboratively constructed between her, the authors, and co-supervisor, Michelle Brønniche Møller Nielsen.

The objective of the study is to provide an educational tool to help veterinary students handle Gastric Dilatation and Volvulus (GDV) patients with ease and to help improve clinical training in emergency medicine. Additionally, this study aims to demonstrate the effectiveness of a low-fidelity simulator in providing practical training for emergency procedures. In this manner we hope to help students gain confidence in managing GDV patients and thus help future canine patients suffering from this condition.

Furthermore, we hope that the present study can motivate further investigations about emotions among veterinary students and subsequently enhance clinical training in emergency medicine.

The authors wish to thank the main supervisor, Rikke Langebæk, for the indispensable guidance and support throughout the MSc period. We would also like to give sincere thanks to co-supervisor, Michelle Brønniche Møller Nielsen for her dedication and faith in the project.

Furthermore, we would like to express our gratitude to the participating veterinarians for spending their valuable time helping us throughout the validation process and to all students participating in the experimental testing. A sincere thanks should also be given to the companies E-Vet and Kruuse for sponsoring essential materials for building the simulator and to the Danish Kennel Club and the QATO Foundation for indispensable financial support. Finally, we want to thank CAMES for professional advice and sponsorship for the project.

Table of contents

Abbreviations

CAMES	Copenhagen Academy for Medical Education and Simulation
CLT	Cognitive Load Theory
CRT	Capillary Refill Time
GDV	Gastric Dilatation and Volvulus
LTM	Long Term Memory
STAI	State-Trait Anxiety Inventory
The Three R's	Reduce, Refine, Replace
WM	Working Memory

Abstract

Gastric dilatation and volvulus (GDV) is an acute and life-threatening condition, requiring rapid diagnosis and treatment. Due to the severity of the disease, and the fact that such acute conditions cannot be scheduled in advance, the practical teaching opportunities in management of GDV patients are limited in the Danish veterinary curriculum.

Based on this, a questionnaire was carried out with the aim of investigating veterinarians and veterinary students' emotions concerning management of GDV patients (part 1). The questionnaire was answered by 137 participants and the results revealed a general insecurity regarding these patients. Responses from this pilot study formed the basis for the development of a GDV simulation with the purpose of reducing students' negative emotions in this area (part 2).

The GDV simulation was case based, contained a low-fidelity simulator (named Maverick) and involved calculation of fluid therapy, oro-gastric intubation, trocarization and gastropexy. The simulation was completed by 10 experienced veterinarians, who subsequently evaluated the simulation via a 5-point likert scale questionnaire. The aim was to investigate the simulation for evidence of content validity. Subsequently 35 veterinary students completed the simulation under calm conditions. Before and after completing the simulation, the participants responded to a modified State-Trait Anxiety Inventory (STAI) questionnaire, concerning their emotions regarding management of GDV patients. The emotions were classified using a scoring system, after which the difference in mean and median point scores was calculated. The higher the score the more positive emotions. The data was analyzed for statistical significance using a paired T-test with the aim of detecting changes in perceived emotions after the simulation.

Results from the veterinarians' questionnaire, after the simulation, showed mean scores ranging from 3.7 to 4.7 and medians ranging from 4 to 5 on the 5-point likert scale, which supported content validation of the simulation. Results from students' questionnaires showed an increase in mean emotional scores after completing the simulation and showed a significant difference ($p < 0.001$) in all questions before compared to after. Furthermore, the students assessed their self-confidence improved after the simulation compared to before. The support of content validity and the significant shift in emotions towards the more positive, indicates that the use of the Maverick simulation for teaching veterinary students may be beneficial.

Resumé

Mavedrejning hos hunde er en akut og livstruende lidelse, der kræver hurtig diagnostik og behandling. Grundet alvoren af lidelsen, samt at sådanne akutte tilstande ikke kan planlægges på forhånd, er de praktiske undervisningsmuligheder i håndtering af mavedrejningspatienter meget begrænsede i det danske veterinære curriculum.
På baggrund af dette blev der gennemført en spørgeskemaundersøgelse mhp. at undersøge dyrlægers og studerendes emotioner vedrørende håndtering af mavedrejningspatienter (del 1). Spørgeskemaet blev besvaret af 137 deltagere og resultaterne viste en gennemgående usikkerhed angående disse patienter. Besvarelserne fra dette pilotstudie dannede grundlag for udviklingen af en mavedrejningssimulation med det formål at reducere studerendes negative følelser på dette område (del 2).

Mavedrejninssimulationen var casebaseret, indbefattede en low-fidelity simulator (kaldet Maverick) og indeholdt beregning af væsketerapi, sondering, trokarisering og gastropexi. Simulationen blev gennemført af 10 erfarne dyrlæger, som efterfølgende vurderede simulationen via et 5-point likert-skala spørgeskema. Formålet var at undersøge simulationen for bevis på content validitet. Derefter gennemførte 35 dyrlægestuderende simulationen under rolige forhold. Før og efter gennemførsel af simulationen, besvarede deltagerne et modificeret State-Trait Anxiety Inventory (STAI) spørgeskema vedrørende deres emotioner om håndtering af mavedrejningspatienter. Vha. et scoringssystem blev emotionerne klassificeret, hvorefter forskellen i gennemsnitlig- og median pointscore kunne beregnes. Des højere pointscore des mere positive følelser. Dataene blev undersøgt for statistisk signifikans vha. en parret T-test med det formål at undersøge ændringer i oplevede negative emotioner efter simulationen.

Resultaterne fra dyrlægernes spørgeskema efter simulationen viste gennemsnitlige scorer mellem 3,7 og 4,7 og en median mellem 4 og 5 på 5-point likert skalaen, hvilket understøttede content validering af simulationen. Resultaterne fra de studerendes spørgeskemaer viste en stigning i gennemsnitlig emotionsscore efter gennemførsel af simulationen, og viste en signifikant forskel ($p < 0,001$) i alle spørgsmål fra før til efter. Desuden vurderede de studerende også deres selvtillid som værende forbedret efter simulationen i forhold til før. Understøttelse af content validering, samt den signifikante forbedring af de studerendes følelser, indikerer, at brugen af Maverick simulationen til undervisning af dyrlægestuderende kan være fordelagtig.

Study design introduction

This study was conducted in two parts. Initially a pilot study was carried out among 137 veterinarians and veterinary students. The pilot study is presented in part 1 of this thesis. Thorough research was conducted to identify relevant studies and articles concerning GDV, simulator training and validation theory. Systematic research was carried out using various academic databases including PubMed and Google Scholar. Based on the feedback from the pilot study, theoretical research, and cadaver practice, a GDV simulator, named Maverick, and an appurtenant case was created, leading to the creation of the complete Maverick simulation. The simulation was tested for evidence of content validity by 10 experienced veterinarians and subsequently student trials were conducted with 35 participants at the University Hospital for Companion Animals in Copenhagen. The creation and validation of the Maverick simulation along with the student trial study is presented in part 2 of this thesis.

1. Theoretical introduction

1.1. Gastric Dilatation and Volvulus

1.1.1. Pathogenesis and etiology

Gastric Dilatation and Volvulus (GDV) in dogs is a severe and potentially life-threatening condition. It is characterized by gastric distention and rotation of the stomach on its mesenteric axis resulting in an acute obstruction of the pylorus and cardia[1]. From a caudal perspective, the volvulus typically occurs in a clockwise direction with the pylorus migrating ventrally and cranially and eventually locating itself on the left side of the abdomen dorsal to the esophagus and fundus[2–5]. It remains unclear whether the stomach rotates or distends first[2,4,6–9].

Large and giant breed dogs such as Great Danes, German Shepards, Standard poodles and Golden Retrievers are at increased risk of developing GDV[4–6,10–12]. Other risk factors include increasing age, deep chest conformation, foreign bodies, large meals, and fast eating, among others[4–6,10,11,13–17]. Clinical history typically includes retching, unproductive vomiting, hypersalivation, restlessness and a distended abdomen. Dogs often present with signs of shock such as tachycardia, tachypnea, cold extremities, pale mucous membranes, and prolonged CRT[4,18]. As the syndrome progresses, injected mucous membranes, weak femoral pulse and fever may present. Ultimately, bradycardia, severe hypotension and hypothermia may develop as a sign of decompensation[2,7,19]. Dogs with

GDV may experience severe cardiovascular consequences following both hypovolemic, obstructive, distributive, and cardiogenic shock[4,7,10,20,21]. Shock can lead to anaerobic metabolism and tissue oxygen deficiency causing hyperlactatemia[4,7,11,22,23]. Various factors influence mortality such as gastric necrosis, arrhythmias and the need for splenectomy, though mortality rates vary significantly between studies, ranging from 10% to 68%[6,10,13,24–26].

1.1.2. Diagnosis and treatment

Suspicion of a GDV usually arises from the patient's history, signalment and the physical examination. The diagnosis is confirmed on an abdominal x-ray which can help differentiate between gastric dilatation and gastric dilatation and volvulus[3,4]. Entrapment of air in the pylorus and the fundus will create a characteristic "double bubble" image with the dog in right lateral recumbency if the volvulus is 180º which is the most common degree of rotation[1,3,4].

Management of a GDV patient involves several steps, including stabilization, blood sampling, gastric decompression (oro-gastric intubation and/or trocarisation) and gastropexy. Initially two large bore catheters should be placed in both cephalic veins to provide shock doses of crystalloids. A blood sample including Complete Blood Count, biochemistry, blood/gas analysis and serum electrolytes should be obtained[4,27,28]. The shock dose should be administered in several proportions of 90 ml/kg and the patient should be reassessed between each dose. In some cases, synthetic colloids and blood products may be indicated[2,4,12,19,25]. Additionally, sufficient analgesia and oxygen supplementation must be provided and cardiac arrhythmias and evaluation of blood pressure should be assessed and managed[2,4,29].

Gastric decompression should be performed by either passing an oro-gastric tube or by transcutaneous trocarization. The aim is to improve venous return and organ perfusion[2,30,31]. Either of these techniques are applicable, however trocarization is faster to perform and may therefore be a more suitable choice for a severely unstable patient. On the other hand, it does not allow gastric lavage and thus removal of stomach content, which oro-gastric intubation does[30].

An oro-gastric tube is measured from the tip of the nose to the xiphoid process and a bandage roll (or another similar device) is placed in the dog's mouth to facilitate passage of the tube and prevent the dog from biting it. After lubricating the tube, it is introduced through the bandage roll and into the esophagus. Some resistance might be felt when the tube reaches the caudal esophageal sphincter. If the tube cannot be passed, transcutaneous decompression should be performed. This involves identifying and aseptically preparing the most tympanic area caudal to the last rib and

subsequently passing a 14 or 16 g. needle or catheter into the stomach[1,2,4]. Both methods are acceptable and associated with a high success- and low complication rate[30].

The surgical procedure begins with a midline celiotomy. If the greater omentum is covering the stomach, it is indicative of volvulus. Since the rotation is often 180^{o} clockwise, the surgeon should be placed on the right side of the animal to reposition the stomach most easily. The surgeon's right hand is passed alongside the left abdominal wall to locate the pylorus. The surgeon gently pulls the pylorus ventrally towards the incision and simultaneously pushes the body of the stomach dorsally towards the table and to the left using his/her left hand. In general, thorough inspection of the abdomen to confirm the orientation of the stomach is essential. Usually, repetitive decompression intraoperatively, with the oro-gastric tube or a needle, is helpful. To ensure satisfactory repositioning of the stomach, the cardia and the distal esophagus is palpated[2,25,29,32].

Once the stomach has been repositioned, viability of the abdominal organs can be assessed with careful attention to the most commonly affected areas, which are the gastric fundus, cardia and greater curvature[23,33]. The stomach should be carefully examined with focus on color, wall thickness, peristaltic, hemorrhage and signs of thrombosis. If devitalized or necrotic gastric areas are identified, a partial gastrectomy must be performed. Torsion of the spleen may accompany GDV, and splenic congestion is a common finding[2,34] The spleen should be inspected for avulsions and thrombosis of the splenic arteries and for signs of infarction. In such cases, a full or partial splenectomy may be necessary[1,2,32]. Splenectomy solely and combined with a partial gastrectomy has been associated with increased mortality[12,24,26,33].

Several techniques to perform gastropexy have been described, however this study will only focus on the incisional gastropexy[1,2,25,35,36]. This technique is most frequently described in the literature probably due to its technical simplicity, low risk and effectiveness[1,29,35]. The aim of this surgery is to create a permanent adhesion between the abdominal wall and the pyloric antrum and thereby prevent recurrent GDV[1,32,35,37,38]. The procedure involves creating a 4-7 cm. incision in the seromuscular layer of the stomach, parallel to its long axis. Correct anatomical placement of the incision at the level of the pyloric antrum between the lesser and greater curvature is essential to avoid partial pyloric outflow obstruction[1,2,29,36,39]. An incision of equal length is made in the right abdominal wall 2-3 cm. caudal to the last rib. The incision is made through the peritoneum and m. transversus abdominis in the direction of the muscle fibers. Subsequently the incisions are sutured together using a 3-0, 2-0 or 0 monofilament in two simple continuous patterns creating a permanent

adhesion[1,2,29,36,39]. Following a gastropexy, recurrence rates have been shown to decrease from 54.5% to 4.3%[6].

1.2. Learning and emotions

The association between learning and emotions is profoundly complex[40]. Learning is highly affected by emotions which may be determined by a variety of factors such as learning environment, experience, learning strategies, social elements and motivation[41,42]. For this reason, the understanding of emotional responses in relation to learning is essential.

1.2.1. Emotional responses

Emotions are multifactored responses unfolding over a short period of time. They can vary in valence, meaning that they may be perceived as positive or negative[43]. Emotions may be divided into categories, although *Russel* demonstrated, that the boundaries between emotions are blurred, since one emotion may be placed in a number of different categories by different individuals[44]. However, *Russel* further suggested, that every emotion has a bipolar opposite such as relaxed and nervous or tense and calm[45]. Positive emotions such as happiness reflect a sensation of enjoyable involvement with the environment, while negative emotions such as anxiety mirror a sense of distress[43]. Negative emotions can emerge from stress, and for instance, stress has shown to significantly increase anxiety symptoms[46,47]. The World Health organization defines "stress" as *"A state of worry or mental tension caused by a difficult situation"* [48]. Additionally, Selye defines stress as *"the nonspecific response of the body to any demand"* and describes that stress is regarded as the *"perception of threat, with resulting anxiety, discomfort, emotional tension, and difficulty in adjustment"*[49].

There are several methods of measuring emotions. One of them is the State-Trait anxiety Inventory (STAI) which is a self-reporting anxiety scale[50].

The definition of state anxiety is described by Spielberger as *"a transitory emotional state or condition of the human organism that is characterized by subjective, consciously perceived feelings of tension and apprehension, and heightened autonomic nervous system activity"*[50]. According to Spielberger, state anxiety refers to this process occurring at a particular moment in time and at a certain intensity, that is the current state of anxiety. Trait anxiety, however, reflects the degree to which an individual is disposed to experience state anxiety in response to a stressful situation[50,51]. The STAI state anxiety questionnaire is developed by using a number of positive and negative

emotions that people have used to describe themselves[50]. Emotions are significant for successful learning as they affect human memory which plays a decisive role when learning new tasks[42].

1.2.2. Learning clinical tasks

The impact of stress on human memory is determined, by which memory phase is activated during a stressful situation[52]. According to R.C. Atkinson and R.M. Shiffrin, human memory can be categorized into three structural components: sensory memory, working memory (WM) and long-term memory (LTM)[53].

In medical education, the sensory memory perceives auditory, visual, olfactory, and tactile information which is processed for a very brief period. Information raising awareness is organized in the WM with the purpose of storing it in the LTM[42].

The WM has limited capacity and is particularly influential when learning complex clinical tasks especially when the information is new to the learner[42,53–55]. When managing an emergency, the veterinarian in charge must not only assess the patient, but must also obtain information from the owner, interpret diagnostic results, retain communication with other team members etc. Based on all this information, decisions must be made, usually in a very brief period of time, which may be stressful.[55].

Elevation in cortisol levels has been identified in response to increased stress[56,57], and elevated cortisol levels and sympathetic activation, have been found to impair WM[58,59]. In this case, the WM will struggle to merge separate elements under the pressure of time and other environmental stressors[42]. When cortisol levels increase and WM is impaired, both learning and performance decreases[40,56,60–62]. Furthermore, emotions regarding self-efficacy, is influential. For example, negative thoughts regarding one's capabilities may lead to stress and anxiety during the given task[43]. Conversely, positive emotions enhance learning and improve positive processes such as creativity and problem solving, and furthermore, a positive learning environment has proven to enhance decision making and thoroughness[42,63].

The complexity of the tasks in medical education often results in a cognitive load that exceeds the learner's WM capacity. When this occurs, the learning is compromised[42.]

According to the "Cognitive load theory" (CLT) there are three types of cognitive load[64]:

- *Intrinsic load* is the cognitive load that is inherent to the task itself.
- *Extraneous load* is the cognitive load that is not essential to the task.
- *Germane load* refers to the cognitive effort that the learner intentionally puts into using cognitive strategies with the aim of retaining information in the LTM.

By reducing these cognitive loads, the CLT suggests that learning can be enhanced. For instance, intrinsic load can be managed by simplifying the task (e.g., breaking it into several elements), progressing from low to high physical fidelity (from a paper case to a physical simulator) and by gradually increasing the task complexity[42,54].

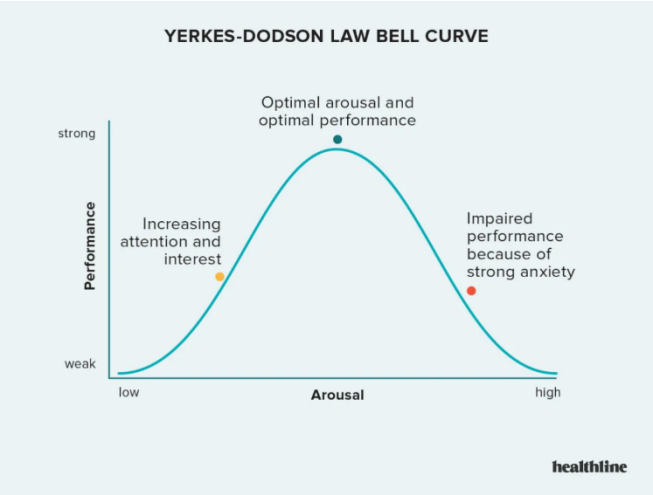


Figure 1: The Yerkes & Dodson Law showing that performance decreases at both too high and to low arousal.

The conception of physical fidelity refers to which extent a simulation appears and behaves compared to the real-life scenario, thus how well it replicates physical characteristics of the intended task[65]. The physical fidelity of the simulation should fit the level of the learner to not exceed cognitive capacity[66]. Although cognitive load can be managed to enhance learning, a certain amount of stress may be beneficial in learning situations[60,67]. According to the Yerkes & Dodson Law, both too low and too high arousal is unfavorable in a learning situation (figure 1)[67,68]. For instance, in high-stress situations, like emergency procedures that may provoke stress, the students' cognitive functions may be impaired[60]. Conversely, too low arousal, such as boredom, has also shown to impair learning outcome[69].

To sum up the complex nature of emotions and cognitive load in relation to learning: An emergency may be perceived as a demand, a threat, or a difficult situation by the novice learner. A response to such a demand in form of stress, and an increase in cortisol levels, increases the cognitive load. From this, negative emotions such as anxiety may occur, thereby further increasing cognitive load. This constantly increasing cognitive load eventually exceeds the WM capacity leading to diminished learning and finally impaired performance. This sums up the disadvantages of having to learn under stressful conditions, indicating that alternatives to teaching emergency procedures may be beneficial.

1.3. Simulator training

1.3.1. The educational use of simulator training

There are several advantages in using simulator-based training in medical education. Numerous studies have demonstrated the advantageous impact regarding development of a range of skills[70–74]. Simulator training offers significant benefits as it allows surgeons and students to prepare for real-life patient scenarios in a safe environment, and thereby provides the opportunity for them to reflect

on their conduct during the procedure[75]. It may help students focus on acquiring the necessary skills rather than being distracted by the fear of harming a living animal[76,77], and it allows them to practice during a mentally compatible state[78]. Since simulator training enables students to practice a specific skill several times[79], simulators can help students develop the perceptual-motor coordination necessary for surgical procedures as this seems to be the key limitation for the initial acquisition of surgical skills[75]. Some simulators have even proven to be more effective in improving basic surgical skills and psychomotor skills than cadaver practice[70].

In surgical courses, anxiety has shown to be at higher levels than in non-surgical courses. One study found that more than 50% of the students experienced negative emotions during their first surgery[80]. Moreover, a study from 2012 found that 96% of students felt that anxiety and nervousness negatively affected their ability to focus, learn and perform during live surgery. Practicing in a surgical skills lab before live surgery might help reduce student anxiety and can provide a positive and psychologically safe environment[80]. This has shown to contribute to the students' feeling of being prepared for live animal surgery and can help increase students' self-confidence[74,81–83], although one study failed to show a significant reduction in overall anxiety following simulator training[84].

Besides contribution to reduced anxiety and increased learning and confidence among veterinary students, simulator training offers another benefit. Using simulators contribute to the reduction, refinement and replacement (the principle of the three R's) of live animals in education, thereby contributing to more humane research and education[79,85].

Overall, practicing on low-fidelity simulators in a safe environment provides the opportunity for a lowered cognitive load which thereby reduces the risk of exceeding WM capacity. In this way, learning can be enhanced.

1.3.2. Simulator validation

The use of surgical simulators has increased considerably in the past 20 years[86]. Before integrating simulators into surgical programs, it is widely agreed that they must be validated. Validity refers to the degree to which an assessment tool such as a model, test, simulation or measurement sufficiently represents its real equivalent[87,88]. The interpretation includes defining the construct the simulation intends to measure and thereby evaluating to which degree the simulation represents the actual task[88]. A simulator, test, model or another reproduction is not simply classified as "valid" or "invalid", rather, the assessment of validity is based on the amount of evidence that supports the

proposed interpretation[89]. Generally, it is challenging to recognize descriptions of specific guidelines concerning definition and measurement of different types of validation. Several validation methods have been described [86,87,90,91], however 5 sources of evidence are currently used in validation methodology: *Content, internal structure, relationship with other variables, response process and consequences.*

Content evidence assesses the "*relationship between the test's content and the construct it is intended to measure*"[87]. It contains elements such as format, formulation, themes, items, tasks, and questions. For instance, this evidence may be gathered via assessment and rating from experts to evaluate the representativeness and importance of specific items.

The remaining four sources are described in table 1 below. Assessment of these sources contributes to evaluation of validity[73,87,90,91].

Internal structure	How well individual items and components of the assessment tool fits the given construct.
Relationship with other variables	The correlation between construct scores and other relevant external variables
Response process	Sources of variance attributed to differences in response that are unrelated to the measured construct
Consequences	Unintended effects of a given assessment tool

Table 1: The four sources of validity evidence besides content validity.

2. Research questions

This thesis seeks to address the following research questions:

Part 1:

1. What are the perceived emotions among veterinarians and veterinary students regarding management of GDV patients, and which aspects of the procedures are perceived challenging?
2. Is there a need for a GDV simulator for practical training in management of a GDV patient, and if so, which components should it contain?

Part 2:

1. Does the Maverick GDV simulation show evidence of content validity, making it a suitable teaching tool for veterinary students to practice in managing GDV patients?
2. In relation to management of a GDV patient, what is the impact of completing a GDV simulation on the perceived emotions and confidence levels among veterinary students?

3. Part 1: Pilot study

Assessing the need for a canine Gastric Dilatation and Volvulus simulator in Danish Veterinary Education: A survey of veterinarians' and veterinary students' comfort levels in managing GDV cases.

3.1. Introduction

Becoming a veterinarian is not only associated with a very steep learning curve but also with a variety of complex emotions[92]. The veterinary education is extremely comprehensive, and despite a veterinary student's utmost diligence, it remains implausible to acquire all knowledge and skills within the limited time frame of the study[93–95]. While the veterinary profession has become increasingly specialized in recent years, veterinarians are still required to have an extensive understanding of a wide range of fields including, internal medicine, surgery, emergency medicine, dermatology, cardiology, ophthalmology and neurology among many others[92,93,96]. Veterinary students can participate in specific cases during their clinical education within some of these specialty areas. For example, students may encounter patients in dermatology from which they can get a lot of hands-on experience without compromising the diagnosis or treatment of the patient. However, this is rarely the case in emergency medicine[97].

The unpredictability of emergency cases seems challenging when educating veterinarians. With many emergency patients presenting in critical condition, a rapid and accurate diagnosis is essential in order to administer proper and immediate treatment. This potentially leads to stressful situations that consequently neglect student participation (*personal observation*). For this reason, we wanted to investigate students' perception of dealing with specific emergency patients after graduating.

In a 2018 survey from a Master's project at University of Copenhagen, it was found that among five emergency surgeries, Gastric Dilatation and Volvulus was ranked as the one, students felt most anxious about[98]. The present study aimed to investigate whether these findings could be replicated. Furthermore, the purpose of this study was to examine whether a GDV simulation could be an aid in making students more comfortable with the management of GDV patients, and if so to clarify relevant components of such a simulator.

3.2. Materials and methods

A cross-sectional study was carried out via a questionnaire on Google Forms and was advertised on Facebook, via e-mail and orally at the University Hospital for Companion Animals in Copenhagen, Denmark. The questionnaire can be found in appendix 1. To meet the inclusion criteria, participants had to have completed at least the rotation in emergency medicine on the 4th or 5th year of the veterinary curriculum. The survey was conducted in the period from January 12 to January 30, 2023, and involved both students and veterinarians.

The questionnaire was designed by the authors with the following objectives:

1. Assess the potential need for a GDV simulation by exploring perceived emotions among different subgroups regarding managing a GDV patient, including ranking surgical emergency procedures by perceived difficulty.
2. Identify challenging aspects of GDV management among participants with the aim of determining potential elements of a simulation.
3. Gain insight into participants' self-assessed surgical proficiency and confidence in relation to their educational level and experience.
4. Investigate participants' view on the necessity of being able to manage GDV patients.
5. Examine participants' preparedness and preferred methods for practicing management of GDV cases.

The data was analysed using Microsoft Excel, Google Sheets and IMB SPSS Statistics. Relevant data was calculated via cross-tabulations and the correlation between level of experience and the various emotions, associated with GDV management, was calculated using the Pearson correlation coefficient.

3.3. Results

A total of 137 veterinarians and veterinary students participated in the survey, distributed among different categories: 7.3% were veterinarians with >5 years of experience, 26.3% had 1-5 years of experience, 18.2% had less than 1 year of experience. Of the students, 25.5% were in their 6th and final year of veterinary school, and 22.6% were in their 5th year (*appendix 2, question 1*).

The responses regarding participants' perceived surgical skills in relation to their educational level, are presented in the cross-tabulation in table 2.

Level of education * surgical skills Crosstabulation

			How would you rate your surgical skills dependent on your level of education					
			I don not feel competent	I feel less competent	Neither nor	I feel fairly competent	I feel very competent	Total
Level of education	5th year vet student	Count	2	6	6	16	1	31
		Percent	6,5%	19,4%	19,4%	51,6%	3,2%	100,0%
	6th year vet student	Count	1	13	6	13	2	35
		Percent	2,9%	37,1%	17,1%	37,1%	5,7%	100,0%
	Veterinarian with less than one year of experience	Count	1	8	3	11	2	25
		Percent	4,0%	32,0%	12,0%	44,0%	8,0%	100,0%
	Veterinarian with 1-5 years of experience	Count	1	5	3	20	7	36
		Percent	2,8%	13,9%	8,3%	55,6%	19,4%	100,0%
	Veterinarian with more than 5 years of experience	Count	0	0	1	6	3	10
		Percent	0,0%	0,0%	10,0%	60,0%	30,0%	100,0%
Total		Count	5	32	19	66	15	137
		Percent	3,6%	23,4%	13,9%	48,2%	10,9%	100,0%

Table 2: Level of education and perceived surgical skills cross-tabulation. This table shows the percentage of participants from each subgroup of educational level and their perceived surgical skills.

When ranking the four emergency procedures on perceived difficulty, the results were divided as seen in figure 2. A cross-tabulation with the four emergency procedures and educational level appears from appendix 3, table 2.

Of all the participants, 49.6% had no personal experience with GDV patients. 14.3% had witnessed the diagnosis and treatment of a GDV patient, 17.5% had assisted but did not have the primary responsibility and 18.2% had diagnosed and treated one or more GDV patients themselves (*appendix 2, question 4*).

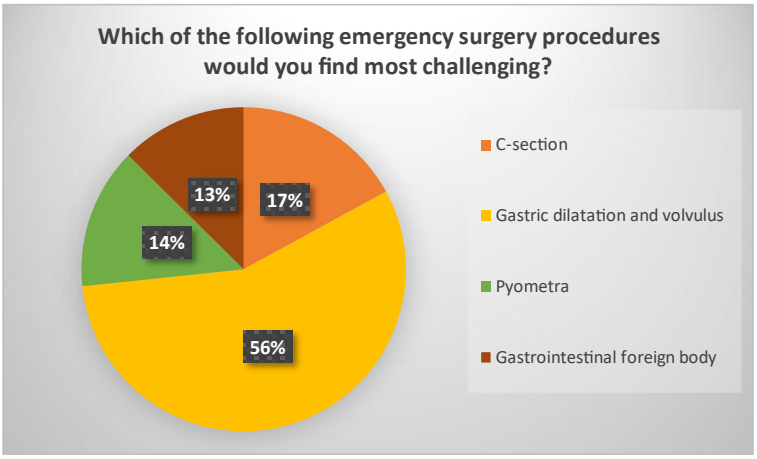


Figure 2: Ranking of emergency surgeries by perceived difficulty. This figure shows the percentage of participants finding each of the four emergency procedures most challenging.

The participants were asked to indicate their emotions while being alone on call waiting for a possible GDV patient. With multiple possible answers, the results showed that the most common responses were feeling worried (54%), insecure (51.1%), focused (50.4%), very nervous (46.7%) and excited (43.8%). The least common responses were feeling secure (3.6%), calm (3.6%),

confused (5.1%) and okay (8%). Responses indicating feelings of nausea accounted for 13.1%, anxiety for 18.2% while 33.6% reported feeling a little nervous (*appendix 2, question 5A*).

Among participants who had solely answered with negative emotions, the gastropexy was considered the most challenging (64.7%). Stabilizing the patient, orogastric intubation and trocarization were also seen as challenging by 48.7%, 41.2% and 36.1%, respectively. The steps that the fewest participants found challenging were interpretation of bloodwork (16%), “all steps" (14.3%) and diagnosing the patient (8.4%) (*appendix 2, question 5B*). Participants who only reported positive emotions, regarding managing a GDV patient on their own, had a similar distribution of responses to the question, but with a slightly higher number of participants feeling challenged by orogastric intubation than stabilization (*appendix 2, question 5C*). Among respondents, 8.8% reported not feeling challenged. When presented with statements regarding their perspective on managing a GDV patient as a veterinarian, the responses were distributed as seen in table 3 below. The perceived emotions regarding management of GDV patients in relation to level of experience is presented by the Pearson correlation coefficient in table 4.

Statement	Number
“I find it challenging to make the GDV diagnosis on a radiograph”	14
“The individual steps in the procedure are not themselves challenging to me, but in a stressful situation I might forget certain steps, or in which order to perform them”	35
“I find it challenging to handle such a critical patient, where I must act fast and in a correct manner in order to save the patient”	54
“In general, I feel insecure about how to handle a GDV patient, since I am not certain about the correct stepwise procedure”	55
“I am familiar with the theoretically optimal way of managing a GDV patient, but I find it challenging to perform one or several steps of the practical procedure”	60
“I am certain that I am familiar with the optimal stepwise procedure, and I feel confident that I can perform them correctly even in a stressful situation”	17

Table 3: Statement responses. Number of participants who have responded to each statement. Multiple answers were possible.

	Have never seen, assisted or handled a GDV patient myself	Have witnessed the diagnosis and treatment of a GDV patient, but did not participate actively	Have assisted diagnosis and treatment of a GDV patient but did not have the primary responsibility	Have diagnosed and treated one or several GDV patients myself
Excited	0,139	-0,109	0,140	0,141
Calm	-0,192	-0,079	0,116	0,205
Very nervous	0,425	0,027	-0,199	-0,376
A little nervous	-0,178	-0,027	0,245	0,016
Focused	-0,122	-0,132	0,066	0,211
Confused	0,232	-0,094	-0,105	-0,110
Nauseous	0,174	0,025	-0,176	-0,075
Anxious	0,262	-0,092	-0,073	-0,183
Secure	-0,192	-0,079	0,014	0,304
Worried	0,195	0,132	0,040	-0,408
Okay	-0,025	-0,044	-0,134	0,201
Insecure	0,310	0,114	-0,162	-0,343

Table 4: Pearson coefficient comparing level of experience with perceived emotions. The number 1 indicates perfect correlation, while -1 indicates perfect uncorrelation. The colors indicate the intensity of the correlation with green suggesting positive correlation and red suggesting negative correlation.

When asked if the ability to handle a GDV patient as a companion animal practitioner is an essential skill, 16.8% strongly agreed, 45.3% agreed, 17.5% answered neither/nor, 18.2% disagreed and 2.2% strongly disagreed (*appendix 2, question 7*). Furthermore, 21.2% strongly disagreed that the lectures and clinical training had prepared them in managing GDV patients, while 40.9% disagreed, 32.8% said neither/nor, 5.1% agreed and none strongly agreed (*appendix 2, question 8*).

When asked about their preferred way of practicing to handle GDV patients, "*completing the procedure once in real life*" ranked highest (53.3%), followed by "*witness the procedure several times on a live patient*" (20.4%), "*practice several times on a simulator*" (11.7%), "*practice once on a cadaver"* (8.8%) and "*watch the procedure several times on video*" (5.1%) (*appendix 2, question 9*). Finally, when asked if the participants would feel calmer in managing a GDV patient, if they had practiced on a simulator first, 21.9% strongly agreed, 59.9% agreed, 13.1% said neither/nor, 2.2% disagreed and 2.9% strongly disagreed (*appendix 2, question 10*)

3.4. Discussion

The present study showed that a large proportion of students in their final year (37.1%) and veterinarians with less than one year of experience (32%) felt less competent when rating their surgical skills in relation to their level of education (table 2). This was a rather surprising finding, since final year students and newly graduated veterinarians are expected to possess a certain level of competence following their education. This might indicate that the participants feel particularly

insecure and vulnerable at these times. These results might reflect the high incidence of imposter syndrome among students and young veterinarians, as found by other studies[99,100]. Students in their final year may feel an increasing amount of pressure in the clinic when approaching graduation, where they are expected to perform and act as veterinarians. Similarly, newly graduated veterinarians will suddenly be the ones holding the responsibility, and several studies suggest that they do not feel comfortable with their skillsets, since they have not yet gained sufficient experience[101–103].

The present study showed that GDV was in fact the surgical procedure the respondents found most challenging, while Caesarean section ranked second. We were not surprised by this finding since these two procedures are not typically a part of the practical clinical education curriculum in Denmark[104]. On the contrary, students are taught how to perform a female spay, which involves watching a video, practicing on a sim-spay model[105], and eventually possibly perform the procedure on a live animal under supervision. While the procedure of operating a pyometra is technically the same as a spay, and the incidence of this condition is more frequent than GDV[106,107], complicating factors may naturally influence the ease of the procedure[11] and besides this even a spay may provoke anxiety among novices[80,92]. Moreover, students are taught to perform gastrotomy and enterotomy and even carry out these procedures on live pigs during their surgical training[104]. Encountering a GDV or Caesarean section patient, in the very limited time in the Emergency Room, is a rare opportunity for veterinary students. Meanwhile, it was interesting to discover that 70% of veterinarians, with more than 5 years of experience, ranked GDV most challenging compared to the range from 52% to 57.1% for the remaining groups (*appendix 3, table 2*). This might imply that the experienced veterinarians possess a more comprehensive understanding of the severity of GDV than novices do, or maybe they simply have more experience with the other three conditions, since the incidence of GDV is relatively low[107]. However, it is worth mentioning, that the available options for emergency procedures were limited to only four, and therefore it is unclear if another option, such as haemorrhagic splenic tumor or other emergency conditions, would have ranked higher if included as a choice. Consequently, it was discouraging, although not unexpected, to learn that most of the inexperienced participants held mainly negative emotions towards managing GDV patients. As anticipated, the study revealed a correlation between most of the negative emotions and lack of experience as shown by the Pearson Correlation Coefficient (table 4). The predominance of negative emotions among participants may therefore be explained by the large proportion of participants being inexperienced students. It should also be noted that the survey was conducted in

Danish, and that the Danish word "spændt", which was used in the survey, can mean both *excited* and *tense* in English[108], which may therefore include both positive and negative aspects.

The results revealed an intriguing variation in opinions regarding whether the ability to manage a GDV patient was an essential skill or not. One would assume that every companion animal practitioner might encounter a GDV patient, hence making it a crucial skill. However, the increasing specialization in veterinary medicine could affect this perception, as a practitioner specialized in ophthalmology or orthopaedic surgery might never encounter a GDV patient. Conversely, it could be argued that such emergency procedures should be taught, given that they pose a life-threatening risk to the patient[6,26,109], unlike a dermatologic condition or a tooth fracture, for which referral is an option without jeopardizing the patient's life. But how should these emergency procedures be taught? They cannot be scheduled in advance, they are too critical to leave to students, and most of them arrive out of hours[4,110]. While most participants prefer to observe or perform the procedure on a live patient, this is rarely feasible, which reflects a general challenge when teaching emergency procedures[97]. Cadaver training is possible, but also has its difficulties as they have limited time of use, especially when working with abdominal organs. Several studies suggests that simulator training offers a dependable alternative that allows for repetitive training in a low-stress environment[70,79,80,92].

The present study revealed that most participants did not feel adequately prepared to handle GDV patients with 62% disagreeing or strongly disagreeing with this statement. This outcome is concerning and highlights the urgency of improving education in this area. The results also indicate that many participants have only theoretical knowledge of the procedure and are uncertain about the practical steps or are generally unsure how to manage these patients. Considering this, and the fact that 82% agrees or strongly agrees that simulator training would make them feel calmer, further emphasizes the need for a GDV simulator.

Results of the present study suggest that a simulator should include stabilization, trocarization, orogastric intubation, and gastropexy if possible, since these components were deemed most challenging. As participants expressed concerns about multiple steps, it may be beneficial creating a simulation that enables the completion of the entire procedure. Additionally, the authors acknowledge that the assessment of gastric and splenic necrosis, which are common complications in GDV, should have been included as options. Further research is needed to investigate the

emotions of veterinarians and veterinary students to improve their education and address areas of insecurity.

3.5. Conclusion

Among participants, this study found that GDV was perceived as the most challenging emergency surgery. Additionally, the study showed a correlation between lack of experience and perceived negative emotions among veterinarians and veterinary students regarding GDV management. The study identified challenging aspects in relation to management of GDV patients and emphasizes the need for practical training in order to improve students' confidence when handling these cases. Results revealed that most participants assessed managing a GDV patient as an essential skill, but at the same time did not feel adequately prepared to do so. Due to the limited access to live patients, limited usefulness of cadavers and based on the knowledge about the benefits of simulator training, this study suggests that a GDV simulator would provide the opportunity to enhance students' comfort level in managing GDV patients.

4. Part 2

Development and Content Validation of a Canine Gastric Dilatation and Volvulus simulator for practical training of Veterinary students

4.1. Study design introduction

This study was carried out following the initial pilot study presented in part 1 of this thesis. This part contains the study of development, validation, and effect of the Maverick simulation.

4.2. Materials and Methods

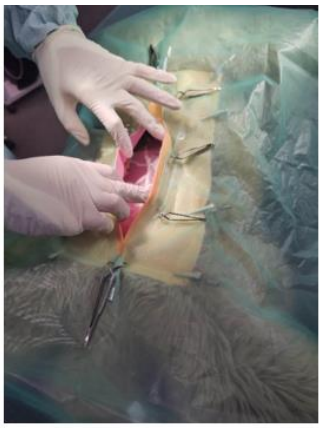
4.2.1. Simulation development

All research, combined with the feedback received from the pilot study, contributed to development of the Maverick simulation. Finally, the simulation contained a clinical GDV case description and a physical model, Maverick.

Development of the physical Maverick simulator

To experience the tactile and visual input when performing the GDV procedure, the authors carried out the full procedure on cadavers. The cadavers were donated by owners to the University Hospital for Companion Animals for research and teaching purposes. The Maverick simulator was crafted by the authors using a variety of carefully selected materials and techniques. Maverick was created with relatively easily accessible and affordable materials. A large stuffed toy dog was kindly donated by the Department of Veterinary Clinical Science at University of Copenhagen and served as the outer model. Finally, the Maverick simulator consisted of an abdominal cavity containing intestines, stomach, greater omentum, spleen, and liver. Furthermore, it contained an oral cavity, an eosophagus and an area for trocarisation through the abdominal wall. The features incorporated into the physical model were oro-gastric intubation, trocarization and gastropexy.

The final construction manual can be found in appendix 6. The pictures below are a selection showing the physical model.


Case development

The simulation case was created based on careful systematic research and with inspiration from GDV patient journals at the University Hospital of Companion Animals. Pictures were taken during procedures performed on the cadavers, with the intent of incorporating them into the simulation case. The case contained a description of a GDV patient including anamnesis, clinical signs, and results from initial tests. Furthermore, the case provided an X-ray, and description of four practical tasks, that should be performed by participants. The four tasks were:

1. Calculation of fluid therapy
2. Decompression by oro-gastric intubation
3. Decompression by trocarization
4. Incisional gastropexy

The case description appears from appendix 7.

4.2.2. Veterinary participants and Content validity evidence

To obtain evidence of content validity, a panel of experienced veterinarians was consulted. The panel consisted of 10 veterinarians who met the following criteria:

- At least 3 years of experience from small animal practice.
- Management of at least 5 GDV patients within the past 5 years.

The 10 participating veterinarians came from 6 different animal hospitals in Denmark and were selected with the predetermined cut-off values to ensure sufficient knowledge and experience with GDV.

The purpose of the simulation was introduced to the veterinarians. Subsequently they were asked to complete the case in the exact same way as the student participants were intended to. Afterwards, they were asked to complete a questionnaire (appendix 4). The questions were designed with focus on specific elements to evaluate evidence of content validity and were based on thorough research in this matter. Veterinarians were asked to pay careful attention to specific elements, and the questionnaire included assessment of the following:

- The comprehensibility of the case, including the task descriptions.
- The correctness of the case description as well as execution of the tasks from a professional perspective.
- The visual and tactile sensations of various components.
- The utility of the simulation in relation to its purpose.

The questionnaire consisted of 25 statements and participating veterinarians were asked to rank the statements on a 5-point likert scale with options ranging from "*Strongly disagree" to "Strongly agree"*.

To quantify responds for data analysis, a scoring system was used as shown in table 5. Veterinarians had the option to elaborate on their answers during the response process.

5-point likert scale	Point
Strongly agree	5
Agree	4
Neither/nor	3
Disagree	2
Strongly disagree	1

Table 5: 5-point likert scale scoring system for content validation.

4.2.3. Student trials

Student questionnaire

To enable analysis of changes in students' emotions, students were asked to complete two identical questionnaires before and after completing the simulation, respectively. For this purpose, a modified state anxiety self-evaluation questionnaire inspired by the STAI[50] was developed (appendix 5). An assortment of 14 different positive and negative emotions were selected and participants were asked to rank each emotion on a 5-point likert scale with options ranging from "*Not at all" to "Extremely"*. The modifications to the original STAI aimed to adapt the questionnaire to the specific requirements of the GDV procedure components. In addition to the likert scale, specific questions regarding participants' educational level, experience with GDV patients and perceived challenges were included. Finally, participants were asked to rate their self-confidence regarding management of a GDV patient. To quantify the intensity of emotions a

scoring system ranging from 1 to 5 was developed, assigning the highest intensity of positive emotions with the highest score value. The selected emotions and the appurtenant scores appear from table 6. The emotions assessed as being positive are marked with a green color, and the emotions assessed as being negative are marked with a red color. Furthermore, participants were given the opportunity to provide feedback on the simulation upon completion.

	Not at all	Slightly	Moderately	Very	Extremely
I feel calm	1	2	3	4	5
I feel nervous	5	4	3	2	1
I feel focused	1	2	3	4	5
I feel confused	5	4	3	2	1
I feel nauseous	5	4	3	2	1
I feel anxious	5	4	3	2	1
I feel secure	1	2	3	4	5
I feel worried	5	4	3	2	1
I feel okay	1	2	3	4	5
I feel well prepared	1	2	3	4	5
I feel a lack of confidence	5	4	3	2	1
I feel like I want to leave the situation	5	4	3	2	1
I have catastrophic thoughts	5	4	3	2	1
I have trouble concentrating	5	4	3	2	1

Table 6: Scoring system for emotions among student participants assigning the highest amount of point to the highest intensity of positive emotions and vice versa.

Student participation

The clinical rotation in emergency medicine takes place during the 4th and 5th year of the Danish veterinary curriculum. Students who had completed this course were specifically invited to participate in the test trial. These students were distributed on 4th, 5th, and 6th year. Invitation to participate in the trials was distributed orally by the authors during various clinical courses and was advertised via relevant Facebook groups. Students registered themselves through a registration form.

For anonymity, students were each assigned an identification number. All students received a uniform introduction to the simulation, which involved following the case description (appendix 7) and completing the specific tasks given by this case. They were also informed that the simulation was not an evaluation and that they should complete it at their own pace. Meanwhile the authors served as veterinary nurses assisting during the surgery. The authors did not orally assist unless the student initiated something clearly incorrect. In this case, the authors referred the student to reread the case description. The progress of completing the simulation is shown in the flowchart in figure 3. In the flowchart the green boxes represent the components, that the students performed, or took part in, during the simulation. The red boxes represent components where results were presented to the students, but they did not actively carry them out themselves.

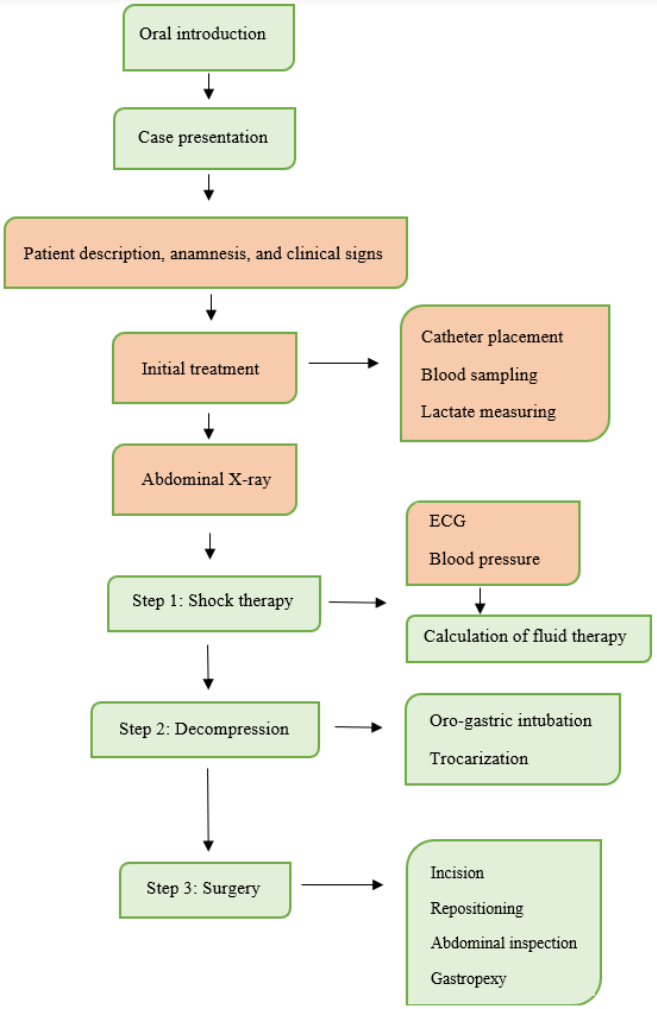


Figure 3: Flowchart showing the simulation sequence with the green color indicating components that students performed or took part in and the red color indicating components that were solely presented to the students.

4.2.4. Data analysis

Data analysis was carried out using Microsoft Excel and IBM SPSS Statistics.

Using a scoring system, the data received from experienced veterinarians was processed by calculating the mean and median for each statement.

The total point score for every question was calculated for each student before and after completing the simulation. The mean scores were calculated and were subsequently analyzed for statistically

significant difference using a paired T-test. Additionally, changes in responses to given statements regarding GDV management, and changes in confidence levels, were analyzed by calculating the numerous and percentage change.

4.3. Results

4.3.1. Evidence of content validity

Figure 4 illustrates the mean and median point scores for each statement on a 5-point likert scale. Highest and lowest possible mean and median scores were 5 and 1, respectively.

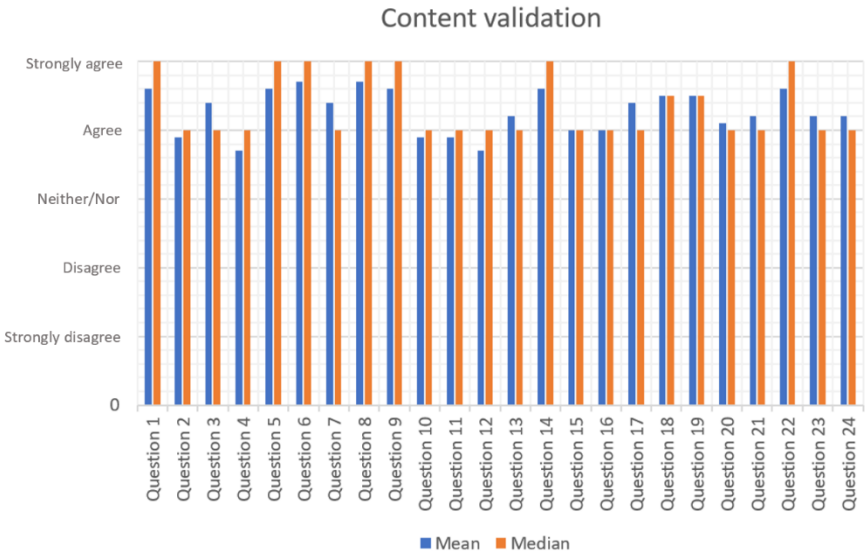


Figure 4: Mean and median point score for each question in the veterinarians' questionnaire on the 5-point likert scale from strongly disagree to strongly agree.

Among 24 statements, 19 received a mean point score ranging between 4 and 5 (equivalent to being placed between *"agree"* and "*strongly agree"* on the Likert scale), with the highest mean score being 4.7. These statements presented a median score varying between 4 and 5. Five statements received a mean point score below 4 with the lowest score recorded being 3.7. The median score for these statements was 4. Overall, no mean scores were placed below 3, equivalent to *"neither/nor"* on the likert scale.

Table 7 shows the mean- and median score for each element, the veterinarians were asked to rank on the 5-point likert scale. The questions receiving the lowest mean scores concerned the tactile realism of the oro-gastric intubation and repositioning of the stomach. The ones with the highest mean scores were mainly related to the case description, trocarization and incisional procedures during the gastropexy.

Question	Mean	Median
1. The case description including diagnostic studies contains a realistic example of a GDV patient – please elaborate.	4.6	5
2. The simulation provides a sufficiently realistic picture of how to stabilize a GDV patient in shock – please elaborate.	3.9	4
3. The written instruction for initial shock treatment is easy to read and understand – please elaborate.	4.4	4
4. Orogastric intubation of the patient can be performed on the simulator with sufficient tactile realism – please elaborate	3.8	4
5. Orogastric intubation of the patient can be performed on the simulator with sufficient visual realism in relation to anatomical landmarks – please elaborate.	4.6	5
6. The written instruction on orogastric intubation is easy to read and understand – please elaborate.	4.7	5
7. Trocarization of the patient can be performed on the simulator with sufficient tactile realism – please elaborate.	4.4	4
8. Trocarization of the patient can be performed on the simulator with sufficient visual realism in relation to anatomical landmarks – please elaborate.	4.7	5
9. The written instruction on trocarization is easy to read and understand – please elaborate.	4.6	5
10. The dimensions of the simulator provide a sufficiently realistic picture of the position and filling of the abdominal organs – please elaborate.	3.9	4
11. Overall, the tactile sensation of the abdominal organs is sufficiently realistic – please elaborate.	3.9	4
12. Repositioning of the stomach can be performed on the simulator with sufficient tactile realism – please elaborate.	3.7	4
13. Repositioning of the stomach can be performed on the simulator with sufficient visual realism in relation to anatomical landmarks – please elaborate.	4.2	4
14. The simulator allows correct anatomical siting of the incision in the stomach – please elaborate.	4.6	5
15. Incision through the layers of the stomach in the simulator can be performed with sufficient visual realism – please elaborate.	4	4
16. Incision through the layers of the stomach in the simulator can be performed with sufficient tactile realism – please elaborate.	4	4
17. The simulator allows correct anatomical siting of the incision in the abdominal wall – please elaborate.	4.4	4
18. Incision through the layers of the abdominal wall of the simulator can be performed with sufficient visual realism – please elaborate.	4.5	4.5
19. Incision through the layers of the abdominal wall of the simulator can be performed with sufficient tactile realism – please elaborate.	4.5	4.5
20. Suturing in the abdominal wall is sufficiently realistic – please elaborate.	4.1	4
21. Suturing in the stomach is sufficiently realistic – please elaborate.	4.2	4
22. The simulator is easy to use – please elaborate.	4.6	5
23. Overall, the simulation provides a realistic picture of what it is like to manage a GDV patient – please elaborate.	4.2	4
24. I assess that the simulation has the overall characteristics necessary to contribute to help make novices more comfortable with managing a GDV patient – please elaborate.	4.2	4

Table 7: Veterinary questionnaire showing mean and median point score for each question on a 5-point likert scale where "strongly agree" equals 5 points and "strongly disagree" equals 1 point.

Additional comments from the participating veterinarians appear from appendix 8.

4.3.2. Student trials

The study population comprised of 35 veterinary students consisting of 28 women (80%) and seven men (20%). All participants had completed their companion animal clinical rotation and the rotation in emergency medicine, and out of these, four had also completed the companion animal differentiation. Among participants, 28 (80%) had never seen, assisted nor managed a GDV patient, whilst three had witnessed the diagnosis and treatment of a GDV patient without actively participating. Four had assisted a GDV patient without the primary responsibility and none of the participants had diagnosed and treated a GDV patient themselves.

The highest and lowest possible scores for a student were 70 and 14 points for each question, respectively. Table 8 shows the mean scores for students before and after completing the simulation and the mean difference. The mean score difference ranges from 10.6 to 14.5 points for the first seven questions whereas differences for the last three questions ranges from 6.6 to 7.5 points.

Question	Mean score before	Mean score after	Mean difference
1. Imagine being on call alone with no back-up veterinarian and being told that a possible GDV patient is on its way. How do you feel while waiting?	39.3	53.8	14.5
2. How do you feel about having to stabilize a GDV patient in shock?	43.5	54.1	10.6
3. How do you feel about having to decompress and lavage the stomach of a GDV patient using an orogastric tube?	48.09	60.7	12.6
4. How do you feel about having to decompress the stomach of a GDV patient using transcutaneous trocarisation? (Using a 14g needle)	45.3	57.06	11.7
5. How do you feel about having to orientate yourself about the positioning of the stomach and the degree of volvulus?	42.1	53.8	11.6
6. How do you feel about having to reposition the stomach intraoperatively?	43.3	55.3	11.9
7. How do you feel about having to make the incision for the gastropexy in the stomach?	44.03	56.6	12.6
8. How do you feel about having to suture the stomach to the abdominal wall?	49.7	57.2	7.5
9. How do you feel about having to assess the degree of necrosis of the stomach in order to possibly performing a partial gastrectomy (removal of the necrotic part of the stomach)?	42.06	49.5	7.4
10. How do you feel about possibly having to perform a spleen extirpation in connection with a GDV surgery?	37.1	43.7	6.6

Table 8: Results from student questionnaires showing the mean point score before and after completing the simulation and the mean difference.

The paired t-test from student trials revealed a statistically significant difference for all 10 questions with all p-values being below 0.001 These results are presented in table 9.

Paired Samples Test

		Paired Differences					t	df	Significance	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			One-Sided p	Two-Sided p
Pair 1	Q1after - Q1before	14,54286	6,13257	1,03659	12,43625	16,64947	14,029	34	<,001	<,001
Pair 2	Q2after - Q2before	10,57143	6,53176	1,10407	8,32769	12,81517	9,575	34	<,001	<,001
Pair 3	Q3after - Q3before	12,57143	8,64763	1,46172	9,60086	15,54199	8,600	34	<,001	<,001
Pair 4	Q4after - Q4before	11,74286	7,17980	1,21361	9,27651	14,20921	9,676	34	<,001	<,001
Pair 5	Q5after - Q5before	11,62857	8,20719	1,38727	8,80930	14,44784	8,382	34	<,001	<,001
Pair 6	Q6after - Q6before	11,94286	7,81380	1,32077	9,25872	14,62699	9,042	34	<,001	<,001
Pair 7	Q7after - Q7before	12,57143	9,02052	1,52475	9,47277	15,67008	8,245	34	<,001	<,001
Pair 8	Q8after - Q8before	7,45714	7,53557	1,27374	4,86858	10,04570	5,855	34	<,001	<,001
Pair 9	Q9after - Q9before	7,42857	8,69173	1,46917	4,44286	10,41429	5,056	34	<,001	<,001
Pair 10	Q10after - Q10before	6,57143	6,50016	1,09873	4,33854	8,80431	5,981	34	<,001	<,001

Table 9: Paired t-test with a 95% confidence interval of the difference, showing a significant change in students' emotional scores with a p-value <0.001.

Table 10 illustrates results regarding perceived challenging components in GDV management, while table 11 shows the change in confidence level among students before compared to after completing the simulation. The tables illustrate the number and percentage change in responds from before to after completion of the simulation. Moreover, figure 5 illustrates the changes in overall confidence levels among student participants regarding management of GDV patients. Additional comments on the simulation provided by student participants appear from appendix 9.

Question C: *Which part of the process in managing a GDV patient do you expect to be the most challenging for you? (Multiple answers possible)*

Procedure	**Before**	**After**
Diagnosing the patient	7 (5.7%)	5 (6.4%)
Stabilizing the patient	23 (18.8%)	12 (15.4%)
Interpretation of blood test results	15 (12.3%)	11 (14.1%)
Trocarization (gastric decompression with a large bore needle)	15 (12.3%)	3 (3.8%)
Orogastric intubation and lavage	16 (13.1%)	1 (1.2%)
Gastropexy (surgical attachment of the stomach to the abdominal wall)	16 (13.1%)	17 (21.8%)
Removal of necrotic tissue (e.g., partial gastrectomy or splenic extirpation)	25 (20.5%)	29 (37.2%)
All steps	5 (4.1%)	0 (0%)
I do not feel challenged	0 (0%)	0 (0%)
Total	**122 (100%)**	**78 (100%)**

Table 10: Results regarding challenging components in GDV management before and after completing the simulation. Number and percentage of responses are given. Note: multiple answers were possible, therefor the unequal number of responses before compared to after.

Question E: *How would you rate your confidence in managing a GDV patient?*

Confidence	Before	After
Very good	0 (0%)	3 (8.6%)
God	3 (8.6%)	22 (62.9%)
Neither/nor	7 (20%)	9 (25.7%)
Poor	17 (48.6%)	1 (2.9%)
Very poor	8 (22.9%)	0 (0%)
Total	**35 (100%)**	**35 (100%)**

Table 11: Table 11: Rating of perceived self-confidence among students before and after completing the simulation. Number and percentage of responses are given.

Figure 5: Confidence level among students before and after completing the GDV simulation.

4.4. Discussion

This study created a GDV simulation, investigated it for evidence of content validity and subsequently analyzed its effect on students' perceived emotions regarding the management of the condition. The simulation was evaluated by experienced veterinarians and showed evidence of content validity, suggesting that it is a useful tool for student practice. Furthermore, the simulation led to a significant shift in students' perceived emotions towards the more positive in all components of the GDV procedure and increased their perceived level of confidence in managing GDV patients. This may help facilitate learning, since a reduction in negative emotions lowers cognitive load, thereby reducing the risk of exceeding WM capacity.

To evaluate the simulation, it was deemed necessary for the experienced veterinarians to have a predetermined amount of experience. A recent study found a significant correlation between

survival rates of GDV patients and the experience of the surgeon[110], which further supports this decision. Therefore, the established cut-off value, of minimum 3 years of experience and 5 GDV patients withing the past 5 years, was maintained despite difficulty in obtaining qualified veterinarians. Additionally, comprehensive examination of existing literature indicates a decrease in overall mortality rates among GDV patients over time, emphasizing the importance of participating veterinarians being updated on the knowledge regarding GDV[6,10,24,25,110,111].

Evidence of content validity was deemed satisfactory in an overall perspective. Due to time and resource limitations, as well as the complexity of GDV patients, it was only feasible to evaluate evidence of content validity in the present study. Evidence of validity could possibly have been more comprehensive by incorporating assessment of multiple sources[89,91]. However, the evidence of content validity suggests that the Maverick simulation sufficiently represents a GDV patient and therefore may be used with the purpose of making students calmer in managing GDV patients. While most veterinarians have provided mainly positive feedback, some also expressed negative views by disagreeing with certain questions and offering more critical comments. Components receiving the lowest evaluation scores regarded the tactile realism of the oro-gastric intubation and the repositioning of the stomach. Most of the comments concerned the intubation being too easy and the lack of dilatation of the stomach. Using a bicycle tube with a smaller diameter might make the intubation more difficult and thereby more realistic. Due to time- and resource limitations, it was not technically possible to create a dilated stomach and at the same time enable oro-gastric intubation. A solution to this problem could be to fill the stomach with some of the stuffing from the toy dog, or to deepen the clay mould (*appendix 6, picture Oa and Ob*), thereby creating the impression of a more dilated stomach that would take up more room in the abdominal cavity. However, the fact that the learner simply obtains to practice these psychomotor skills may be beneficial, since it still catches the essence of the procedure. This is supported by the suggestion that the initial step in learning a new skill is developing the ability to coordinate perception with motor skills[75].

It was interesting to observe, that the veterinarians with the most experience (38 and 35 years), and specialization in small animal surgery, provided the least favorable responses. For example, one of these veterinarians incorrectly commented that the stomach was counterclockwise rotated in the simulator, and another performed a different gastropexy method than the one portrayed in the case instruction. This observation might be explained by the so-called “expertise reversal effect” which describes that an instructional method with a proved beneficial effect on novices may have no or

even adverse effect on experts[112,113]. The simplicity of the simulation, intended to lower the extraneous load for novices, may inadvertently increase extraneous load for experts thus impairing their performance[113,114]. Naturally, it is important to acknowledge that critical responses provided by experts may also simply indicate insufficiencies in the simulation, as it may be presumed that these experts possess the greatest knowledge in the area.

Furthermore, participating veterinarians suggested several additions for the simulation. Some examples included generating a more tympanic sound for percussion, allowing the students to perform an ultrasound, using two sutures for the gastropexy instead of one and implementing a stress-element such as a beeping monitor. All these suggestions are valuable, but several factors should be considered before implementing them in the simulation. First, this simulation was created for teaching purposes. The physical fidelity must be adapted to the experience level of the intended users and aim not to exceed the cognitive capacity in order to obtain successful learning. By including several components, and increasing fidelity, cognitive load may increase, which in turn potentially impairs learning. Low-fidelity simulators have proven effective in surgical training[70,73,81,105]. In fact, studies have proven that low-fidelity simulators are equally as good or even superior in developing clinical skills among medical students compared to high-fidelity simulators[66,72]. Additionally, a study by *Langebæk et al* demonstrated that a low-fidelity simulator increased students' perceived confidence levels[105], while another study by *Massoth et al* showed that a high-fidelity simulator led to overconfidence among students[66]. However, the suggestion of incorporating additional components may over time be beneficial to gradually increase the complexity as described by the CLT[64,115]. This approach aligns with the previously mentioned Yerkes & Dodson Law[67]. Nevertheless, timing in the learning progression seems essential when increasing the cognitive load, including both stress and task complexity to ensure optimal learning and performance as suggested by several studies[40,56,61,64,115,116]. Considering these factors, the implementation of the Maverick simulator, into the veterinary curriculum, should contain the possibility of varying complexities. The following flowchart (figure 6) shows a suggestion for a GDV teaching sequence:

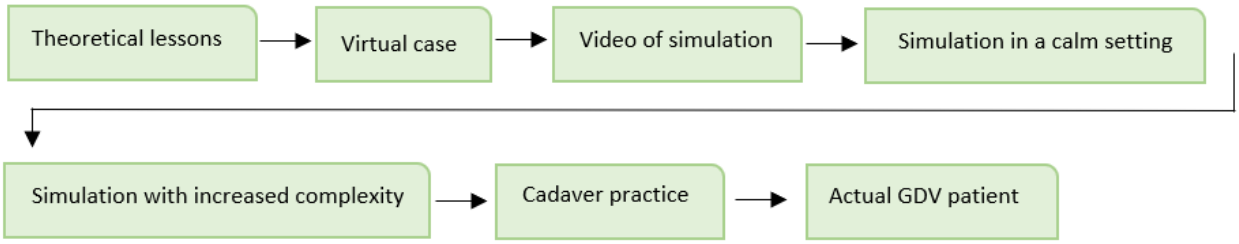


Figure 6: Suggestion for a GDV teaching sequence.

Results from the students' questionnaires showed significant changes in perceived emotions in all questions. This indicates a notable shift towards more positive emotions after completing the simulation which may positively influence students' learning and memory. Furthermore, the results also indicated substantial increase in their perceived confidence level regarding the management of GDV patients. These findings suggest that completing the simulation positively affected the students' level of insecurity, which is consistent with previous research indicating the positive influence of simulator training on students' emotions, which may ultimately contribute to enhanced learning[74,80,117]. However, since some veterinarians indicated that the simulation might have portrayed a rather simplified exposition of certain components, it is possible that the students' improvement in emotional score attributes to the relative ease in performing these specific tasks. Nevertheless, it is worth noting that the veterinarians assessed, that the simulation could help making students more comfortable with the overall procedure. Out of five comments on the ease of the simulation, only one veterinarian declared that the overall simulation was a little too easy, while the remaining four comments focused on individual components. Clearly it was attempted to create a life-like tactile and visual sensation. Nevertheless, this may not be crucial, since simulators with a much lower fidelity have proven efficient in skill acquisition and in reducing anxiety[66,81,105]. A study by *Langebæk et al* have however shown, that the tactile, visual, dimensional, and situational features are of importance to students when assessing the usability of surgical simulators[81]. This simulation was overall considered tactile and visually sufficient by veterinarians, and the significant increase in students' emotional scores indicates that it is useful for this purpose.

Notably, the emotions defined in the students' questionnaire were determined by the authors. As described by *Russel*[44], emotional categorizations may vary between individuals, and a possible beneficial approach could have been to ask a broad population of individuals to define their perceived emotions regarding GDV management and include these responses in the questionnaire. Furthermore, the emotions listed in the questionnaire may vary in perceived valence between

individuals. For instance, if a participant responds with "*Extremely"* both to the statement "*I feel anxious*" and "*I feel confused*", these two statements will both be assigned with 1 point. This may be imprecise since some might perceive being extremely anxious as more negative than feeling extremely confused.

All questions did show a significant difference in emotional scores before compared to after the simulation, also in the matter of performing a splenectomy and assessment of necrosis. Even though the mean difference in these questions was less remarkable than most of the remaining questions, this was an unexpected finding, since the simulation does not include performing a splenectomy nor contains necrotic tissue. Several students commented that they felt more secure in the individual procedures, except in performing a splenectomy and assessing necrosis. Despite this, these students' emotional scores still increased in these two questions. A possible explanation for this outcome might be that the students' overall confidence has increased, hence influencing their responses to these questions becoming more positive. It is possible that their increased confidence in other components of the procedure allows them to focus more on these two elements and thereby reduces their perceived negative emotions. Despite the overall significant change, it should be noted, that several students actually had a decrease in emotional score in these particular questions.

In the comments, some students expressed a wish for pictures of necrosis in the case. However, relying solely on visual assessment might not be particularly helpful in this matter. Apart from a wide range of appearances of necrotic tissue, the tactile sensation plays a crucial role in determining if the tissue should be removed or not[32]. One experienced veterinarian pointed out that even though removal of necrotic tissue is not considered a day-one competence, it is essential to address such possible complications if performing a gastropexy. For this reason, it may be beneficial including information on how to manage such cases either permanently or temporary until more experienced colleagues are available. Moreover, it may be argued that students who have been presented with pictures of necrotic tissue, may be more inclined to physically inspect tissue appearing this way and thereby identify necrotic tissue that should be removed. Pictures of necrotic tissue would be a quite simple addition to the simulation. However, the cognitive load on novices should still be considered when practicing on a simulator, which is why a separate simulator for necrosis assessment and splenectomy would most likely be more advantageous.

Another surprising finding was the less prominent increase in emotional scores regarding suturing the stomach to the abdominal wall, compared to the remaining questions. We did not expect this since this was a feature of the simulator. Additionally, none of the experienced veterinarians

assessed this component too difficult. During the simulation, several students were surprised by the technical execution of a gastropexy. They believed that the gastropexy was simply performed by suturing the stomach to the abdominal wall and were surprised that they had to make two incisions and two continuous sutures in a vertical direction. This indicates that the students may have expected an easier procedure and that the surprising complexity might explain the less prominent increase in emotion scores in this matter. This also aligns with this question receiving the highest mean score prior to completion of the simulation, despite of the gastropexy by far being assessed as the most challenging in the pilot study. This finding may be explained by the Dunning-Kluger effect, describing that a lack of experience in a particular task may lead to overrating of own skills[118]. Despite the minor increase in emotional scores in these matters, the results presented in table 10 showed, that after completion, more participants were challenged by components, that were not a part of the simulation. For example, more participants were challenged by removal of necrotic tissue and interpretation of bloodwork after than before, while fewer were challenged by oro-gastric intubation and trocarization. However, an exception was that more participants were challenged by the gastropexy after than before, which aligns with this components' less prominent increase in mean emotional scores compared to other questions.

In this study a student expressed the urge to practice the gastropexy several times in order to become more confident. This emphasizes the importance of repetitive practice in skill acquisition for a certain procedure and furthermore underlines the usefulness of simulators as described by other studies[75,79]. The opportunity for repetitive practice does, however, come with additional costs since each use requires reloading, and for this reason the Maverick simulator was designed to be cost-effective. Only two foam dressing suture pads and one piece of "skin" for the initial incision is required for reloading between each student, which allows students to try it multiple times.

Besides allowing repetitive practice, simulators also contribute to reducing the use of live animals and cadavers, thus aligning with the principle of the three R's[85]. However, in this case it can be debated if a GDV simulator to a higher extend is an addition and not a replacement, reduction nor a refinement, since practical management of GDV patients is not a standard part of the veterinary curriculum in Denmark. Even as an addition, the use of the Maverick simulation hopefully increases animal welfare by contributing to the improvement in future veterinarians' ability to manage GDV patients correctly.

Overall, after completing it once, the simulation successfully attained the intended effect among students. However, it is important to acknowledge potential sources of error influencing this

outcome. In this study, solely the state anxiety was evaluated. Since we know that state anxiety is closely connected to trait anxiety[50], it would most likely add an extra dimension to the interpretation of the results to be acquainted with the students' trait anxiety as well. Additionally, all participants in the present study were volunteers, thus indicating a certain amount of motivation to learn about GDV management. Motivation plays a decisive role in successful learning, as it provides mental and physical preparedness and focus[60,115]. Consequently, participants' motivation may alone have facilitated enhanced learning and thereby lead to increase in confidence and reduction in perceived anxiety. Had participants been randomly elected, it is plausible suggesting that the results would have been less prominent. This suggestion aligns with reported descriptions of volunteer bias[119,120]. Despite volunteer bias being frequently described, it should be acknowledged that simulator training has been associated with increase in self-confidence, irrespective of participants volunteering or not[74,83]. Furthermore, student participants were aware that the simulation concerned GDV management. Therefore, it is also important to acknowledge that they may have spent time reflecting or gathering information on the subject prior to attending the simulation.

A general area of concern is the possibility of social desirability bias. Since it was necessary for the authors to attend student trials, students might have tended to respond in a way that they thought were expected of them to please the study objective. The aim of the study was quite distinct when responding to the first questionnaire which may have affected responses. This is a well-known source of bias[121–123]. Moreover, due to the length and uniformity of the questionnaire, the possibility of response fatigue bias should be acknowledged[122,124].

In this study, all participating students completed the simulation. Another approach that might had been favorable would have involved using a case-control study design. In this setup, students in the control group would solely have replied to the questionnaire while the test group would have completed the simulation and subsequently have responded to the questionnaire. There is a possibility that this could have remedied some of the biases arising from students figuring out the intended purpose of the study when answering the first questionnaire.

Observing that the emotion scores among students were generally low prior to completing the simulation was not surprising. These findings align with a previous study conducted at University of Copenhagen, which showed that students were significantly more anxious when attending a surgical course than a non-surgical course[80]. Moreover, part 1 of the present study indicated that Danish veterinarians and veterinary students highly express fear and lack of confidence in managing GDV patients, and in the light of these findings, emergency surgery simulators could be

considered incorporated into the veterinary curriculum. Several studies support this suggestion, since emergency procedures are associated with high levels of stress[40,56,75,97,125].
Stress and anxiety have been proven to impair learning[40,56,115,125], and therefore it can be argued that it is most likely ineffective teaching emergency procedures in real life, where stressful emotions may be too overwhelming for the student. In this study, the simulation was intentionally carried out in a stress-free environment. Students were explicitly told that the simulation was not an evaluation of their skills. This decision was based on studies describing that experiencing distress during an emergency simulation is unfavorable in facilitating learning[126]. Furthermore, testing and evaluation of students during a simulation may contribute to increased stress levels[127,128] while a safe learning environment improves learning outcomes and performance[63]. In a non-stressful environment, students may experience more positive emotions, for example regarding their self-efficacy. It has been described that positive efficacy cognitions are related with better performance[43], thereby suggesting that the students might perform better if they are motivated by their belief in their own capabilities. In the light of this knowledge, it can be considered teaching emergency procedures without the element of stress. In general, veterinarians face significant challenges such as stress and anxiety[129,130], which is also reflected in high suicide rates within the profession[131]. Apart from improving teaching strategies, education in coping strategies could be considered incorporated in the curriculum, as this has been shown to enhance performance[78]. Wellbeing of veterinarians should be prioritized, and necessary adjustments should be carried out to reduce the existing stress and anxiety among students [80], thereby benefitting both students and animal patients.

5. Conclusion

The results of the pilot study in this thesis showed that most participants held mainly negative emotions regarding managing GDV patients. Furthermore, the pilot study identified gastropexy, stabilization, oro-gastric intubation and trocarization as being the most challenging aspects of the GDV procedure among participants. The overall results of the pilot study suggested a need for a GDV simulation for practical training in management of GDV patients, which should contain the components that participants perceived most challenging.
The Maverick simulation showed evidence of content validity from evaluation provided by experienced veterinarians. This confirms that the simulation sufficiently represents a GDV patient and may serve as a useful tool in reducing the amount of perceived negative emotions regarding GDV management among veterinary students.

After completing the Maverick simulation, in a low-stress environment, students experienced a significant decrease in negative emotions concerning GDV patients in all components of the procedure. Furthermore, their confidence in managing a GDV patient increased following the simulation. The findings in this study suggest that incorporating the Maverick simulation into the veterinary curriculum may be beneficial in reducing students' negative emotions concerning GDV management and may contribute to enhanced learning.

6. Perspectives

The present study investigated the impact of a GDV simulator on veterinary students' perceived emotions and confidence levels. Incorporation of the Maverick simulation in the veterinary curriculum may have a major influence on future students perceived emotions and confidence levels regarding GDV patients. Although practical skills were not assessed by this study, veterinary simulators may also serve as a tool to assess students' performances. By using rubrics, it would be possible for teachers to evaluate performances and thereby identify areas in need of improvement. It may be a useful tool in assessing both students' individual achievements and educational pitfalls.

The research and results of this study clarified the challenges faced when teaching emergency procedures. Continuous development of veterinary simulators may be beneficial, especially in areas such as emergency medicine and surgery, where procedures can be challenging to teach. During the collaboration with CAMES we discovered the immense use of humane simulators. A future working relationship between humane and veterinary medicine, regarding the use and development of simulators, should be explored in order to share knowledge in the area.

Given the widely agreed recognition of veterinary medicine as a stressful field, it would be interesting to explore the impact of educating veterinary students in stress coping strategies. Further research is necessary regarding the impact of coping strategies on stress and anxiety in the veterinary field.

References

1. Rosselli D. Updated Information on Gastric Dilatation and Volvulus and Gastropexy in Dogs. *Vet Clin North Am Small Anim Pract*. 2022;52(2):317-337. doi:10.1016/j.cvsm.2021.11.004

2. Monnet E. Gastric dilatation-volvulus syndrome in dogs. *Vet Clin North Am Small Anim Pract*. 2003;33(5):987-1005. doi:10.1016/S0195-5616(03)00059-7

3. Funkquist B. Gastric torsion in the dog-I. Radiological picture during nonsurgical treatment related to the pathological anatomy and to the further clinical course. *J Small Anim Pract*. 1979;20(2):73-91. doi:10.1111/j.1748-5827.1979.tb05942.x

4. Tivers M, Brockman D. Gastric dilation-volvulus syndrome in dogs 1. Pathophysiology, diagnosis and stabilisation. *In Pract*. 2009;31(2):66-69. doi:10.1136/inpract.31.2.66

5. Stieger-Vanegas SM, Frank PM. Stomach. In: *Textbook of Veterinary Diagnostic Radiology*. Elsevier; 2018:894-925. doi:10.1016/B978-0-323-48247-9.00058-9

6. Glickman L, Lantz G, Schellenberg D, Glickman N. A prospective study of survival and recurrence following the acute gastric dilatation-volvulus syndrome in 136 dogs. *J Am Anim Hosp Assoc*. 1998;34(3):253-259. doi:10.5326/15473317-34-3-253

7. Sharp CR, Rozanski EA. Cardiovascular and Systemic Effects of Gastric Dilatation and Volvulus in Dogs. *Top Companion Anim Med*. 2014;29(3):67-70. doi:10.1053/j.tcam.2014.09.007

8. Funkquist B, Garmer L. Pathogenetic and Therapeutic Aspects of Torsion of the Canine Stomach. *J Small Anim Pract*. 1967;8(9):523-532. doi:10.1111/j.1748-5827.1967.tb06775.x

9. Blackburn PS, McFarlane D. Acute fatal dilatation of the stomach in the dog. *J Comp Pathol Ther*. 1944;54:189-199. doi:10.1016/S0368-1742(44)80020-0

10. Glickman LT, Glickman NW, Pérez CM, Schellenberg DB, Lantz GC. Analysis of risk factors for gastric dilatation and dilatation-volvulus in dogs. *J Am Vet Med Assoc*. 1994;204(9):1465-1471.

11. O'Neill D. G, Case J, Boag AK, et al. Gastric dilation-volvulus in dogs attending UK emergency-care veterinary practices: prevalence, risk factors and survival. *J Small Anim Pract*. 2017;58(11):629-638. doi:10.1111/jsap.12723

12. Brockman DJ, Washabau RJ, Drobatz KJ. Canine gastric dilatation/volvulus syndrome in a veterinary critical care unit: 295 cases (1986-1992). *J Am Vet Med Assoc*. 1995;207(4):460-464.

13. Glickman LT, Glickman NW, Schellenberg DB, Raghavan M, Lee T. Non-dietary risk factors for gastric dilatation-volvulus in large and giant breed dogs. *J Am Vet Med Assoc*. 2000;217(10):1492-1499. doi:10.2460/javma.2000.217.1492

14. Schellenberg D, Yi Q, Glickman N, Glickman L. Influence of thoracic conformation and genetics on the risk of gastric dilatation-volvulus in Irish setters. *J Am Anim Hosp Assoc*. 1998;34(1):64-73. doi:10.5326/15473317-34-1-64

15. Km E, Vj A. Mortality and morbidity due to gastric dilatation-volvulus syndrome in pedigree dogs in the UK. *J Small Anim Pract*. 2010;51(7). doi:10.1111/j.1748-5827.2010.00949.x

16. de Battisti A, Toscano MJ, Formaggini L. Gastric foreign body as a risk factor for gastric dilatation and volvulus in dogs. *J Am Vet Med Assoc*. 2012;241(9):1190-1193. doi:10.2460/javma.241.9.1190

17. Raghavan M, Glickman N, McCabe G, Lantz G, Glickman LT. Diet-related risk factors for gastric dilatation-volvulus in dogs of high-risk breeds. *J Am Anim Hosp Assoc*. 2004;40(3):192-203. doi:10.5326/0400192

18. Ullmann B, Seehaus N, Hungerbühler S, Meyer-Lindenberg A. Gastric dilatation volvulus: a retrospective study of 203 dogs with ventral midline gastropexy. *J Small Anim Pract*. 2016;57(1):18-22. doi:10.1111/jsap.12406

19. Haak CE, Rudloff E, Kirby R. Comparison of Hb-200 and 6% hetastarch 450/0.7 during initial fluid resuscitation of 20 dogs with gastric dilatation-volvulus. *J Vet Emerg Crit Care San Antonio Tex 2001*. 2012;22(2):201-210. doi:10.1111/j.1476-4431.2012.00726.x

20. Wingfield WE, Cornelius LM, Deyoung DW. Pathophysiology of the gastric dilation-torsion complex in the dog. *J Small Anim Pract*. 1974;15(12):735-739. doi:10.1111/j.1748-5827.1974.tb05659.x

21. Green JL, Cimino Brown D, Agnello KA. Preoperative thoracic radiographic findings in dogs presenting for gastric dilatation-volvulus (2000-2010): 101 cases: Thoracic radiographs in gastric dilatation and volvulus. *J Vet Emerg Crit Care*. 2012;22(5):595-600. doi:10.1111/j.1476-4431.2012.00802.x

22. Mooney E, Raw C, Hughes D. Plasma Lactate Concentration as a Prognostic Biomarker in Dogs With Gastric Dilation and Volvulus. *Top Companion Anim Med*. 2014;29(3):71-76. doi:10.1053/j.tcam.2014.09.005

23. Green TI, Tonozzi CC, Kirby R, Rudloff E. Evaluation of initial plasma lactate values as a predictor of gastric necrosis and initial and subsequent plasma lactate values as a predictor of survival in dogs with gastric dilatation-volvulus: 84 dogs (2003-2007): GDV and plasma lactate. *J Vet Emerg Crit Care*. 2011;21(1):36-44. doi:10.1111/j.1476-4431.2010.00599.x

24. Mackenzie G, Barnhart M, Kennedy S, DeHoff W, Schertel E. A retrospective study of factors influencing survival following surgery for gastric dilatation-volvulus syndrome in 306 dogs. *J Am Anim Hosp Assoc*. 2010;46(2):97-102. doi:10.5326/0460097

25. Pass MA, Johnston DE. Treatment of gastric dilation and torsion in the dog. Gastric decompression by gastrostomy under local analgesia. *J Small Anim Pract*. 1973;14(3):131-142. doi:10.1111/j.1748-5827.1973.tb06908.x

26. Brourman JD, Schertel ER, Allen DA, Birchard SJ, DeHoff WD. Factors associated with perioperative mortality in dogs with surgically managed gastric dilatation-volvulus: 137 cases (1988-1993). *J Am Vet Med Assoc*. 1996;208(11):1855-1858.

27. Rauserova-Lexmaulova L, Vanova-Uhrikova I, Rehakova K. Acid-Base, Electrolyte and Lactate Abnormalities as Well as Gastric Necrosis and Survival in Dogs With Gastric Dilation-Volvulus Syndrome. A Retrospective Study in 75 Dogs. *Top Companion Anim Med*. 2020;39:100403. doi:10.1016/j.tcam.2020.100403

28. Verschoof J, Moritz A, Kramer M, Bauer N. Hemostatic variables, plasma lactate concentration, and inflammatory biomarkers in dogs with gastric dilatation-volvulus. *Tierärztl Prax Ausg K Kleintiere Heimtiere*. 2015;43(06):389-398. doi:10.15654/TPK-150284

29. Fossum T. Surgery of the digestive system. In: *Small Animal Surgery 5th Edition*. Elsevier; 2018:406-415.

30. Goodrich ZJ, Powell LL, Hulting KJ. Assessment of two methods of gastric decompression for the initial management of gastric dilatation-volvulus. *J Small Anim Pract*. 2013;54(2):75-79. doi:10.1111/jsap.12019

31. White RS, Sartor AJ, Bergman PJ. Evaluation of a staged technique of immediate decompressive and delayed surgical treatment for gastric dilatation-volvulus in dogs. *J Am Vet Med Assoc*. 2021;258(1):72-79. doi:10.2460/javma.258.1.72

32. Tivers M, Brockman D. Gastric dilation–volvulus syndrome in dogs : 2. Surgical and postoperative management. *In Pract*. 2009;31. doi:10.1136/inpract.31.3.114

33. Beck JJ, Staatz AJ, Pelsue DH, et al. Risk factors associated with short-term outcome and development of perioperative complications in dogs undergoing surgery because of gastric dilatation-volvulus: 166 cases (1992–2003). *J Am Vet Med Assoc*. 2006;229(12):1934-1939. doi:10.2460/javma.229.12.1934

34. Kipnis RM. Torsion of the splenic pedicle and gastric volvulus in a dog. *J Am Vet Med Assoc*. 1974;164(12):1202-1203.

35. Benitez ME, Schmiedt CW, Radlinsky MG, Cornell KK. Efficacy of Incisional Gastropexy for Prevention of GDV in Dogs. *J Am Anim Hosp Assoc*. 2013;49(3):185-189. doi:10.5326/JAAHA-MS-5849

36. Allen P, Paul A. Gastropexy for Prevention of Gastric Dilatation-Volvulus in Dogs: History and Techniques. *Top Companion Anim Med*. 2014;29(3):77-80. doi:10.1053/j.tcam.2014.09.001

37. Wingfield WE, Betts CW, Greene RW. Operative techniques and recurrence rates associated with gastric volvulus in the dog. *J Small Anim Pract*. 1975;16(7):427-432.

38. Tanno F, Weber U, Wacker C, Gaschen L, Schmid V, Lang J. Ultrasonographic comparison of adhesions induced by two different methods of gastropexy in the dog. *J Small Anim Pract*. 1998;39(9):432-436. doi:10.1111/j.1748-5827.1998.tb03751.x

39. Smeak DD. Gastropexy. In: *Gastrointestinal Surgical Techniques in Small Animals*. John Wiley & Sons, Ltd; 2020:165-178. doi:10.1002/9781119369257.ch23

40. Fraser K, Ma I, Teteris E, Baxter H, Wright B, McLaughlin K. Emotion, cognitive load and learning outcomes during simulation training. *Med Educ*. 2012;46(11):1055-1062. doi:10.1111/j.1365-2923.2012.04355.x

41. Pekrun R. The Control-Value Theory of Achievement Emotions: Assumptions, Corollaries, and Implications for Educational Research and Practice. *Educ Psychol Rev*. 2006;18(4):315-341.

42. Young JQ, Van Merrienboer J, Durning S, Ten Cate O. Cognitive Load Theory: Implications for medical education: AMEE Guide No. 86. *Med Teach*. 2014;36(5):371-384. doi:10.3109/0142159X.2014.889290

43. King PS. Emotions: Positive and Negative. In: Gellman MD, ed. *Encyclopedia of Behavioral Medicine*. Springer International Publishing; 2020:753-755. doi:10.1007/978-3-030-39903-0_949

44. Russell J. A Circumplex Model of Affect. *J Pers Soc Psychol*. 1980;39:1161-1178. doi:10.1037/h0077714

45. Barrett LF, Russell JA. Independence and Bipolarity in the Structure of Current Affect. *J Pers Soc Psychol*. 1998;74(4):967-984. doi:10.1037/0022-3514.74.4.967

46. Du J, Huang J, An Y, Xu W. The Relationship between stress and negative emotion: The Mediating role of rumination. *Clin Res Trials*. 2018;4(1). doi:10.15761/CRT.1000208

47. Fiedler N, Laumbach R, Kelly-McNeil K, et al. Health Effects of a Mixture of Indoor Air Volatile Organics, Their Ozone Oxidation Products, and Stress. *Environ Health Perspect*. 2005;113(11):1542-1548.

48. World Health Organization. Stress. Published February 2023. Accessed May 11, 2023. https://www.who.int/news-room/questions-and-answers/item/stress

49. Selye H. HISTORY AND GENERAL OUTLINE OF THE STRESS CONCEPT. In: *Stress in Health and Disease*. Elsevier; 1976:3-34. doi:10.1016/B978-0-407-98510-0.50009-4

50. Spielberger CD, Gorsuch RL, Lushene RE. *STAI Manual for the STATE-TRAIT ANXIETY INVENTORY ("Self-Evaluation Questionnaire")*. Consulting Psychologists Press, Inc.; 1970.

51. Spielberger CD. *Group Report: State-Trait Anxiety Inventory for Adults*. Mind Garden, Inc.; 2015.

52. Wolf OT. The influence of stress hormones on emotional memory: Relevance for psychopathology. *Acta Psychol (Amst)*. 2008;127(3):513-531. doi:10.1016/j.actpsy.2007.08.002

53. Atkinson RC, Shiffrin RM. Human Memory: A Proposed System and its Control Processes. In: Spence KW, Spence JT, eds. *Psychology of Learning and Motivation*. Vol 2. Academic Press; 1968:89-195. doi:10.1016/S0079-7421(08)60422-3

54. Sweller J, Ayres P, Kalyuga S. Altering Element Interactivity and Intrinsic Cognitive load. In: *Cognitive Load Theory*. Springer New York; 2011:203-218. doi:10.1007/978-1-4419-8126-4

55. LeBlanc VR. The effects of acute stress on performance: implications for health professions education. *Acad Med J Assoc Am Med Coll*. 2009;84(10 Suppl):S25-33. doi:10.1097/ACM.0b013e3181b37b8f

56. Arora S, Sevdalis N, Aggarwal R, Sirimanna P, Darzi A, Kneebone R. Stress impairs psychomotor performance in novice laparoscopic surgeons. *Surg Endosc*. 2010;24(10):2588-2593. doi:10.1007/s00464-010-1013-2

57. González-Cabrera J, Fernández-Prada M, Iribar-Ibabe C, Peinado JM. Acute and chronic stress increase salivary cortisol: a study in the real-life setting of a national examination undertaken by medical graduates. *Stress*. 2014;17(2):149-156. doi:10.3109/10253890.2013.876405

58. Elzinga BM, Roelofs K. Cortisol-Induced Impairments of Working Memory Require Acute Sympathetic Activation. *Behav Neurosci*. 2005;119(1):98-103. doi:10.1037/0735-7044.119.1.98

59. Lupien SJ, Gillin CJ, Hauger RL. Working memory is more sensitive than declarative memory to the acute effects of corticosteroids: a dose-response study in humans. *Behav Neurosci*. 1999;113(3):420-430. doi:10.1037//0735-7044.113.3.420

60. OECD. The Impact of Environment on the Learning Brain. In: *Understanding the Brain: The Birth of a Learning Science.* OECD; 2007:59-77. doi:10.1787/9789264029132-en

61. Russ SJ, Morrison I, Bell C, Morse JC, Mackenzie RK, Johnston MK. Relationship between acute stress and clinical performance in medical students: a pilot simulation study. *BMJ Simul Technol Enhanc Learn*. 2018;4(4):171-178. doi:10.1136/bmjstel-2017-000276

62. Anton NE, Rendina MA, Hennings JM, Stambro R, Stanton-Maxey KJ, Stefanidis D. Association of Medical Students' Stress and Coping Skills With Simulation Performance. *Simul Healthc J Soc Simul Healthc*. 2021;16(5):327-333. doi:10.1097/SIH.0000000000000511

63. Isen AM, Rosenzweig AS, Young MJ. The influence of positive affect on clinical problem solving. *Med Decis Mak Int J Soc Med Decis Mak*. 1991;11(3):221-227. doi:10.1177/0272989X9101100313

64. Sweller J, Ayres P, Kalyuga S. Intrinsic and Extraneous Cognitive Load. In: *Cognitive Load Theory*. Springer New York; 2011:57-69. doi:10.1007/978-1-4419-8126-4

65. Gray R. Virtual environments and their role in developing perceptual-cognitive skills in sports. In: *Anticipation and Decision Making in Sport*. ; 2019:342-358. doi:10.4324/9781315146270-19

66. Massoth C, Röder H, Ohlenburg H, et al. High-fidelity is not superior to low-fidelity simulation but leads to overconfidence in medical students. *BMC Med Educ*. 2019;19(1):29. doi:10.1186/s12909-019-1464-7

67. Yerkes RM, Dodson JD. The relation of strength of stimulus to rapidity of habit-formation. *J Comp Neurol Psychol*. 1908;18(5):459-482. doi:10.1002/cne.920180503

68. Yerkes-Dodson Law: How It Correlates to Stress, Anxiety, Performance. Healthline. Published October 22, 2020. Accessed June 2, 2023. https://www.healthline.com/health/yerkes-dodson-law

69. Baker RSj, D'Mello SK, Rodrigo MT, Graesser AC. Better to be frustrated than bored: The incidence, persistence, and impact of learners' cognitive–affective states during interactions with three different computer-based learning environments. *Int J Hum-Comput Stud*. 2010;68(4):223-241. doi:10.1016/j.ijhcs.2009.12.003

70. Griffon DJ, Cronin P, Kirby B, Cottrell DF. Evaluation of a Hemostasis Model for Teaching Ovariohysterectomy in Veterinary Surgery. *Vet Surg*. 2000;29(4):309-316. doi:10.1053/jvet.2000.7541

71. Hyltander A, Liljegren E, Rhodin PH, Lönroth H. The transfer of basic skills learned in a laparoscopic simulator to the operating room. *Surg Endosc*. 2002;16(9):1324-1328. doi:10.1007/s00464-001-9184-5

72. Read EK, Vallevand A, Farrell RM. Evaluation of Veterinary Student Surgical Skills Preparation for Ovariohysterectomy Using Simulators: A Pilot Study. *J Vet Med Educ*. 2016;43(2):190-213. doi:10.3138/jvme.0815-138R1

73. Hunt JA, Heydenburg M, Kelly CK, Anderson SL, Dascanio JJ. Development and Validation of a Canine Castration Model and Rubric. *J Vet Med Educ*. 2020;47(1):78-90. doi:10.3138/jvme.1117-158r1

74. da Silva DAF, Fernandes AA, Ventrone AE, et al. The influence of low-fidelity simulator training on canine peripheral venous puncture procedure. *Vet World*. 2021;14(2):410-418. doi:10.14202/vetworld.2021.410-418

75. Ericsson KA. Deliberate Practice and the Acquisition and Maintenance of Expert Performance in Medicine and Related Domains: *Acad Med*. 2004;79(Supplement):S70-S81. doi:10.1097/00001888-200410001-00022

76. Smeak DD. Teaching Surgery to the Veterinary Novice: The Ohio State University Experience. *J Vet Med Educ*. 2007;34(5):620-627. doi:10.3138/jvme.34.5.620

77. Samsel RW, Schmidt GA, Hall JB, Wood LD, Shroff SG, Schumacker PT. Cardiovascular physiology teaching: computer simulations vs. animal demonstrations. *Adv Physiol Educ*. 1994;266(6):S36. doi:10.1152/advances.1994.266.6.S36

78. McKinney EH, Davis KJ. Effects of Deliberate Practice on Crisis Decision Performance. *Hum Factors J Hum Factors Ergon Soc*. 2003;45(3):436-444. doi:10.1518/hfes.45.3.436.27251

79. Hunt JA, Hughes C, Asciutto M, Johnson JT. Development and Validation of a Feline Medial Saphenous Venipuncture Model and Rubric. *J Vet Med Educ*. 2020;47(3):333-341. doi:10.3138/jvme.0718-085

80. Langebæk R, Eika B, Jensen AL, Tanggaard L, Toft N, Berendt M. Anxiety in Veterinary Surgical Students: A Quantitative Study. *J Vet Med Educ*. 2012;39(4):331-340. doi:10.3138/jvme.1111-111R1

81. Langebaek R, Berendt M, Pedersen LT, Jensen AL, Eika B. Features that contribute to the usefulness of low-fidelity models for surgical skills training. *Vet Rec*. 2012;170(14):361-361. doi:10.1136/vr.100181

82. Langebæk R, Berendt M, Tipold A, Engelskirchen S, Dilly M. Evaluation of the Impact of Using a Simulator for Teaching Veterinary Students Cerebrospinal Fluid Collection: A Mixed-Methods Study. *J Vet Med Educ*. 2021;48(2):217-227. doi:10.3138/jvme.2019-0006

83. Au Yong JA, Case JB, Kim SE, Verpaalen VD, McConkey MJ. Survey of instructor and student impressions of a high-fidelity model in canine ovariohysterectomy surgical training. *Vet Surg*. 2019;48(6):975-984. doi:10.1111/vsu.13218

84. MacArthur SL, Johnson MD, Colee JC. Effect of a Spay Simulator on Student Competence and Anxiety. *J Vet Med Educ*. 2021;48(1):115-128. doi:10.3138/jvme.0818-089r3

85. Russel WMS, Burch RL. *The Principles of Humane Experimental Technique*. Vol 1959. London : Methuen a. Co.

86. Schout BMA, Hendrikx AJM, Scheele F, Bemelmans BLH, Scherpbier AJJA. Validation and implementation of surgical simulators: a critical review of present, past, and future. *Surg Endosc*. 2010;24(3):536-546. doi:10.1007/s00464-009-0634-9

87. American Educational Research Association, American Psychological Association, National Council on Measurement in Education. *Standards for Educational and Psychological Testing*. American Educational Research Association; 2014.

88. Harris DJ, Bird JM, Smart PA, Wilson MR, Vine SJ. A Framework for the Testing and Validation of Simulated Environments in Experimentation and Training. *Front Psychol*. 2020;11:605. doi:10.3389/fpsyg.2020.00605

89. Downing SM. Validity: on the meaningful interpretation of assessment data. *Med Educ*. 2003;37(9):830-837. doi:10.1046/j.1365-2923.2003.01594.x

90. Cook DA, Beckman TJ. Current concepts in validity and reliability for psychometric instruments: theory and application. *Am J Med*. 2006;119(2):166.e7-16. doi:10.1016/j.amjmed.2005.10.036

91. Beckman TJ, Cook DA, Mandrekar JN. What is the validity evidence for assessments of clinical teaching? *J Gen Intern Med*. 2005;20(12):1159-1164. doi:10.1111/j.1525-1497.2005.0258.x

92. Langebæk R, Eika B, Tanggaard L, Jensen AL, Berendt M. Emotions in Veterinary Surgical Students: A Qualitative Study. *J Vet Med Educ*. 2012;39(4):312-321. doi:10.3138/jvme.0611.068R1

93. Future directions for veterinary medicine: The Pew report Pew National Veterinary Education Program. *Can Vet J Rev Veterinaire Can*. 1989;30(6):472-476.

94. Fernandes TH. European veterinary education: A bridge to quality. *Vet J*. 2005;169(2):210-215. doi:10.1016/j.tvjl.2004.09.001

95. Biggs PM, Cuthbert A, Follett SBrian, et al. Report of the Committee of Enquiry into Veterinary Research. Published online November 1997:57.

96. Karg M. Designated licensure—the case for speciation within the veterinary degree. *J Am Vet Med Assoc*. 2000;217(12):1792-1796. doi:10.2460/javma.2000.217.1792

97. Totten VY. ETHICS AND TEACHING THE ART OF EMERGENCY MEDICINE. *Emerg Med Clin North Am*. 1999;17(2):429-441. doi:10.1016/S0733-8627(05)70069-9

98. Lundgren M, Bengtsson S. *Development and Evaluation of a Canine Cesarean Section Simulator for Veterinary Clinical Training*.; 2018:0-43.

99. Kogan LR, Schoenfeld-Tacher R, Hellyer P, Grigg EK, Kramer E. Veterinarians and impostor syndrome: an exploratory study. *Vet Rec*. 2020;187(7):271-271. doi:10.1136/vr.105914

100. Villwock JA, Sobin LB, Koester LA, Harris TM. Impostor syndrome and burnout among American medical students: a pilot study. *Int J Med Educ*. 2016;7:364-369. doi:10.5116/ijme.5801.eac4

101. Duijn C, Bok H, Ten Cate O, Kremer W. Qualified but not yet fully competent: perceptions of recent veterinary graduates on their day-one skills. *Vet Rec*. 2020;186(7):216-216. doi:10.1136/vr.105329

102. Lavictoire S. EDUCATION, LICENSING, AND THE EXPANDING SCOPE OF VETERINARY PRACTICE MEMBERS EXPRESS THEIR VIEWS. *Can Vet J*. 2003;44(4):282-284.

103. Lofstedt J. Confidence and competence of recent veterinary graduates — Is there a problem? *Can Vet J*. 2003;44(5):359-360.

104. Absalon.ku.dk. Published May 2023. https://absalon.ku.dk/

105. Langebæk R, Toft N, Eriksen T. The SimSpay—Student Perceptions of a Low-Cost Build-It-Yourself Model for Novice Training of Surgical Skills in Canine Ovariohysterectomy. *J Vet Med Educ*. 2015;42(2):166-171. doi:10.3138/jvme.1014-105

106. Egenvall A, Hagman R, Bonnett BN, Hedhammar A, Olson P, Lagerstedt AS. Breed risk of pyometra in insured dogs in Sweden. *J Vet Intern Med*. 2001;15(6):530-538. doi:10.1892/0891-6640(2001)015<0530:bropii>2.3.co;2

107. O'Neill DG, Case J, Boag AK, et al. Gastric dilation-volvulus in dogs attending UK emergency-care veterinary practices: prevalence, risk factors and survival. *J Small Anim Pract*. 2017;58(11):629-638. doi:10.1111/jsap.12723

108. Ordbogen.com. Published May 2023. https://www.ordbogen.com/da/

109. Mackenzie G, Barnhart M, Kennedy S, DeHoff W, Schertel E. A Retrospective Study of Factors Influencing Survival Following Surgery for Gastric Dilatation-Volvulus Syndrome in 306 Dogs. *J Am Anim Hosp Assoc*. 2010;46(2):97-102. doi:10.5326/0460097

110. Song KK, Goldsmid SE, Lee J, Simpson DJ. Retrospective analysis of 736 cases of canine gastric dilatation volvulus. *Aust Vet J*. 2020;98(6):232-238. doi:10.1111/avj.12942

111. Sharp CR, Rozanski EA, Finn E, Borrego EJ. The pattern of mortality in dogs with gastric dilatation and volvulus. *J Vet Emerg Crit Care San Antonio Tex 2001*. 2020;30(2):232-238. doi:10.1111/vec.12932

112. van Merriënboer JJG, Sweller J. Cognitive load theory in health professional education: design principles and strategies. *Med Educ*. 2010;44(1):85-93. doi:10.1111/j.1365-2923.2009.03498.x

113. Rey GD, Buchwald F. The expertise reversal effect: cognitive load and motivational explanations. *J Exp Psychol Appl*. 2011;17(1):33-48. doi:10.1037/a0022243

114. Sweller J, Ayres P, Kalyuga S. The Expertise Reversal Effect. In: *Cognitive Load Theory*. Springer New York; 2011:155-170. doi:10.1007/978-1-4419-8126-4

115. Fraser KL, Ayres P, Sweller J. Cognitive Load Theory for the Design of Medical Simulations. *Simul Healthc J Soc Simul Healthc*. 2015;10(5):295-307. doi:10.1097/SIH.0000000000000097

116. Isen AM, Daubman KA, Nowicki GP. Positive affect facilitates creative problem solving. *J Pers Soc Psychol*. 1987;52(6):1122-1131. doi:10.1037//0022-3514.52.6.1122

117. Badman M, Tullberg M, Höglund OV, Hagman R. Veterinary Student Confidence after Practicing with a New Surgical Training Model for Feline Ovariohysterectomy. *J Vet Med Educ*. 2016;43(4):427-433. doi:10.3138/jvme.1015-165R2

118. Kruger J, Dunning D. Unskilled and unaware of it: how difficulties in recognizing one's own incompetence lead to inflated self-assessments. *J Pers Soc Psychol*. 1999;77(6):1121-1134. doi:10.1037//0022-3514.77.6.1121

119. Callahan CA, Hojat M, Gonnella JS. Volunteer bias in medical education research: an empirical study of over three decades of longitudinal data. *Med Educ*. 2007;41(8):746-753. doi:10.1111/j.1365-2923.2007.02803.x

120. Jordan S, Watkins A, Storey M, et al. Volunteer bias in recruitment, retention, and blood sample donation in a randomised controlled trial involving mothers and their children at six months and two years: a longitudinal analysis. *PloS One*. 2013;8(7):e67912. doi:10.1371/journal.pone.0067912

121. Gove WR, McCorkel J, Fain T, Hughes MD. Response bias in community surveys of mental health: systematic bias or random noise? *Soc Sci Med*. 1976;10(9-10):497-502. doi:10.1016/0037-7856(76)90118-9

122. Choi BCK, Pak AWP. A catalog of biases in questionnaires. *Prev Chronic Dis*. 2005;2(1):A13.

123. Subjektive besvarelser (social desirability). Metodeguiden.au.dk. Accessed May 31, 2023. https://metodeguiden.au.dk/subjektive-besvarelser-social-desirability

124. Egleston BL, Miller SM, Meropol NJ. The impact of misclassification due to survey response fatigue on estimation and identifiability of treatment effects. *Stat Med*. 2011;30(30):3560-3572. doi:10.1002/sim.4377

125. OECD. *Understanding the Brain: The Birth of a Learning Science. The Impact of Environment on the Learning Brain*. OECD; 2007:59-81. doi:10.1787/9789264029132-6-en

126. Stein C. The effect of clinical simulation assessment on stress and anxiety measures in emergency care students. *Afr J Emerg Med Rev Afr Med Urgence*. 2020;10(1):35-39. doi:10.1016/j.afjem.2019.12.001

127. Koudela-Hamila S, Smyth J, Santangelo P, Ebner-Priemer U. Examination stress in academic students: a multimodal, real-time, real-life investigation of reported stress, social contact, blood pressure, and cortisol. *J Am Coll Health*. 2022;70(4):1047-1058. doi:10.1080/07448481.2020.1784906

128. Rutherford-Hemming T, Kardong-Edgren S, Gore T, Ravert P, Rizzolo MA. High-Stakes Evaluation: Five Years Later. *Clin Simul Nurs*. 2014;10(12):605-610. doi:10.1016/j.ecns.2014.09.009

129. Pohl R, Botscharow J, Böckelmann I, Thielmann B. Stress and strain among veterinarians: a scoping review. *Ir Vet J*. 2022;75(1):15. doi:10.1186/s13620-022-00220-x

130. Fritschi L, Morrison D, Shirangi A, Day L. Psychological well-being of Australian veterinarians. *Aust Vet J*. 2009;87(3):76-81. doi:10.1111/j.1751-0813.2009.00391.x

131. Platt B, Hawton K, Simkin S, Mellanby RJ. Systematic review of the prevalence of suicide in veterinary surgeons. *Occup Med*. 2010;60(6):436-446. doi:10.1093/occmed/kqq044

132. Absalon.ku.dk. Veterinary imaging. Published May 2023. https://absalon.ku.dk/courses/59261/quizzes/73679?module_item_id=1679485

Appendices

Appendix 1: Pilot study questionnaire

Spørgeskema vedrørende Gastric Dilatation and Volvolus hos hund

Tryk 'Næste' for at besvare spørgeskemaet. Besvarelsen er anonym.

* Spørgsmålet er obligatorisk

Spørgsmål 1

1. Hvad er dit nuværende uddannelsestrin? *

Markér kun ét felt.

- ◯ Dyrlægestuderende på 5. år der har gennemført akutrotationen
- ◯ Dyrlægestuderende på 6. år
- ◯ Uddannet dyrlæge med under 1 års erfaring i smådyrspraksis
- ◯ Uddannet dyrlæge med mellem 1 og 5 års erfaring i smådyrspraksis
- ◯ Uddannet dyrlæge med mere end 5 års erfaring i smådyrspraksis

Spørgsmål 2

2. Hvordan vil du selv vurdere dine kirurgiske færdigheder *i forhold til dit uddannelsesniveau* *

Markér kun ét felt.

- ◯ Jeg føler mig meget kompetent
- ◯ Jeg føler mig nogenlunde kompetent
- ◯ Hverken eller
- ◯ Jeg føler mig mindre kompetent
- ◯ Jeg føler mig ikke kompetent

Spørgsmål 3

Hvilken af følgende akutte kirurgiske procedurer ville du finde mest udfordrende. Opstil i rækkefølge med den mest udfordrende som nr. 1 og den mindst udfordrende som nr. 4 (prioritér venligst ikke to procedurer med samme tal)

Kejsersnit *

Markér kun ét felt.

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4

Mavedrejning *

Markér kun ét felt.

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4

Pyometra *

Markér kun ét felt.

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4

Gastrointestinalt fremmedlegeme *

Markér kun ét felt.

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4

Spørgsmål 4

Har du assisteret ved- eller selv diagnosticeret og behandlet en mavedrejningspatient? *

Markér kun ét felt.

- ◯ Ja, jeg har selv diagnosticeret og behandlet en eller flere mavedrejningspatienter
- ◯ Jeg har assisteret ved en mavedrejningspatient, men jeg havde ikke det primære ansvar
- ◯ Jeg har overværet diagnosticering og behandling af en mavedrejningspatient, men jeg har ikke selv deltaget aktivt
- ◯ Nej, jeg har aldrig set, assisteret ved- eller håndteret en mavedrejningspatient

Spørgsmål 5

5A.
Forestil dig, at du har vagt alene, uden bagvagt, og du får at vide, at der er en* mulig mavedrejningspatient på vej. Hvordan har du det mens du venter? Markér gerne mere end 1 svar.

Markér alle, du er enig i.

- ☐ Spændt
- ☐ Rolig
- ☐ Meget nervøs
- ☐ Lidt nervøs
- ☐ Fokuseret
- ☐ Forvirret
- ☐ Kvalm
- ☐ Angst
- ☐ Sikker
- ☐ Bekymret
- ☐ Okay
- ☐ Usikker
- ☐ Andet: _____

5B.
Svar **KUN** på dette spørgsmål hvis du i spørgsmål 5 har markeret en eller flere af følgende muligheder:

Meget nervøs, lidt nervøs, forvirret, kvalm, angst, bekymret eller usikker.

Marker hvilken del af det kommende kliniske forløb, du forventer bliver det mest udfordrende for dig? (flere svar er muligt)

Markér alle, du er enig i.

- [ ] Diagnosticering af patienten
- [ ] Stabilisering af patienten
- [ ] Throkarisering (dekompression af ventriklen med stor g kanyle)
- [ ] Sondering (orogastric tube og skylning af ventriklen)
- [ ] Gastropexi (kirurgisk fastgørelse af ventriklen til bugvæggen)
- [ ] Tolkning af blodprøvesvar
- [ ] Alle steps
- [ ] Andet: _____

5C.
Svar **KUN** på dette spørgsmål hvis du i spørgsmål 5 **udelukkende** har markeret en eller flere af følgende muligheder:

Rolig, fokuseret, okay eller sikker.

Hvilken del af det kommende kliniske forløb forventer du, vil blive mest udfordrende for dig? (flere svar er muligt)

Markér alle, du er enig i.

- [ ] Diagnosticering af patienten
- [ ] Stabilisering af patienten
- [ ] Throkarisering (dekompression af ventriklen med stor g kanyle)
- [ ] Sondering (orogastric tube og skylning af ventriklen)
- [ ] Gastropexi (kirurgisk fastgørelse af ventriklen til bugvæggen)
- [ ] Tolkning af blodprøvesvar
- [ ] Alle steps
- [ ] Jeg føler mig ikke udfordret
- [ ] Andet: _____

Spørgsmål 6

Mavedrejning er en akut og livstruende tilstand med en høj mortalitetsrate. Patienterne er ofte i kritisk tilstand ved ankomst til klinikken. Diagnosticering og behandling skal ske hurtigt og foregår optimalt set i flere steps, indeholdende fx røntgen, blodprøvetagning, shockbehandling, throkarisering, sondering, gastropexi og postoperativ behandling. *

Besvar bedst muligt hvilke udsagn der passer på din opfattelse af at skulle håndtere en mavedrejningspatient selv som dyrlæge (flere svar er muligt)

Markér alle, du er enig i.

- [ ] Jeg finder det udfordrende at stille diagnosen mavedrejning på et røntgenbillede
- [ ] De individuelle steps i proceduren er i sig selv ikke udfordrende for mig, men i en stresset situation risikerer jeg at glemme steps eller hvilken rækkefølge jeg skal udføre dem i
- [ ] Jeg finder det udfordrende at håndtere denne type kritiske patient, hvor jeg skal handle hurtigt og korrekt for at redde patienten
- [ ] Jeg er generelt usikker på, hvordan jeg skal gribe en mavedrejningspatient an, da jeg er usikker på hvad den optimale trinvise procedure er.
- [ ] Jeg er bekendt med den teoretisk optimale måde at håndtere en mavedrejningspatient på, men jeg føler det udfordrende at udføre et eller flere af trinene i proceduren i praksis.
- [ ] Jeg føler mig sikker på, at jeg kender de optimale trin i proceduren, og jeg føler mig sikker i at kunne udføre dem korrekt selv i en stresset situation
- [ ] Andet: _____

Spørgsmål 7

Besvar følgende udsagn: *

"Det er en essentiel færdighed at kunne håndtere en mavedrejning som praktiserende dyrlæge i smådyrspraksis"

Markér kun ét felt.

- ◯ Meget uenig
- ◯ Uenig
- ◯ Hverken eller
- ◯ Enig
- ◯ Meget enig

Spørgsmål 8

Besvar følgende udsagn: *

"Forelæsningerne og den kliniske undervisning på dyrlægestudiet har forberedt mig godt på at håndtere en patient med mavedrejning"

Markér kun ét felt.

- ◯ Meget uenig
- ◯ Uenig
- ◯ Hverken eller
- ◯ Enig
- ◯ Meget enig

Spørgsmål 9

Besvar nedenstående udsagn i prioriteret rækkefølge med 1 som den vigtigste og 5 som den mindst vigtige.

"Jeg vil føle mig mere rolig ved at skulle diagnosticere og behandle en mavedrejningspatient hvis jeg ..."

Jeg havde set en video af forløbet gentagne gange *

Markér kun ét felt.

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5

Jeg havde øvet forløbet gentagne gange på en simulator *

Markér kun ét felt.

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5

Jeg havde gennemført forløbet én gang i virkeligheden *

Markér kun ét felt.

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5

Jeg havde øvet forløbet en gang på et kadaver *

Markér kun ét felt.

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5

Jeg havde overværet proceduren flere gange på en levende patient *

Markér kun ét felt.

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5

Spørgsmål 10

Besvar følgende udsagn: *

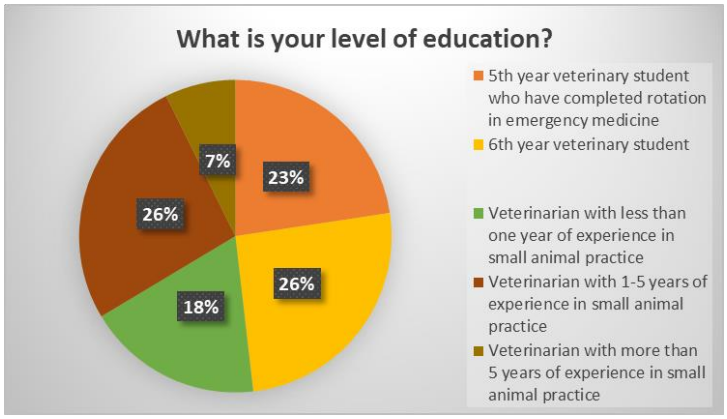
"Jeg vil føle mig mere rolig ved at skulle håndtere en mavedrejningspatient, hvis jeg har øvet mig på en simulator først"

Markér kun ét felt.

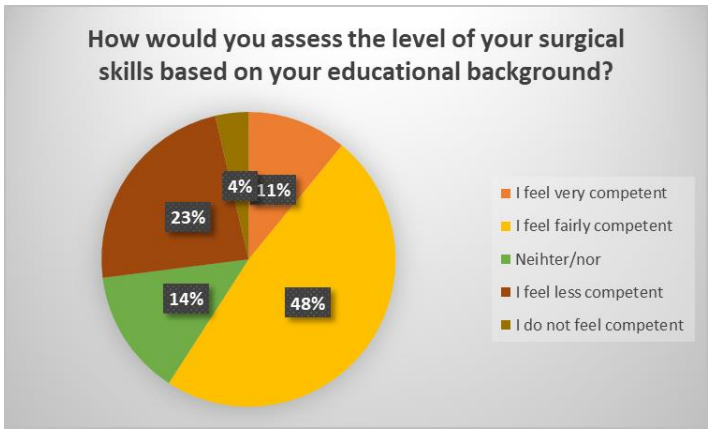
- ◯ Meget uenig
- ◯ Uenig
- ◯ Hverken eller
- ◯ Enig
- ◯ Meget enig

Appendix 2: Pilot study results

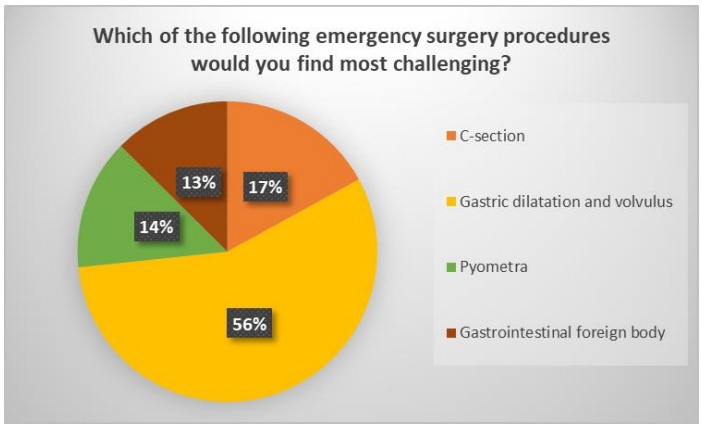
Question 1



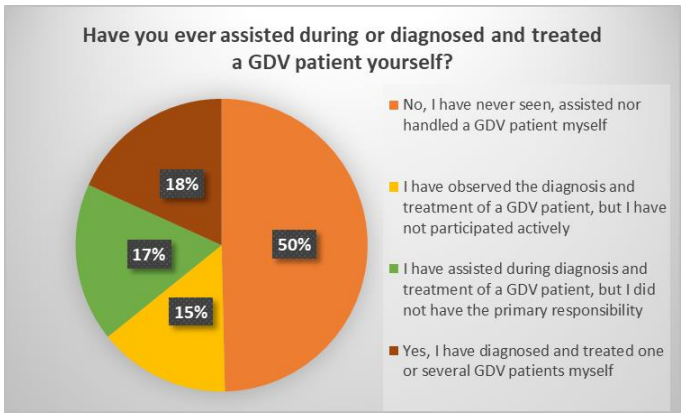
Question 2



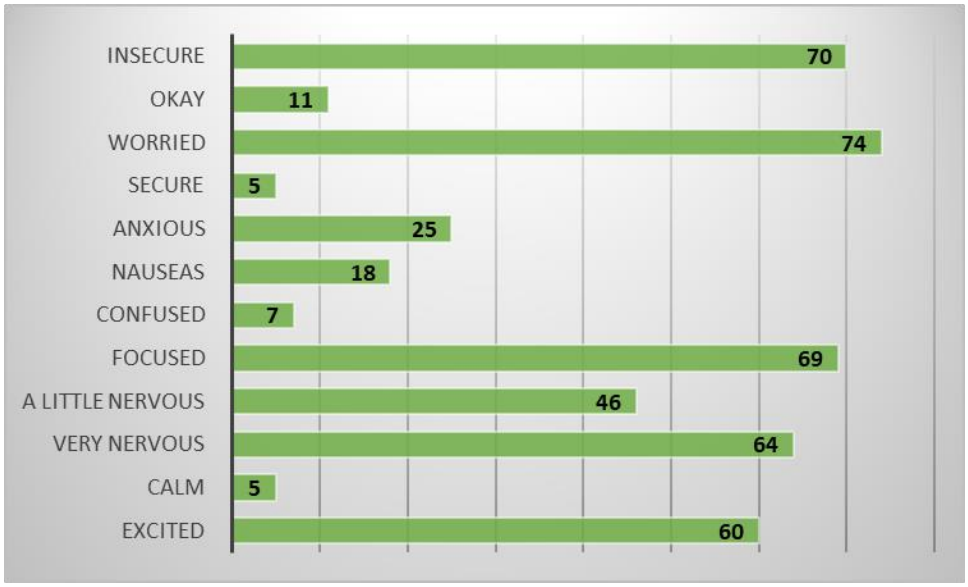
Question 3



Question 4:

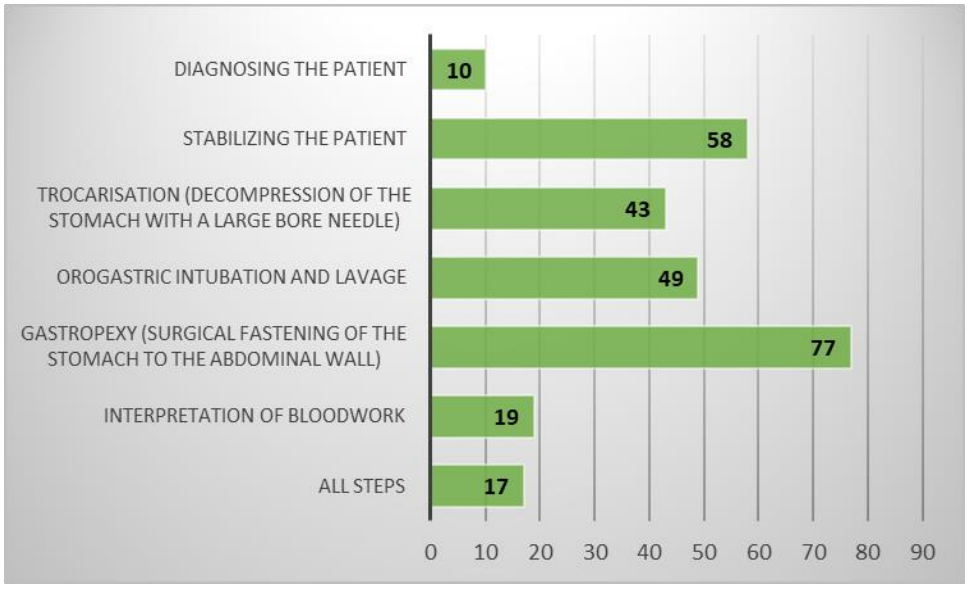


Question 5A: Imagine being alone on call with no back-up colleague and being told a possible GDV patient is on the way. How do you feel while waiting? (Multiple answers are possible)



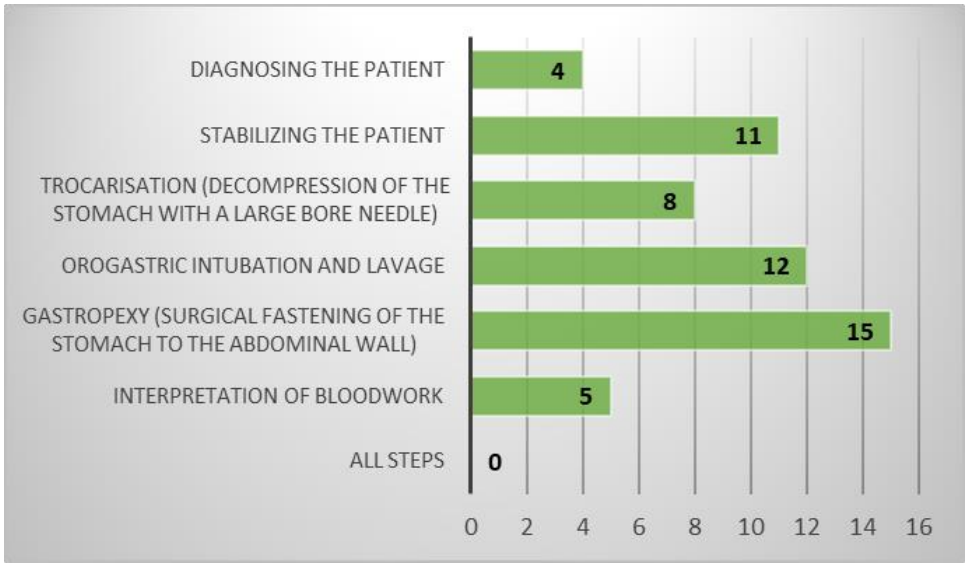
Question 5B: Please only reply to this question if you have answered one or several of the following: *Very nervous, a little nervous, confused, nauseas, anxious, worried, or insecure*.

Which aspect of the upcoming clinical process do you anticipate will be the most challenging for you? (Multiple answers are possible)



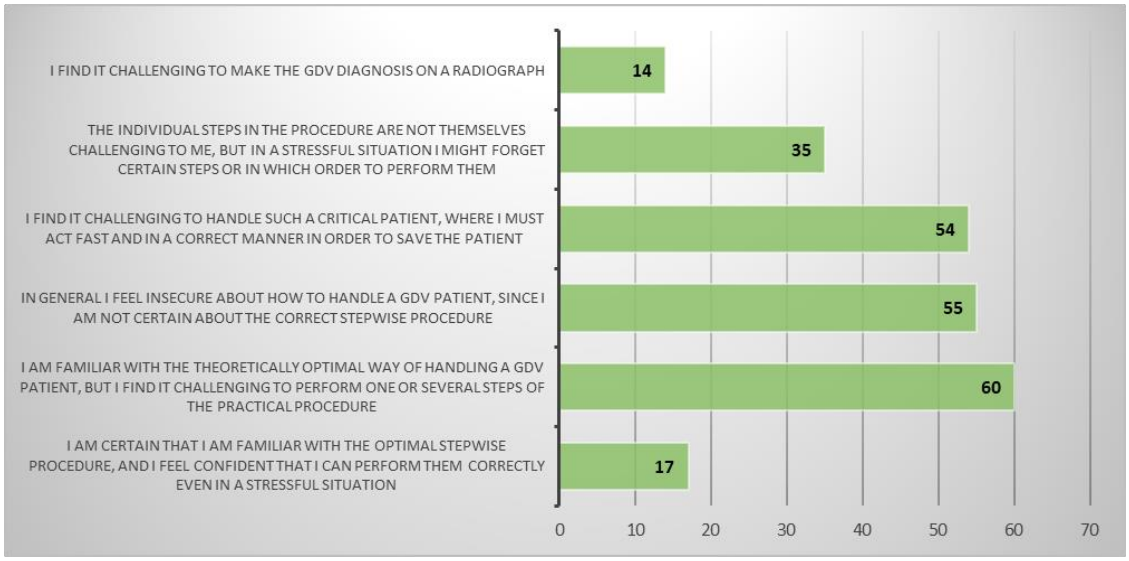
Question 5C: Please only reply to this question if you have solely answered one or several of the following: *Calm, focused, okay or secure.*

Which aspect of the upcoming clinical process do you anticipate will be the most challenging for you? (Multiple answers are possible)

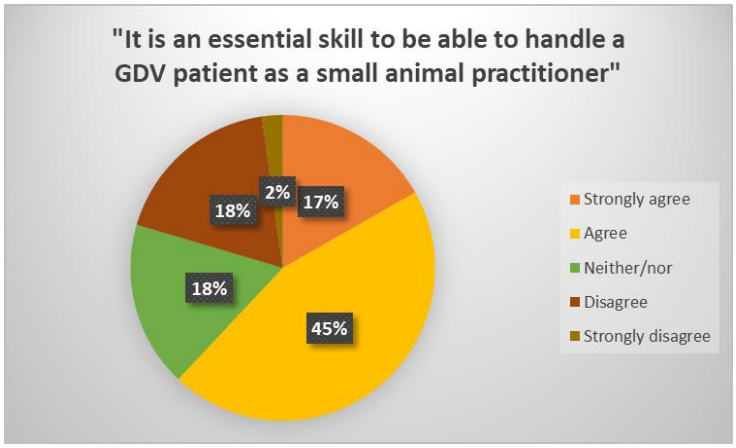


Question 6: *Gastric dilatation and volvulus is an acute and life-threatening condition with a high mortality rate. Patients are often in a critical condition upon arrival at the clinic. Diagnosis and treatment must be rapid and is optimally performed in several steps including for example abdominal x-ray, bloodwork, shock treatment, trocarization, orogastric intubation, gastropexy and postoperative care.*

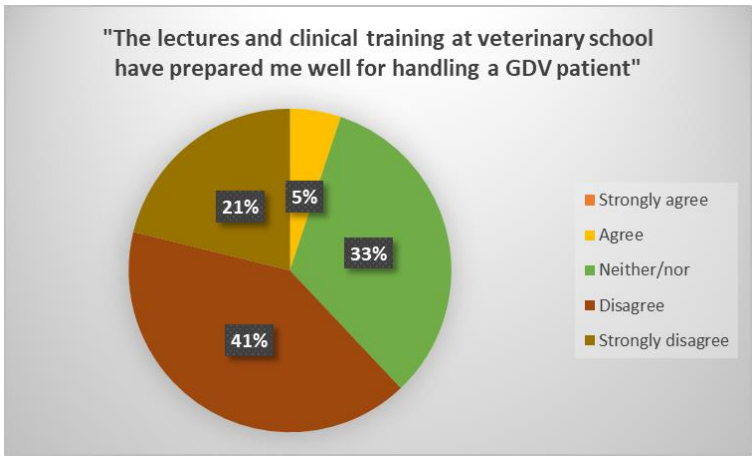
Please answer to the best of your ability which statements match your perception of having to handle a GDV patient as a veterinarian. (Multiple answers are possible).



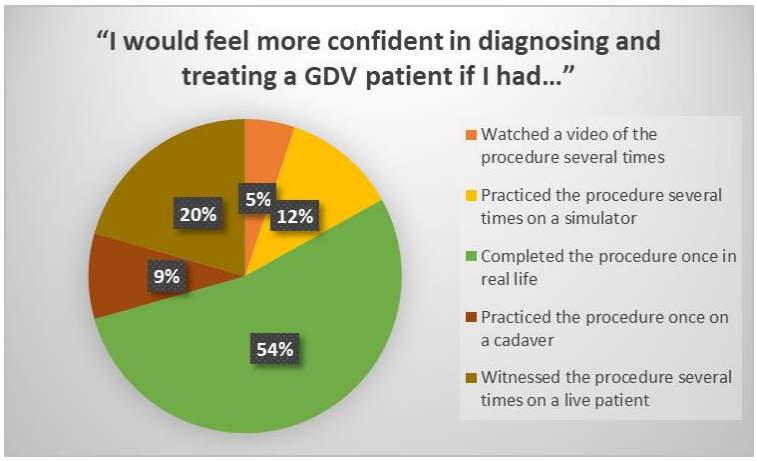
Question 7: Please respond to the following statement:



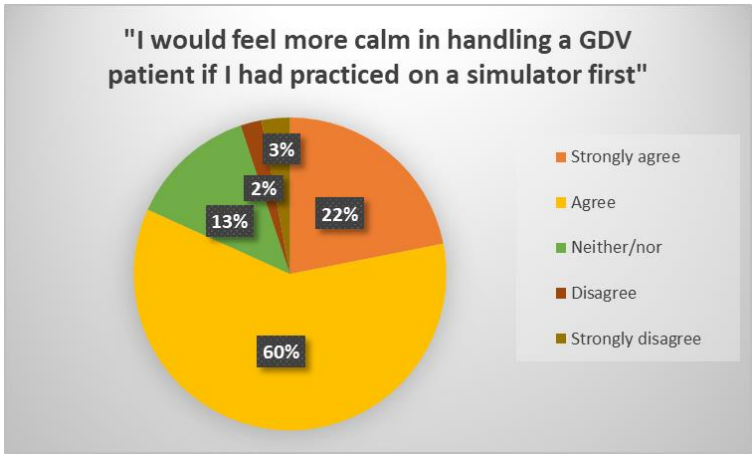
Question 8: Please respond to the following statement:



Question 9: Please rank the following statements in order of importance with 1 being the most important and 5 being the least important:



Question 10: Please respond to the following statement:



Appendix 3: Cross-tabulations pilot study

Rating of surgical skills dependent on level of education (cross-tabulation)

Table 1.

Level of education * surgical skills Crosstabulation

			How would you rate your surgical skills dependent on your level of education					
			I don not feel competent	I feel less competent	Neither nor	I feel fairly competent	I feel very competent	Total
Level of education	5th year vet student	Count	2	6	6	16	1	31
		Percent	6,5%	19,4%	19,4%	51,6%	3,2%	100,0%
	6th year vet student	Count	1	13	6	13	2	35
		Percent	2,9%	37,1%	17,1%	37,1%	5,7%	100,0%
	Veterinarian with less than one year of experience	Count	1	8	3	11	2	25
		Percent	4,0%	32,0%	12,0%	44,0%	8,0%	100,0%
	Veterinarian with 1-5 years of experience	Count	1	5	3	20	7	36
		Percent	2,8%	13,9%	8,3%	55,6%	19,4%	100,0%
	Veterinarian with more than 5 years of experience	Count	0	0	1	6	3	10
		Percent	0,0%	0,0%	10,0%	60,0%	30,0%	100,0%
Total		Count	5	32	19	66	15	137
		Percent	3,6%	23,4%	13,9%	48,2%	10,9%	100,0%

Level of education and ranking of GDV dependent on level of difficulty cross-tabulation.

Table 2.

Level of education * GDV Crosstabulation

			GDV				
			1	2	3	4	Total
Level of education	5th year vet student	Count	17	8	3	3	31
		Percent	54,8%	25,8%	9,7%	9,7%	100,0%
	6th year vet student	Count	20	7	4	4	35
		Percent	57,1%	20,0%	11,4%	11,4%	100,0%
	Veterinarian with less than one year of experience	Count	13	6	3	3	25
		Percent	52,0%	24,0%	12,0%	12,0%	100,0%
	Veterinarian with 1-5 years of experience	Count	19	6	5	6	36
		Percent	52,8%	16,7%	13,9%	16,7%	100,0%
	Veterinarian with more than 5 years of experience	Count	7	2	1	0	10
		Percent	70,0%	20,0%	10,0%	0,0%	100,0%
Total		Count	76	29	16	16	137
		Percent	55,5%	21,2%	11,7%	11,7%	100,0%

Appendix 4: Questionnaire – experienced veterinarians

Spørgeskema vedr. GDV-Simulator

Udvikling af en GDV-simulator til brug af veterinærstuderende

Projektets forskningsspørgsmål:
"In relation to treatment of a GDV patient, what is the impact of training on a GDV simulator on the percieved level of insecurity in veterinary students?"
Udfyld følgende spørgeskema vedrørende GDV-simulationen, *"Maverick"*, ud fra følgende kriterier:

1. Simulationen skal illustrere en korrekt stepvis procedure til håndtering af den beskrevne GDV-case.

2. Simulatoren er en low-fidelity simulator. Dette betyder, at den kun til en vis grad kan simulere et virkeligt scenarie.

Da simulationen skal
kunne bruges til undervisning af studerende, er det meget vigtigt for os med feedback på de enkelte elementer. Derfor ønskes meget gerne uddybning af jeres svar, da dette kan bidrage til forbedring af simulatoren.

* Spørgsmålet er obligatorisk

1. **Case:** *

Casebeskrivelsen inkl. diagnostiske undersøgelser indeholder et realistisk eksempel på en GDV-patient - uddyb gerne

Vælg kun én svarmulighed på skalaen fra meget uenig til meget enig, men vælg OGSÅ "andet" hvis du gerne vil uddybe

Markér alle, du er enig i.

- ☐ Meget enig
- ☐ Enig
- ☐ Hverken/eller
- ☐ Uenig
- ☐ Meget uenig
- ☐ Andet: _____

2. **Shockbehandling:** *

Simulationen giver et tilstrækkeligt realistisk billede af, hvordan man stabiliserer en GDV-patient i shock - uddyb gerne

Vælg kun én svarmulighed på skalaen fra meget uenig til meget enig, men vælg OGSÅ "andet" hvis du gerne vil uddybe

Markér alle, du er enig i.

- [ ] Meget enig
- [ ] Enig
- [ ] Hverken/eller
- [ ] Uenig
- [ ] Meget uenig
- [ ] Andet: _____

3. **Shockbehandling:** *

Vejledningen til initiel shockbehandling er let læselig og forståelig - uddyb gerne

Vælg kun én svarmulighed på skalaen fra meget uenig til meget enig, men vælg OGSÅ "andet" hvis du gerne vil uddybe

Markér alle, du er enig i.

- [ ] Meget enig
- [ ] Enig
- [ ] Hverken/eller
- [ ] Uenig
- [ ] Meget uenig
- [ ] Andet: _____

4. **Sondering:** *

Sondering af patienten kan udføres på simulatoren med tilstrækkelig taktil realisme - uddyb gerne

Vælg kun én svarmulighed på skalaen fra meget uenig til meget enig, men vælg OGSÅ "andet" hvis du gerne vil uddybe

Markér alle, du er enig i.

- [ ] Meget enig
- [ ] Enig
- [ ] Hverken/eller
- [ ] Uenig
- [ ] Meget uenig
- [ ] Andet: _____

5. **Sondering:** *

Sondering af patienten kan udføres på simulatoren med tilstrækkelig visuel realisme ift. anatomiske pejlemærker - uddyb gerne

Vælg kun én svarmulighed på skalaen fra meget uenig til meget enig, men vælg OGSÅ "andet" hvis du gerne vil uddybe

Markér alle, du er enig i.

- [ ] Meget enig
- [ ] Enig
- [ ] Hverken/eller
- [ ] Uenig
- [ ] Meget uenig
- [ ] Andet: _____

6. **Sondering:** *

Den skriftlige vejledning til sondering er let læselig og forståelig - uddyb gerne

Vælg kun én svarmulighed på skalaen fra meget uenig til meget enig, men vælg OGSÅ "andet" hvis du gerne vil uddybe

Markér alle, du er enig i.

- [ ] Meget enig
- [ ] Enig
- [ ] Hverken/eller
- [ ] Uenig
- [ ] Meget uenig
- [ ] Andet: _____

7. **Trokarisering:** *

Trokarisering af patienten kan udføres på simulatoren med tilstrækkelig taktil realisme - uddyb gerne

Vælg kun én svarmulighed på skalaen fra meget uenig til meget enig, men vælg OGSÅ "andet" hvis du gerne vil uddybe

Markér alle, du er enig i.

- [ ] Meget enig
- [ ] Enig
- [ ] Hverken/eller
- [ ] Uenig
- [ ] Meget uenig
- [ ] Andet: _____

8. **Trokarisering:** *

Trokarisering af patienten kan udføres på simulatoren med tilstrækkelig visuel realisme ift. anatomiske pejlemærker - uddyb gerne

Vælg kun én svarmulighed på skalaen fra meget uenig til meget enig, men vælg OGSÅ "andet" hvis du gerne vil uddybe

Markér alle, du er enig i.

- [ ] Meget enig
- [ ] Enig
- [ ] Hverken/eller
- [ ] Uenig
- [ ] Meget uenig
- [ ] Andet: _____

9. **Trokarisering:** *

Den skriftlige vejledning til trokarisering er letlæselig og forståelig - uddyb gerne

Vælg kun én svarmulighed på skalaen fra meget uenig til meget enig, men vælg OGSÅ "andet" hvis du gerne vil uddybe

Markér alle, du er enig i.

- [ ] Meget enig
- [ ] Enig
- [ ] Hverken/eller
- [ ] Uenig
- [ ] Meget uenig
- [ ] Andet: _____

10. **Gastropexi:** *

Simulatorens dimensioner giver et tilstrækkeligt realistisk billede af organernes placering og udfyldning af abdomen - uddyb gerne

Vælg kun én svarmulighed på skalaen fra meget uenig til meget enig, men vælg OGSÅ "andet" hvis du gerne vil uddybe

Markér alle, du er enig i.

- [ ] Meget enig
- [ ] Enig
- [ ] Hverken/eller
- [ ] Uenig
- [ ] Meget uenig
- [ ] Andet: _____

11. **Gastropexi:** *

Den taktile følelse af bughuleorganerne var overordnet set tilstrækkeligt realistisk - uddyb gerne

Vælg kun én svarmulighed på skalaen fra meget uenig til meget enig, men vælg OGSÅ "andet" hvis du gerne vil uddybe

Markér alle, du er enig i.

- [ ] Meget enig
- [ ] Enig
- [ ] Hverken/eller
- [ ] Uenig
- [ ] Meget uenig
- [ ] Andet: _____

12. **Gastropexi:** *

Repositionering af ventriklen kan udføres på simulatoren med tilstrækkelig taktil realisme - uddyb gerne

Vælg kun én svarmulighed på skalaen fra meget uenig til meget enig, men vælg OGSÅ "andet" hvis du gerne vil uddybe

Markér alle, du er enig i.

- [ ] Meget enig
- [ ] Enig
- [ ] Hverken/eller
- [ ] Uenig
- [ ] Meget uenig
- [ ] Andet: _____

13. **Gastropexi:** *

Repositionering af ventriklen kan udføres på simulatoren med tilstrækkelig visuel realisme ift. anatomiske pejlemærker - uddyb gerne

Vælg kun én svarmulighed på skalaen fra meget uenig til meget enig, men vælg OGSÅ "andet" hvis du gerne vil uddybe

Markér alle, du er enig i.

- [ ] Meget enig
- [ ] Enig
- [ ] Hverken/eller
- [ ] Uenig
- [ ] Meget uenig
- [ ] Andet: _____

14. **Gastropexi:** *

Simulatoren tillod korrekt anatomisk placering af ventrikelincisionen - uddyb gerne

Vælg kun én svarmulighed på skalaen fra meget uenig til meget enig, men vælg OGSÅ "andet" hvis du gerne vil uddybe

Markér alle, du er enig i.

- [ ] Meget enig
- [ ] Enig
- [ ] Hverken/eller
- [ ] Uenig
- [ ] Meget uenig
- [ ] Andet: _____

15. **Gastropexi:** *

Incision gennem lagene i simulatorens ventrikel kunne udføres med tilstrækkelig visuel realisme - uddyb gerne

Vælg kun én svarmulighed på skalaen fra meget uenig til meget enig, men vælg OGSÅ "andet" hvis du gerne vil uddybe

Markér alle, du er enig i.

- [ ] Meget enig
- [ ] Enig
- [ ] Hverken/eller
- [ ] Uenig
- [ ] Meget uenig
- [ ] Andet: _____

16. **Gastropexi:** *

Incision i simulatorens ventrikel kunne udføres med tilstrækkelig taktil realisme - uddyb gerne

Vælg kun én svarmulighed på skalaen fra meget uenig til meget enig, men vælg OGSÅ "andet" hvis du gerne vil uddybe

Markér alle, du er enig i.

- [ ] Meget enig
- [ ] Enig
- [ ] Hverken/eller
- [ ] Uenig
- [ ] Meget uenig
- [ ] Andet: _____

17. **Gastropexi:** *

Simulatoren tillod korrekt anatomisk placering af bugvægsincisionen - uddyb gerne

Vælg kun én svarmulighed på skalaen fra meget uenig til meget enig, men vælg OGSÅ "andet" hvis du gerne vil uddybe

Markér alle, du er enig i.

- [ ] Meget enig
- [ ] Enig
- [ ] Hverken/eller
- [ ] Uenig
- [ ] Meget uenig
- [ ] Andet: _____

18. **Gastropexi:** *

Incision gennem lagene i simulatorens bugvæg kunne udføres med tilstrækkelig visuel realisme - uddyb gerne

Vælg kun én svarmulighed på skalaen fra meget uenig til meget enig, men vælg OGSÅ "andet" hvis du gerne vil uddybe

Markér alle, du er enig i.

- [ ] Meget enig
- [ ] Enig
- [ ] Hverken/eller
- [ ] Uenig
- [ ] Meget uenig
- [ ] Andet: _____

19. **Gastropexi:** *

Incision i simulatorens bugvæg kunne udføres med tilstrækkelig taktil realisme - uddyb gerne

Vælg kun én svarmulighed på skalaen fra meget uenig til meget enig, men vælg OGSÅ "andet" hvis du gerne vil uddybe

Markér alle, du er enig i.

- [ ] Meget enig
- [ ] Enig
- [ ] Hverken/eller
- [ ] Uenig
- [ ] Meget uenig
- [ ] Andet: _____

20. **Gastropexi:** *

Suturering i bugvæggen var tilstrækkeligt realistisk - uddyb gerne

Vælg kun én svarmulighed på skalaen fra meget uenig til meget enig, men vælg OGSÅ "andet" hvis du gerne vil uddybe

Markér alle, du er enig i.

- [ ] Meget enig
- [ ] Enig
- [ ] Hverken/eller
- [ ] Uenig
- [ ] Meget uenig
- [ ] Andet: _____

21. **Gastropexi:** *

Suturering i ventriklen var tilstrækkeligt realistisk - uddyb gerne

Vælg kun én svarmulighed på skalaen fra meget uenig til meget enig, men vælg OGSÅ "andet" hvis du gerne vil uddybe

Markér alle, du er enig i.

- [ ] Meget enig
- [ ] Enig
- [ ] Hverken/eller
- [ ] Uenig
- [ ] Meget uenig
- [ ] Andet: _____

22. **Simulator:** *

Simulatoren var let at anvende - uddyb gerne

Vælg kun én svarmulighed på skalaen fra meget uenig til meget enig, men vælg OGSÅ "andet" hvis du gerne vil uddybe

Markér alle, du er enig i.

- [ ] Meget enig
- [ ] Enig
- [ ] Hverken/eller
- [ ] Uenig
- [ ] Meget uenig
- [ ] Andet: _____

23. **Simulator:** *

Simulationen gav overordnet set et realistisk billede af, hvordan det er at håndtere en GDV-patient - uddyb gerne

Vælg kun én svarmulighed på skalaen fra meget uenig til meget enig, men vælg OGSÅ "andet" hvis du gerne vil uddybe

Markér alle, du er enig i.

- [ ] Meget enig
- [ ] Enig
- [ ] Hverken/eller
- [ ] Uenig
- [ ] Meget uenig
- [ ] Andet: _____

24. **Simulator:** *

Jeg vurderer, at simulationen har de overordnede egenskaber, der kræves for at kunne bidrage til at gøre nybegyndere mere komfortable med det at skulle håndtere en GDV-patient - uddyb gerne

Vælg kun én svarmulighed på skalaen fra meget uenig til meget enig, men vælg OGSÅ "andet" hvis du gerne vil uddybe

Markér alle, du er enig i.

- [ ] Meget enig
- [ ] Enig
- [ ] Hverken/eller
- [ ] Uenig
- [ ] Meget uenig
- [ ] Andet: _____

25. **Øvrige kommentarer til simulatoren**

_____

Appendix 5: Student questionnaire before and after the simulation

Spørgeskema FØR og EFTER afprøvning af GDV simulator

Følgende spørgeskema omhandler din mentale tilstand vedrørende dét at skulle håndtere en mavedrejningspatient

* Spørgsmålet er obligatorisk

1. Identifikationsnummer *

2. Hvad er dit uddannelsesniveau? *

Markér kun ét felt.

- ◯ Dyrlægestuderende der har bestået akutrotationen
- ◯ Dyrlægestuderende der har bestået BÅDE akutrotation og AKP smådyr
- ◯ Dyrlægestuderende der har bestået smådyrsdifferentiering

3. Hvad er dit biologiske køn? *

Markér kun ét felt.

- ◯ Kvinde
- ◯ Mand
- ◯ Andet/ønsker ikke at oplyse

4. Har du overværet-, assisteret ved eller selv diagnosticeret og behandlet en GDV-patient? *

Markér kun ét felt.

- ◯ Ja, jeg har selv diagnosticeret og behandlet én eller flere mavedrejningspatienter
- ◯ Jeg har assisteret ved en mavedrejningspatient, men jeg havde ikke det primære ansvar
- ◯ Jeg har overværet diagnosticering og behandling af en mavedrejningspatient, men jeg har ikke selv deltaget aktivt
- ◯ Nej, jeg har aldrig set-, assisteret ved-, eller håndteret en mavedrejningspatient

5. Forestil dig, at du har vagt alene, uden bagvagt, og du får at vide, at der er en mulig mavedrejningspatient på vej. Hvordan har du det mens du venter? Udfyld alle rubrikker i nedenstående skema omkring din mentale tilstand *

Markér kun ét felt pr. række.

	Slet ikke	En smule	Moderat	Meget	Rigtig meget
Jeg føler mig rolig	◯	◯	◯	◯	◯
Jeg føler mig nervøs	◯	◯	◯	◯	◯
Jeg føler mig fokuseret	◯	◯	◯	◯	◯
Jeg føler mig forvirret	◯	◯	◯	◯	◯
Jeg føler mig kvalm	◯	◯	◯	◯	◯
Jeg føler mig angst	◯	◯	◯	◯	◯
Jeg føler mig sikker	◯	◯	◯	◯	◯

Jeg føler mig bekymret	◯	◯	◯	◯	◯
Jeg føler mig okay	◯	◯	◯	◯	◯
Jeg føler mig velforberedt	◯	◯	◯	◯	◯
Jeg føler, at jeg mangler selvtillid	◯	◯	◯	◯	◯
Jeg føler at jeg har lyst til at forlade situationen	◯	◯	◯	◯	◯
Jeg får katastrofetanker	◯	◯	◯	◯	◯
Jeg får koncentrationsbesvær	◯	◯	◯	◯	◯

6. Besvar bedst muligt hvilke udsagn der passer på din opfattelse af at skulle håndtere en mavedrejningspatient selv som færdiguddannet dyrlæge (flere svar er muligt) *

Markér alle, du er enig i.

- [ ] Jeg finder det udfordrende at stille diagnosen mavedrejning på et røntgenbillede
- [ ] De individuelle steps i proceduren er i sig selv ikke udfordrende for mig, men i en stresset situation risikerer jeg at glemme steps eller hvilken rækkefølge jeg skal udføre dem i
- [ ] Jeg finder det udfordrende at håndtere denne type kritiske patient, hvor jeg skal handle hurtigt og korrekt for at redde patienten
- [ ] Jeg er generelt usikker på, hvordan jeg skal gribe en mavedrejningspatient an, da jeg er usikker på hvad den optimale trinvise procedure er.
- [ ] Jeg er bekendt med den teoretisk optimale måde at håndtere en mavedrejningspatient på, men jeg føler det udfordrende at udføre et eller flere af trinene i proceduren i praksis.
- [ ] Jeg føler mig sikker på, at jeg kender de optimale trin i proceduren, og jeg føler mig sikker i at kunne udføre dem korrekt selv i en stresset situation
- [ ] Andet: _____

7. Hvilken del af det kliniske forløb ved en GDV-patient forventer du, vil blive mest udfordrende for dig? (flere svar er muligt) *

Markér alle, du er enig i.

- [ ] Diagnosticering af patienten
- [ ] Stabilisering af patienten
- [ ] Tolkning af blodprøvesvar
- [ ] Trokarisering (dekompression af ventriklen med stor g kanyle)
- [ ] Sondering (orogastric tube og skylning af ventriklen)
- [ ] Gastropexi (kirurgisk fastgørelse af ventriklen til bugvæggen)
- [ ] Fjernelse af nekrotisk væv (fx partiel gastrektomi eller milt ekstirpation)
- [ ] Alle steps
- [ ] Jeg føler mig ikke udfordret
- [ ] Andet: _____

8. Hvordan har du det med at skulle stabilisere en GDV-patient i shock? (udfyld alle rubrikker) *

Markér kun ét felt pr. række.

	Slet ikke	En smule	Moderat	Meget	Rigtig meget
Jeg føler mig rolig	◯	◯	◯	◯	◯
Jeg føler mig nervøs	◯	◯	◯	◯	◯
Jeg føler mig fokuseret	◯	◯	◯	◯	◯
Jeg føler mig forvirret	◯	◯	◯	◯	◯
Jeg føler mig kvalm	◯	◯	◯	◯	◯
Jeg føler mig angst	◯	◯	◯	◯	◯
Jeg føler mig sikker	◯	◯	◯	◯	◯
Jeg føler mig bekymret	◯	◯	◯	◯	◯
Jeg føler mig okay	◯	◯	◯	◯	◯
Jeg føler mig velforberedt	◯	◯	◯	◯	◯
Jeg føler, at jeg mangler selvtillid	◯	◯	◯	◯	◯
Jeg føler at jeg har lyst til at forlade situationen	◯	◯	◯	◯	◯
Jeg får katastrofetanker	◯	◯	◯	◯	◯
Jeg får koncentrationsbesvær	◯	◯	◯	◯	◯

9. Hvordan har du det med at skulle dekomprimere ventriklen på en GDV-patient med en eosophagussonde? (oro-gastric tube og skylning af ventriklen) (udfyld alle rubrikker) *

Markér kun ét felt pr. række.

	Slet ikke	En smule	Moderat	Meget	Rigtig meget
Jeg føler mig rolig	◯	◯	◯	◯	◯
Jeg føler mig nervøs	◯	◯	◯	◯	◯
Jeg føler mig fokuseret	◯	◯	◯	◯	◯
Jeg føler mig forvirret	◯	◯	◯	◯	◯
Jeg føler mig kvalm	◯	◯	◯	◯	◯
Jeg føler mig angst	◯	◯	◯	◯	◯
Jeg føler mig sikker	◯	◯	◯	◯	◯
Jeg føler mig bekymret	◯	◯	◯	◯	◯
Jeg føler mig okay	◯	◯	◯	◯	◯
Jeg føler mig velforberedt	◯	◯	◯	◯	◯
Jeg føler, at jeg mangler selvtillid	◯	◯	◯	◯	◯
Jeg føler at jeg har lyst til at forlade situationen	◯	◯	◯	◯	◯
Jeg får katastrofetanker	◯	◯	◯	◯	◯
Jeg får koncentrationsbesvær	◯	◯	◯	◯	◯

10. Hvordan har du det med at skulle dekomprimere ventriklen på en GDV-patient ved transkutan trokarisering? (med 14g kanyle) (udfyld alle rubrikker) *

Markér kun ét felt pr. række.

	Slet ikke	En smule	Moderat	Meget	Rigtig meget
Jeg føler mig rolig	◯	◯	◯	◯	◯
Jeg føler mig nervøs	◯	◯	◯	◯	◯
Jeg føler mig fokuseret	◯	◯	◯	◯	◯
Jeg føler mig forvirret	◯	◯	◯	◯	◯
Jeg føler mig kvalm	◯	◯	◯	◯	◯
Jeg føler mig angst	◯	◯	◯	◯	◯
Jeg føler mig sikker	◯	◯	◯	◯	◯
Jeg føler mig bekymret	◯	◯	◯	◯	◯
Jeg føler mig okay	◯	◯	◯	◯	◯
Jeg føler mig velforberedt	◯	◯	◯	◯	◯
Jeg føler, at jeg mangler selvtillid	◯	◯	◯	◯	◯
Jeg føler at jeg har lyst til at forlade situationen	◯	◯	◯	◯	◯
Jeg får katastrofetanker	◯	◯	◯	◯	◯
Jeg får koncentrationsbesvær	◯	◯	◯	◯	◯

11. Hvordan har du det med at skulle orientere dig om ventriklens positionering og graden af volvulus? (udfyld alle rubrikker) *

Markér kun ét felt pr. række.

	Slet ikke	En smule	Moderat	Meget	Rigtig meget
Jeg føler mig rolig	◯	◯	◯	◯	◯
Jeg føler mig nervøs	◯	◯	◯	◯	◯
Jeg føler mig fokuseret	◯	◯	◯	◯	◯
Jeg føler mig forvirret	◯	◯	◯	◯	◯
Jeg føler mig kvalm	◯	◯	◯	◯	◯
Jeg føler mig angst	◯	◯	◯	◯	◯
Jeg føler mig sikker	◯	◯	◯	◯	◯
Jeg føler mig bekymret	◯	◯	◯	◯	◯
Jeg føler mig okay	◯	◯	◯	◯	◯
Jeg føler mig velforberedt	◯	◯	◯	◯	◯
Jeg føler, at jeg mangler selvtillid	◯	◯	◯	◯	◯
Jeg føler at jeg har lyst til at forlade situationen	◯	◯	◯	◯	◯
Jeg får katastrofetanker	◯	◯	◯	◯	◯
Jeg får koncentrationsbesvær	◯	◯	◯	◯	◯

12. Hvordan har du det med at skulle repositionere ventriklen intraoperativt? (udfyld alle rubrikker) *

Markér kun ét felt pr. række.

	Slet ikke	En smule	Moderat	Meget	Rigtig meget
Jeg føler mig rolig	◯	◯	◯	◯	◯
Jeg føler mig nervøs	◯	◯	◯	◯	◯
Jeg føler mig fokuseret	◯	◯	◯	◯	◯
Jeg føler mig forvirret	◯	◯	◯	◯	◯
Jeg føler mig kvalm	◯	◯	◯	◯	◯
Jeg føler mig angst	◯	◯	◯	◯	◯
Jeg føler mig sikker	◯	◯	◯	◯	◯
Jeg føler mig bekymret	◯	◯	◯	◯	◯
Jeg føler mig okay	◯	◯	◯	◯	◯
Jeg føler mig velforberedt	◯	◯	◯	◯	◯
Jeg føler, at jeg mangler selvtillid	◯	◯	◯	◯	◯
Jeg føler at jeg har lyst til at forlade situationen	◯	◯	◯	◯	◯
Jeg får katastrofetanker	◯	◯	◯	◯	◯
Jeg får koncentrationsbesvær	◯	◯	◯	◯	◯

13. Hvordan har du det med at skulle lave incisionen til gastropexien i ventriklen? *
(udfyld alle rubrikker)

Markér kun ét felt pr. række.

	Slet ikke	En smule	Moderat	Meget	Rigtig meget
Jeg føler mig rolig	◯	◯	◯	◯	◯
Jeg føler mig nervøs	◯	◯	◯	◯	◯
Jeg føler mig fokuseret	◯	◯	◯	◯	◯
Jeg føler mig forvirret	◯	◯	◯	◯	◯
Jeg føler mig kvalm	◯	◯	◯	◯	◯
Jeg føler mig angst	◯	◯	◯	◯	◯
Jeg føler mig sikker	◯	◯	◯	◯	◯
Jeg føler mig bekymret	◯	◯	◯	◯	◯
Jeg føler mig okay	◯	◯	◯	◯	◯
Jeg føler mig velforberedt	◯	◯	◯	◯	◯
Jeg føler, at jeg mangler selvtillid	◯	◯	◯	◯	◯
Jeg føler at jeg har lyst til at forlade situationen	◯	◯	◯	◯	◯
Jeg får katastrofetanker	◯	◯	◯	◯	◯
Jeg får koncentrationsbesvær	◯	◯	◯	◯	◯

14. Hvordan har du det med at skulle suturere ventriklen fast til bugvæggen? (udfyld alle rubrikker) *

Markér kun ét felt pr. række.

	Slet ikke	En smule	Moderat	Meget	Rigtig meget
Jeg føler mig rolig	◯	◯	◯	◯	◯
Jeg føler mig nervøs	◯	◯	◯	◯	◯
Jeg føler mig fokuseret	◯	◯	◯	◯	◯
Jeg føler mig forvirret	◯	◯	◯	◯	◯
Jeg føler mig kvalm	◯	◯	◯	◯	◯
Jeg føler mig angst	◯	◯	◯	◯	◯
Jeg føler mig sikker	◯	◯	◯	◯	◯
Jeg føler mig bekymret	◯	◯	◯	◯	◯
Jeg føler mig okay	◯	◯	◯	◯	◯
Jeg føler mig velforberedt	◯	◯	◯	◯	◯
Jeg føler, at jeg mangler selvtillid	◯	◯	◯	◯	◯
Jeg føler at jeg har lyst til at forlade situationen	◯	◯	◯	◯	◯
Jeg får katastrofetanker	◯	◯	◯	◯	◯
Jeg får koncentrationsbesvær	◯	◯	◯	◯	◯

15. Hvordan har du det med at skulle vurdere graden af nekrose i ventriklen mhp. evt. partiel gastrektomi (fjernelse af den nekrotiske del af mavesækken)? (udfyld alle rubrikker) *

Markér kun ét felt pr. række.

	Slet ikke	En smule	Moderat	Meget	Rigtig meget
Jeg føler mig rolig	◯	◯	◯	◯	◯
Jeg føler mig nervøs	◯	◯	◯	◯	◯
Jeg føler mig fokuseret	◯	◯	◯	◯	◯
Jeg føler mig forvirret	◯	◯	◯	◯	◯
Jeg føler mig kvalm	◯	◯	◯	◯	◯
Jeg føler mig angst	◯	◯	◯	◯	◯
Jeg føler mig sikker	◯	◯	◯	◯	◯
Jeg føler mig bekymret	◯	◯	◯	◯	◯
Jeg føler mig okay	◯	◯	◯	◯	◯
Jeg føler mig velforberedt	◯	◯	◯	◯	◯
Jeg føler, at jeg mangler selvtillid	◯	◯	◯	◯	◯
Jeg føler at jeg har lyst til at forlade situationen	◯	◯	◯	◯	◯
Jeg får katastrofetanker	◯	◯	◯	◯	◯
Jeg får koncentrationsbesvær	◯	◯	◯	◯	◯

16. Hvordan har du det med evt. at skulle foretage en miltekstirpation ifm. en GDV- operation? (udfyld alle rubrikker) *

Markér kun ét felt pr. række.

	Slet ikke	En smule	Moderat	Meget	Rigtig meget
Jeg føler mig rolig	◯	◯	◯	◯	◯
Jeg føler mig nervøs	◯	◯	◯	◯	◯
Jeg føler mig fokuseret	◯	◯	◯	◯	◯
Jeg føler mig forvirret	◯	◯	◯	◯	◯
Jeg føler mig kvalm	◯	◯	◯	◯	◯
Jeg føler mig angst	◯	◯	◯	◯	◯
Jeg føler mig sikker	◯	◯	◯	◯	◯
Jeg føler mig bekymret	◯	◯	◯	◯	◯
Jeg føler mig okay	◯	◯	◯	◯	◯
Jeg føler mig velforberedt	◯	◯	◯	◯	◯
Jeg føler, at jeg mangler selvtillid	◯	◯	◯	◯	◯
Jeg føler at jeg har lyst til at forlade situationen	◯	◯	◯	◯	◯
Jeg får katastrofetanker	◯	◯	◯	◯	◯
Jeg får koncentrationsbesvær	◯	◯	◯	◯	◯

17. Hvordan vil du selv vurdere din selvtillid i forhold til at skulle håndtere en GDV-patient? *

Markér kun ét felt.

- ◯ Meget god
- ◯ God
- ◯ Hverken/eller
- ◯ Dårlig
- ◯ Meget dårlig

18. Kommentarer til simulationen

Appendix 6: Simulator construction manual

This manual was created to describe how to construct the Maverick simulator using any outer model, therefore no measures are provided, as they may vary depending on the measures of the outer model.
The outer model used for the Maverick 1 is the “Sherman Golden Retriever, large” from Douglas Cuddle Toys.

Oral cavity and esophagus

Materials

3D Printed canine oral cavity	Oral cavity
2 x small balls of airdrying clay	Spacers between upper and lower jaw
6 x kitchen rubber bands	To create jaw tension
1 x bottle neck from a plastic bottle	Serving as the connection between the esophagus and the oral cavity
1 x pink latex bicycle tube	Esophagus
30 x30 cm Neoprene fabric	To sew funnel-shaped “glove” to connect esophagus to oral cavity

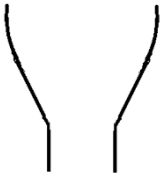
- For the Maverick 1 simulator, the 3D model “Wolf Dog Teeth Set 3D model” from cgtrader.com was used. The model was modified to separate the upper and lower jaw, and subsequently 3D printed.

- Paint the oral cavity as desired. In this case, the oral mucosa and the teeth were painted using pink and white acrylic paint, respectively.

- Shape two balls of appropriately sized air-drying clay and place them on top of the lower jaw molars. Place the upper jaw on top and compress the jaws to make tooth impressions in the clay. Ensure adequate space for the oro-gastric tube to pass through. See picture A.

Picture A

- Sew a funnel of neoprene fabric, see shape below.



- Cut the bottle neck of a plastic bottle in the shape seen in picture B.
- Pull the latex bicycle tube over the narrow part of the bottle neck, as shown in picture C, using superglue to ensure attachment.
- Insert the bottle neck through the neoprene funnel and fit the 3D printed oral cavity into the funnel (picture C). Provide adequate jaw tension by placing 6 rubber bands on the outside of the neoprene as shown in picture C and D.
- Place 6 kitchen rubber bands over the neoprene around the oral cavity.

Picture B

Picture C

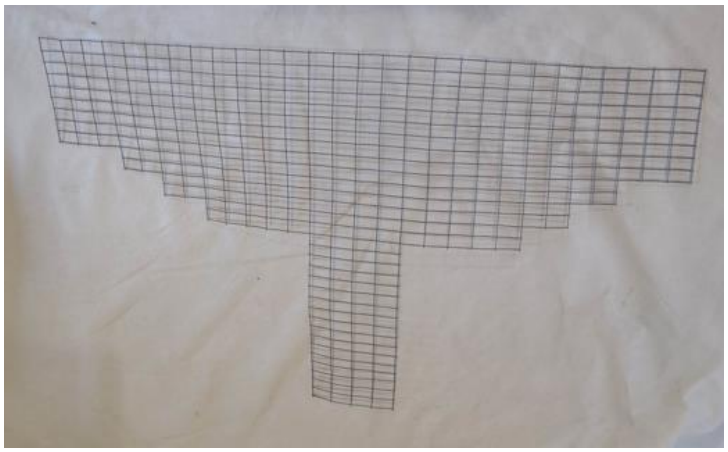
Picture D

Abdominal cavity

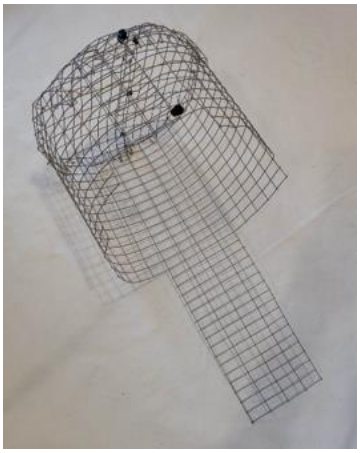
Materials

Fine-meshed solid metal chicken wire	Solid component of abdominal cavity and ribs.
Oil cloth in a proper color	Inner lining of abdominal cavity
Dishcloth	Outer lining of abdominal cavity
Zip ties	Attaching the chicken wire parts together
7 small buttons	To attach the replaceable Allevyn patch to the abdominal wall
Allevyn or foam dressing in an appropriate amount (depending on number of participants)	The patch on the abdominal wall to allow suturing of the stomach to the abdominal wall.
Red marker	To paint on the muscle fibers on the Allevyn.

- Cut the chicken wire as seen in picture E. The shape is important as it must mimic important landmarks as the ribs in xiphoid process.
    - Fold the chicken wire as shown in picture F and measure the diameter. Cut a round piece of chicken wire in this diameter to serve as the diaphragm.
    - To strengthen the sternum, an additional rectangular piece of wire may be added.
- Zip ties are used to hold the chicken wire together in the desired shape.



Picture E



Picture F

- Cut the oil cloth in the shape seen in picture G. The large round piece must fit the diameter of the round piece of chicken wire functioning as the diaphragm, plus sew allowance. The minor circle must fit the diameter of the pelvic region of the outer model.

The side with the yellow outline should fit the circumference of the larger round piece and likewise the blue outline should fit the minor round piece of oil cloth. The remaining purple sides should equal the length of the chicken wire abdominal cavity.

Picture G

- The oil cloth pieces are sewn together. The yellow side with the large circle and the blue side with the minor circle. The final design is shown in picture H.

Picture H

- Now place the oil cloth construct inside the chicken wire and coat the entire model with dishcloth on the outside. The dishcloth and the oil cloth must be sewn together alongside the abdominal opening. The dishcloth is added to provide additional thickness to the final abdominal wall.

- Sew seven buttons to the inside of the right abdominal wall, allowing placement of a 10x10 allevyn patch. The buttons must allow accurate anatomical placement of the patch, as this serves as the area of the gastropexy incision. The correct anatomical site is 2-3 cm. behind the most caudal rib. See picture Ja.

Picture I

Picture Ja

- Cut the allevyn patches in 10x10 cm. pieces and draw muscle fibres in the correct anatomical direction on each patch using a thin red marker. See picture Jb.

- Cut seven holes suitable for the buttons in each Allyvyn patch. See picture Jb.

Picture Jb

Trocarization pocket

Materials

2 x dishcloth	Pocket for plastic freezer bags
2 x small press studs	To close the dishcloth pocket
3 x big press studs	To fixate the abdominal wall to the outer model
3 pieces of 15x15 cm thin latex	Cutaneous area for trocarization
14g syringes	For trocarization

- Cut two dishcloths in a shape that fits a 4L inflated freezer bag.
- Sew the two pieces together in a shape similar to the one seen in pictures Ka and Kb, creating a dishcloth pocket.

Picture Ka

Picture Kb

- The pocket is sewn into the outer model at the correct anatomical site for a distended stomach. See picture L.

Picture L

- Cut a hole in the outer model in the area of the dishcloth pocket and place a three-layer patch of latex between the pocket and the outer model serving as the cutis. See picture Ma and Mb.

Picture Ma

Picture Mb

- Place two press studs at the opening of the pocket to enable closing after inflation of the freezing bag. See picture N.

- The final construct of the abdominal cavity is inserted into the outer model.

- Another three large press studs are sewn into the model to enable closure between the abdominal wall and the outer model. See picture N.

Picture N

Abdominal organs

Materials

8 x 1 kg air drying clay	To create the stomach mould
Body Silicone (10 Shore A) (2 kg kit)	The stomach
Thix agent for silicone	Hardens the silicone
Silicone color – light red	Provides color to the silicone
8 fan shaped paint brushes	To apply silicone to the clay mould
1 x small plastic cylinder	Serves as connection point for the latex bicycle tube and the silicone eosophagus

Allevyn or foam dressing in an appropriate amount (depending on number of participants)	The patch on the stomach to enable suturing of the abdominal wall and stomach.
7 small buttons	To attach the the Allevyn patches to the stomach
1 x mesh fruit bag	The greater omentum
Construction silicone	The fat of the greater omentum
Oil cloth	Spleen and liver
Wheat flour	Filling for liver, spleen and safety patch
Pink latex bicycle tubes in different sizes	Intestines
Cat litter	Filling for the colon
Potato flour	Filling for the small intestines

- Cut open the fruit bag and make an omentum-like pattern using the construction silicone. See picture Q.

- Form two laterally reversed moulds in the shape of a stomach using the air drying clay. Create an elevation in the clay in one of the moulds to enable placement of an Allevyn patch in level with the silicone. For a more realistic impression, lines may be drawn into the clay in the shape of the gastric arteries. It is recommended to ensure a deeper clay mould than the one used for

the original Maverick, since this would most likely make the stomach appear more dilated and less flattened.

Picture Oa

Picture Ob

- When the clay moulds are completely dry, the silicone is mixed following instructions. Adequate thickness of the stomach requires approximately 4-6 layers of silicone depending on the thickness of the layers and the amount of thix agent used. See picture P.
  When the 3rd layer has been applied, the omentum is placed alongside the length of the greater curvature on top of the silicone in the mould without the patch elevation. Apply the last 2-3 layers of silicone so that the omentum is molded into the silicone. See picture Q

Picture P

Picture Q

- After finishing the moulding of both sides of the stomach, one is placed on top of the other and the edges are approximated. Seal the edged together with silicone to create a hollow stomach.

- Sew 7 small buttons into the patch dent of the stomach. Sew the buttons through a piece of neoprene on the inside of the stomach, so that the tread does not rip through the silicone. Attach an oil cloth safety patch to prevent cutting into the stomach, when performing the gastropexy. See picture Ra.

Picture Ra

- Cut Allevyn patches in the shape of the dent and make seven buttonholes. See picture Rb.

Picture Rb

- Create a hole through both the diafragm of the oil cloth - and chickenwire for the silicone esophagus to pass through.

- Pad the edge of the hole with airdrying clay, to prevent the chicken wire from cutting into the silicone esophagus.

- Use the plastic cylinder to connect the latex- and silicone part of the esophagus See picture Sa and Sb.

Picture Sa

Picture Sb

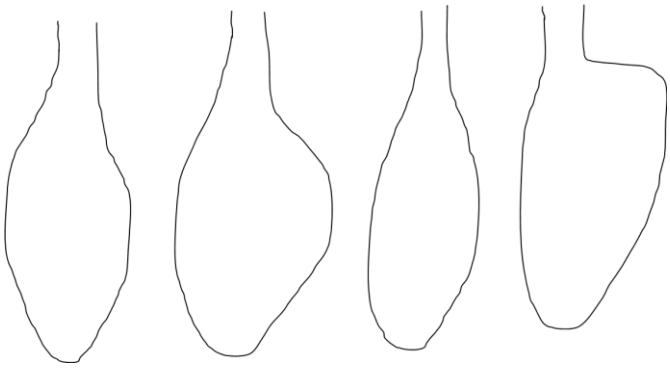
- Fill the latex bicycle tubes with potato flour and glue the ends together using super glue. Fill a section of the largest bicycle tube with cat litter, and place it caudally in the outer model, functioning as the colon. See picture Sc.

Picture Sc

- Sew the silicone duodenum and a bicycle tube together to connect them.
- Sew a spleen-shaped pocket of oilcloth and pack it with freezer bags filled with flour to ensure accurate weight and sensation.
- Sew the oil cloth spleen to the omentum. See picture T.

Picture T

- Sew 4-5 liver lobes of oil cloth. Se picture U for shape ideas. Ensure long ends to pass through the diaphragm.



Picture U

- Fill the liver lobes with freezer bags filled with flour.

- Cut a hole in the diafragm for the ends of the liver lobes to pass through.
- Pad the edges of the hole with airdrying clay, to prevend the chicken wire from bamaging the oil cloth.
- Pull all the liver lobe ends through the hole in the diafragm. Tie them together using a metal wire and attach it to the chickenwire, to make the liver lobes stay in place. See picture V.

Picture V

Skin

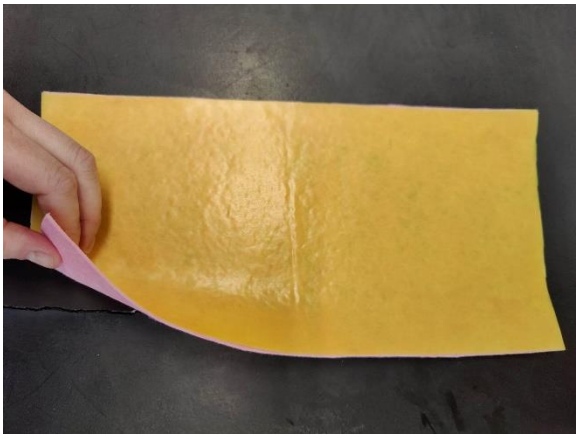
Materials

Discloth	Skin
Thera-band. Thickness 0,35mm	Skin
Glue	To glue dishcloth and thera-band together

- Cut the Thera-band in the length and width that fits your model.

- Cut dishcloth in the same size as your there-band.

- Glue the two materials together. See picture X for result.



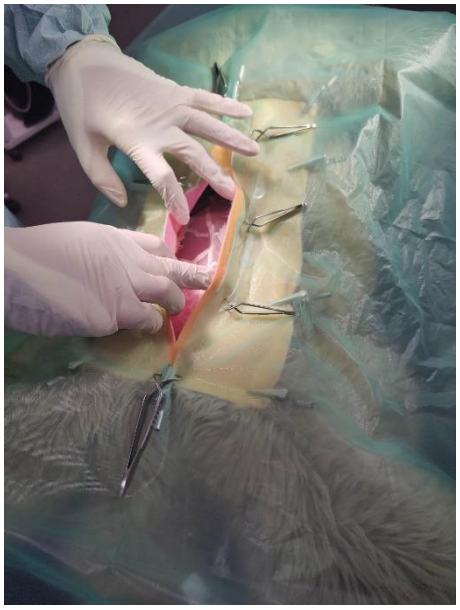
Picture X

Materials needed for the simulation

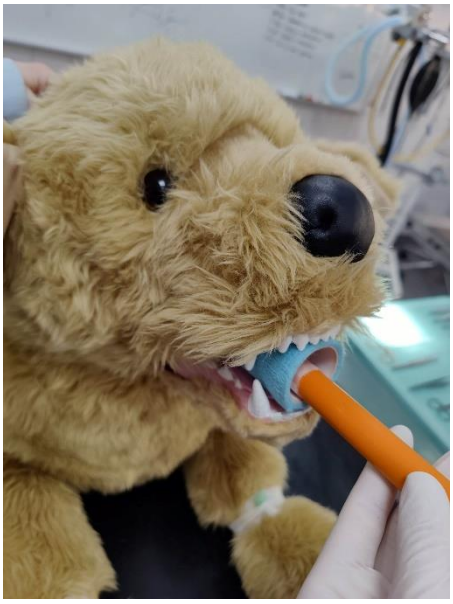
1x oro-gastric tube	Oro-gastric intubation
1 x Vetflex	To keep the mouth open
1 x tape	To mark the length on the oro-gastric tube
Baby oil	Lubricant for the oro-gastric tube
14g syringes	For trocarization
Freezer bags	To inflate for trocarization
1 x straw	To ease inflate the freezer bags in the trocarization pocket

2 x large catheter	To place in the forelegs of the outer model
10 x small alligator clips	To attach the skin to the outer model
2 x Surgical drape	For draping the patient and the instrument table.
Surgical instrument of own choice	For the gastropexy
PDS suture 0 or 2-0	For the gastropexy
Surgical gown	Gowning

Patient ready for surgery



Surgery



Oro-gastric intubation

Appendix 7: Maverick case

Maverick Case – Mavedrejning

Signalement:

- Maverick, Golden Retriever, 5 år 6 mdr., neutraliseret han.

Anamnese:

- Akut dårlig her til aften. Rastløs, uproduktiv vomitus, hypersalivation, distenderet abdomen.

Klinisk undersøgelse:

- Ankommer liggende i sideleje.
- Vægt: 40 kg.
- T: 37,7 grader
  R: Halser
  P:160 - 180/min
- Cirkulation: Svag femoral puls, CRT >3 sek. bleg gingival slimhinde
- Hydrering: Tørre slimhinder, hudturgor <2 sek.
- Ausk cor: To veladskilte hjertetoner uden mislyde. Tachycardi.
- Abdomen: Voldsomt distenderet og tympanisk abdomen. Dolent ved palpation.

Initiel behandling og diagnose:

- Da hunden er i kritisk tilstand og i shock, anlægger sygeplejersken store venekatetre i begge hundens forben.

- Du mistænker, at hunden har en mavedrejning, og derfor vælger du at udtage blod til hæmogram, biokemi, blod/gas og koagulationsprofil fra v. jugularis. Du analyserer dem når svarene foreligger.

- Du måler laktatniveauet på en laktatmåler.

    - Laktat: 7,9 mmol/L

- For at stille diagnosen vælger du at tage et lateralt abdominalt røntgenbillede på højre side.

Note: Laktatniveauet ved præsentation samt fald i laktatniveau efter behandling har betydning for prognosen. Studier viser at høje laktatniveauer give øget mortalitet (cut-off hhv. 4.1, 6.0, 7.4 og 9.0 mmol/L)

132

STEP 1: Shockterapi

- Sygeplejersken måler blodtryk og tager EKG.
  - Blodtryk: SAP/DAP/MAP: 88/48/58
  - EKG: Normalt, puls: 180/min.
- Imens udregner du væsketerapi
  - Shock-behandling:
    - Max. 90 ml/kg/t. isoton krystalloid
    - Dette administreres i ¼ doser, der gives på 15 min. Patienten reevalueres imellem hver dosis.
      - Beregn maximal shock dosis samt bolusmængden.
    - Du udvælger og administrerer passende analgesi

Note: Afhængigt af respons på væsketerapien kan yderligere max 20 ml/kg af syntetiske kolloider tilføjes. Dette administreres i ¼ doser (5 ml/kg).

STEP 2: Dekompression

For at udligne det intraabdominale tryk kan dekompression udføres på to måder. Sondering forsøges altid mhp. at skylle ventriklen før operation samt for at dekomprimere. Trokarisering kan udføres, hvis ikke en sonde kan passeres samt ved meget akutte patienter.

Sondering

1. Afmål sonden fra snudespids til processus xiphoideus og markér længden med et stykke tape.

2. Placér en hul rulle med fx vetflex (eller lignende) på langs i hundens mund til at holde munden åben og til at føre sonden igennem.

3. Smør sonden med lubrikerende middel og passér sonden igennem hullet i rullen med vetflex og ned i eosophagus. Der kan være resistens ved den nedre eosophagussphincter.

4. Skyl med 5-10 ml/kg lunt vand og lad vand og maveindhold komme retur gennem sonden og ned i en spand. Indholdet undersøges for tegn på hæmorrhagi eller nekrose (rød- eller sortfarvning). Gentag skylning 2-3 gange (simuleres blot på simulatoren).

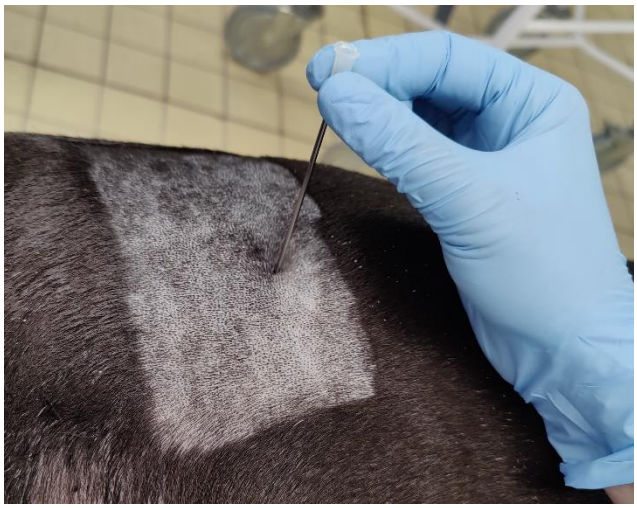
Note: Hvis ikke sonden kan passeres, kan det forsøges at placere hunden med forbenene på bordet og bagbenene på gulvet, altså i en mere opret position.

Hvis ikke sondering er mulig, forsøg da med trokarisering først!

Trokarisering

1. Udvælg det mest dilaterede område af ventriklen
2. Klip og klargør området lege artis (dette er udført på simulatoren)
3. Trokarisér ventriklen med en 14g kanyle og dekomprimér ventriklen

Note: Der kan perkuteres efter en høj "ping-lyd", hvis denne ikke høres, kan det skyldes at milten er i vejen. Brug da UL til at vælge området for trokarisering.



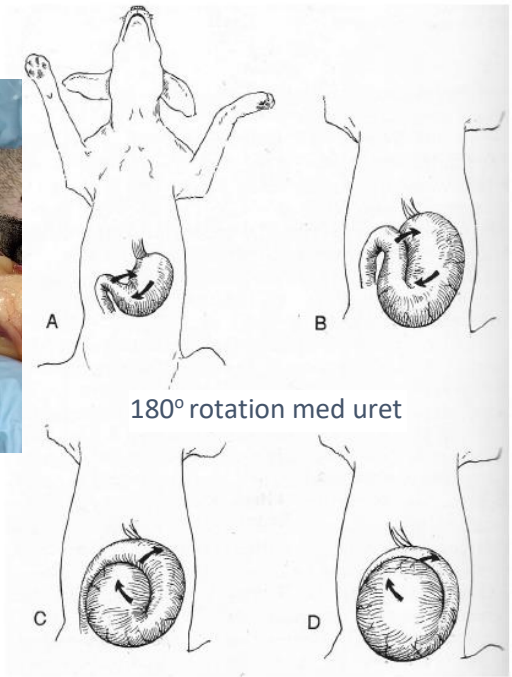
STEP 3: Gastropexi

5. **Incision**
   - Lav en midtlinjeincision i en passende længde fra processus xiphoideus gennem kutis, subkutis og linea alba.
     Hvis omentum major dækker ventriklen sfa. rotationen, flyt det da forsigtigt.

6. **Repositionering**
   - Stå på dyrets højre side.
     Orientér dig om ventriklens og miltens placering. Rotationer sker oftest med uret.

   - Før højre hånd ned langs venstre abdominalvæg ved siden af ventriklen, tag forsigtigt fat i pylerus og træk den ventralt (op mod incisionen). Skub samtidig forsigtigt på mavesækken med din venstre hånd i dorsal retning (nedad mod bordet) og mod dyrets venstre side.

   - Palpér den distale del af eosophagus og cardia for at sikre at der ikke længere er en volvulus.



Slatter D, editor. Textbook of small animal surgery. 2nd edition. Philadelphia: WB Saunders; 1993. p. 602;

7. **Gennemgang af abdomen**
   - Undersøg ventriklen for tegn på nekrose især omkring fundus og curvatura major.
   - Tjek for tegn på blødning og palpér ventriklen for fremmedlegemer.
   - Tjek at milten er korrekt placeret i venstre kvadrant samt for tegn på nekrose.

8. **<u>Gastropexi</u>**:
   - Lav en 4-7 cm. incision i det seromuskulære lag af ventriklen parallelt med længdeaksen imellem curvatura major og minor i niveau med antrum pyloricum. Incisionen skal IKKE gå ind i lumen.

   - Lav en incision på samme længde 2-3 cm. caudalt for bagerste ribben. Incisionen skal lægges parallelt med fibrene i m. transversus abdominis igennem peritoneum og musklen.

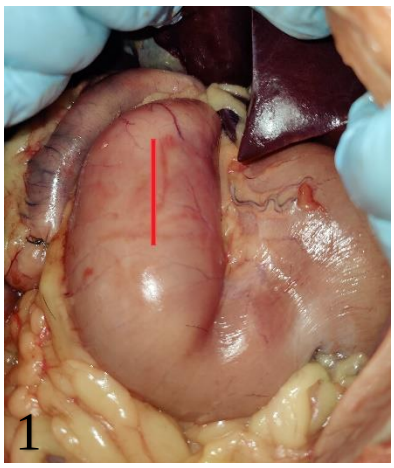
   - Brug 0 eller 2-0 absorbérbar sutur (fx PDS)

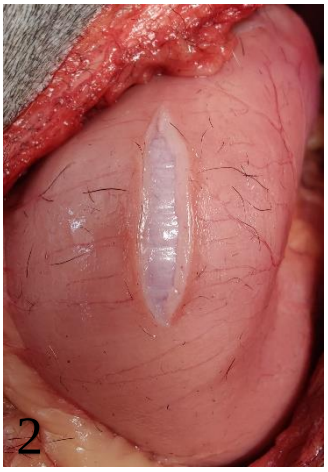
   - Start med at suturere den cranielle sårrand på ventriklen sammen med den cranielle sårrand på bugvæggen i et simpelt fortløbende mønster. Start dorsalt. Suturér derefter den caudale sårrand på ventriklen sammen med den caudale sårrand på bugvæggen sammen på samme måde.

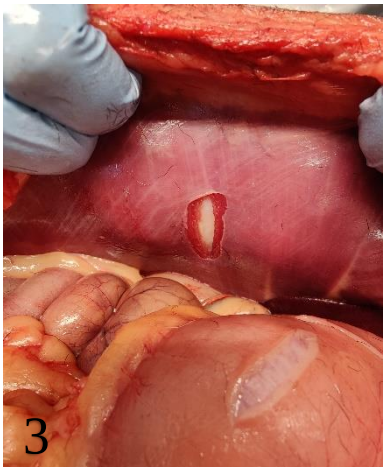
   - Vær sikker på at det ventrikulære muskellag er i kontakt med den abdominale muskel.

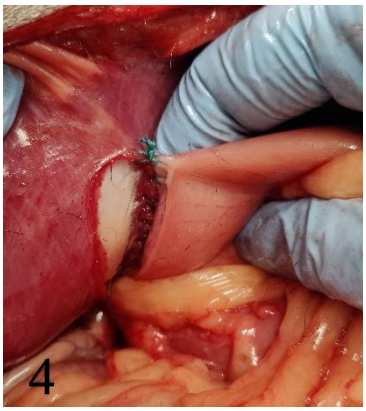
9. **<u>Lukning</u>**:
   - Luk abdomen i tre lag (gøres ikke på simulator)

<u>Note:</u> Oftest er ventriklen roteret 180 grader med uret. En større grad af rotation og rotation mod uret kan også forekomme, derfor er det vigtigt at orientere sig om ventriklens placering intraoperativt.









Appendix 8: Content validation comments

Spørgsmål 1. Case:

Casebeskrivelsen inkl. diagnostiske undersøgelser indeholder et realistisk eksempel på en GDV-patient - uddyb gerne

- "Realistisk race mv."
- "Mange GDV-patienter er mere dybbrystet end en Golden retriever, derudover er de sjældent sideliggende, men vågne, gående, rastløse og prøver at kaste op uden noget kommer op."
- "Men de behøver slet ikke være så dårlige"
- "I casen blev der taget hæm, bio og blodgas(ev mere?). Det er sjældent at hæm+bio er relevante medmindre hunden har comorbiditett som kan influere på beslutning om man bør gå videre med OP eller ikke. Så ofte kan man nøjes med en blodgas alternativt laktat."

Spørgsmål 2. Shockbehandling:

Simulationen giver et tilstrækkeligt realistisk billede af, hvordan man stabiliserer en GDV-patient i shock - uddyb gerne

- "Måske uddybe at tingene ofte foregår samtidig - væskebehandling samtidig med sondering fx"
- "Forslag at skrive drop-hastighed (ml/t) for både total mængde samt for boluser"
- "Fin beskrivelse med væske, smertestillende mv."
- "Der er for ensporet fokus kun på væsketerapi."
- "Kommentar: Det er sjældent at man faktisk beregner en præcis shockbolus til en GDV-pt i den virkelige verden. Man vil ofte sætte dem på fuld hastighed mens de forberedes for OP. De fleste når derved at få 1,5-2L inden OP. Ved mindre racer bør man selvf. udregne mængde."

Spørgsmål 3. Shockbehandling:

Vejledningen til initiel shockbehandling er let læselig og forståelig - uddyb gerne

- "Overvej hvornår der måles blodtryk og EKG i et praktisk scenarie"

- ”I forhold til beregning af shockbolus NaCl, så mangler der kilder på væskebolus-mængden (findes der valide kilder?), derudover så er det utroligt svært at overhydrere en hund med GDV da det oftest er store- eller gigantracer som ikke får problemer med væskebolus på samme måde som små hunde hvor det er lettere at lave en utilsigtet overhydrering.”
- ”Mangler smertelindring”

Spørgsmål 4. Sondering:

Sondering af patienten kan udføres på simulatoren med tilstrækkelig taktil realisme - uddyb gerne

- ”Usikker på hvor tydeligt man mærker om man kommer i oesophagus, fornemmelsen var god men kunne jo i princippet have været i trachea. Jeg foretrækker at først sondere under anæstesi da det er enklere, patient mærker det ikke, der er mindre stress/bedre kontrol, der er allerede tubus i trachea. Kræver oftest trocharisering først. Giver mere stabil patient i forhold til cirkulation, smerte etc.”
- ”Meget velfungerende og realistisk fornemmelse også med sphincteren. Man kunne have ønsket en ventrikel med lidt tryk ved sondering eller indhold for realismens skyld.”
- ”Det er en del for let”
- ”Compartmentdannelsen der ses på røntgenbilledet eksiterer ikke i modellen.”
- ”Der mangler en fornemmelse af at man ikke kan komme længere ind når ventriklen er drejet. Men jeg forstår at det er svært at udføre :)”

Spørgsmål 5. Sondering:

Sondering af patienten kan udføres på simulatoren med tilstrækkelig visuel realisme ift. anatomiske pejlemærker - uddyb gerne

Ingen kommentarer

Spørgsmål 6. Sondering:

Den skriftlige vejledning til sondering er let læselig og forståelig - uddyb gerne

- ”Kunne godt have ønsket en tydeliggørelse af vigtigheden af brug af vetflex/træstykke mm til at passe på sonden i munden, så den ikke bides over. Derudover tydeliggørelse af om sonden lægges på bedøvet og intuberet hund eller vågen hund. Hvis bedøvet hund bør vigtigheden af intubering med oppustet cuff understreges.”

Spørgsmål 7. Trokarisering:

Trokarisering af patienten kan udføres på simulatoren med tilstrækkelig taktil realisme - uddyb gerne

- ”Jeg foretrækker at gøre det på venstre sode i forhold til milten - men scanner gerne inden, for at tjekke hvilken side milten er på”
- ”Hvis det er teknisk muligt at få endnu mere tympanisk lyd men det var rigtig fint”
- ”Den var meget god. Man kan palpere ribben, men ikke få steelband lyd”
- ”Ventrikelovertrykket burdevære tydeligere hørbart evt med udsivende maveindhold.”

Spørgsmål 8. Trokarisering:

Trokarisering af patienten kan udføres på simulatoren med tilstrækkelig visuel realisme ift. anatomiske pejlemærker - uddyb gerne

- ”Hvis man kunne lave modellen med en ultralydsscanner så testpersoner kunne tjekke for at milten ikke blev trokariseret ville det være en lækker feature.”

Spørgsmål 9. Trokarisering:

Den skriftlige vejledning til trokarisering er letlæselig og forståelig - uddyb gerne

Ingen kommentarer

Spørgsmål 10. Gastropexi:

Simulatorens dimensioner giver et tilstrækkeligt realistisk billede af organernes placering og udfyldning af abdomen - uddyb gerne

- ”Milten skal måske være større/mere i vejen men en lille detalje”

- ”Tarmene fyldte mindre end normalt og bevæger sig ikke i vejen som på den levende patient”
- ”Meget eng, men simulatoren er lidt lille i forhold til den gennemsnitlige patient med GDV.”
- ”Ventriklen er lidt for mobil, kan bevæges for meget cranielt/caudalt”
- ”Ventriklen er slet ikke dilateret og i mit tilfælde roteret mod uret.”

Spørgsmål 11. Gastropexi:

Den taktile følelse af bughuleorganerne var overordnet set tilstrækkeligt realistisk - uddyb gerne

- ”Cardia kunne palperes drejet men lå i følge Veronika korrekt og skulle bare justeres lidt :-) Hvis det er muligt at lade sonden ligge i (under anestesi) så er det i det virkelig liv ofte lettere at mærke folderne hvis de er der”
- ”Lidt mindre elastiskt”
- ”Der mangler udspilning af ventriklen samt at materialet er lidt stift at arbejde med.”
- ”Oesophagustorkveringen kunne ikke føles. Pylorus/duedenum var ganske entydigt mærkbar.”
- ”Oment og ventrikel ligner godt!”

Spørgsmål 12. Gastropexi:

Repositionering af ventriklen kan udføres på simulatoren med tilstrækkelig taktil realisme - uddyb gerne

- ”Vil sige at det er markant nemmere på simulatoren end i virkeligheden”
- ”Ved akut kirurgi oplever jeg ofte at ventriklen dilatere igen og luften slipper når den bliver drejet på plads. Hvis det er muligt at puste den op igen med sonde og se at den tømmer sig? Men det er måske for avanceret for modellen”
- ”Lidt nemmere end i virkeligheden”
- ”Lidt stift materiale. Savner noget tyngde i ventriklen (som hvis den har lidt indhold, hvilket der ofte er), samt at man mærker dekomprimering når den reponeres, da gassen kan komme ud.”

- ”Under normale omstændigheder vil det meste at abdomen være udfyldt, der er lidt for god plads her”
- ”Vanskelig pga manglende ventrikeldilatation og miltstørrelse/-stase.”

Spørgsmål 13. Gastropexi:

Repositionering af ventriklen kan udføres på simulatoren med tilstrækkelig visuel realisme ift. anatomiske pejlemærker - uddyb gerne

- ”Pylorus og esophagus er godt angivet.”
- ”Pylerus/duodenum er lidt for markant. Vil som ofres være mere som en stor ballon der skal roteres og ikke hvor man kan tage fat i en tarm”
- ”Manglende dilatation er også her et problem. Langt de fleste pt bliver kun delvis dekomprimeret.”

Spørgsmål 14. Gastropexi:

Simulatoren tillod korrekt anatomisk placering af ventrikelincisionen - uddyb gerne

- ”Tillader korrekt position af incision, men viser også hvor det skal være meget tydeligt så begrænset “detektivarbejde” i denne del.”
- ”Ventriklen var måske lidt caudalt ift bugvæggen”

Spørgsmål 15. Gastropexi:

Incision gennem lagene i simulatorens ventrikel kunne udføres med tilstrækkelig visuel realisme - uddyb gerne

- ”Man er usikker på om man kommer igennem ventriklen. Er det muligt at lave en slags hinde som man ikke skal perforere?”
- ”Man mangler fornemmelsen af de forskellige lag i ventriklen”

Spørgsmål 16. Gastropexi:

Incision i simulatorens ventrikel kunne udføres med tilstrækkelig taktil realisme - uddyb gerne

- ”Ingen tydelig corian slip”
- ”Se ovenfor”
- ”Materialet er lidt sejt at skære i.”
- ”Som skrevet tidligere, mangler lagene i vævet, for er mærke hvor meget man skal “skære” igennem”

Spørgsmål 17. Gastropexi:

Simulatoren tillod korrekt anatomisk placering af bugvægsincisionen - uddyb gerne

- ”Måske kan ribben være lidt tydeligere indefra abdomen eller også mærkede jeg ikke ordentlig efter”
- ”Materialerne viser hvor incisionen skal være. Ønsker understregelse af alvoren af at man er bagved bagerste ribben for ikke at risikere at lave hul i diafragma.”
- ”Jeg lægger normalt snittet horisontalt, bare til info”

Spørgsmål 18. Gastropexi:

Incision gennem lagene i simulatorens bugvæg kunne udføres med tilstrækkelig visuel realisme - uddyb gerne

- ”Man mangler fornemmelsen af vævet der trækkes fra hinanden, men generelt fint”

Spørgsmål 19. Gastropexi:

Incision i simulatorens bugvæg kunne udføres med tilstrækkelig taktil realisme - uddyb gerne

Ingen kommentarer

Spørgsmål 20. Gastropexi:

Suturering i bugvæggen var tilstrækkeligt realistisk - uddyb gerne

- ”Materialerne er ikke stærke nok til at holde suturerne, så en assisten skal holde ventriklen mod bugvæggen for at der ikke rives igennem materialet.”

- ”Lidt for god plads men ellers ja”
- ”Sprang sutur over”
- ”Materialet var for svagt og ventrikel for stiv.”

Spørgsmål 21. Gastropexi:

Suturering i ventriklen var tilstrækkeligt realistisk - uddyb gerne

- ”Forslag at bruge 2 suturer til hhv craniale og caudale incision”
- ”Samme som for bugvæggen.”
- ”Allevyn er lidt mere skrøbeligt end væv, så svært at trække incisionernr sammen uden ar det går i stykker.”
- ”Do”

Spørgsmål 22. Simulator:

Simulatoren var let at anvende - uddyb gerne

- ”Lidt nemmere end på den rigtige patient”
- ”Meget let og realistisk.”
- ”Gav et godt indblik i hvor svært det er at “nå ned” i abdomen”

Spørgsmål 23. Simulator:

Simulationen gav overordnet set et realistisk billede af, hvordan det er at håndtere en GDV-patient - uddyb gerne

- ”Lidt for nemt, men god til st give et billede af arbejdsgangene”

Spørgsmål 24. Simulator:

Jeg vurderer, at simulationen har de overordnede egenskaber, der kræves for at kunne bidrage til at gøre nybegyndere mere komfortable med det at skulle håndtere en GDV-patient - uddyb gerne

- ”Der mangler info for nybegyndere i hvordan man evt håndterer komplikationer som nekrose af ventrikelvæg mm. Ressektion af nekrotisk væg mm. Er næppe dag 1 kompetence

og derfor bræ man nævne nogle muligheder for hvordan man kan løse sådanne komplikationer enten permanent eller midlertidigt til man kan få hjælp."

- "Det er fedt at I har alle steps med, lige fra laktatmåling, sonderin, trokarisering til selve operationsproceduren"
- "For mig er det ikke det kirurgiske der er det svære ved operationen. Vil vurdere de er meget mere komplicerede ift shock og anæstesi"
- ", men den gør det lettere at vurdere sværhedsgraden af gastropexidelen."

Øvrige kommentarer til simulatoren

- "Flot arbejde!!"
- "SImlulatoren er god men der mangler lidt overordnet en mer realistisk vævsfølelse for organer og bugvæg"
- "Jeg håber det kan hjælpe med at afmystificere mavedrejninger for studerende, så de kan føle sig lidt mere trygge med den type patienter. Og så de ved hvad der skal gøres."
- "Overordnet set super god for det kirurgiske men mangler noget mere ift anæstesi og specielt analgesi"
- "Sjovt og spændende og meget relevant problemstilling."

Appendix 9: Student questionnaire, after the simulation – comments

Kommentarer til simulationen

21 svar

- "Virkelig god simulation! Noget man virkelig har manglet mere indgående kendskab til i undervisningen"

- "Fedt at simulatoren "går hele vejen" med casen, så man ikke skal forestille sig større dele af casen uden at få det i hænderne. Hvis simulatoren skal udbygges kan man inkludere flere beslutningsprocesser ift. shockbehandling og evt. mere baggrundsinformation om prædisponerende faktorer, så man øver sit mønstergenkendelse."

- "Føler jeg er blevet rimelig ok til de ting der blev gennemgået i simulatoren. Men fx fjernelse af nekrotisk væv og miltekstirpation vil jeg stadig syntes er svært."

- ”Simulationen gav en rigtig god gennemgang af de forskellige trin i håndtering af en GDV, og jeg føler mig mere rustet, hvis jeg skulle møde det i praksis. Dog er der fortsat mange uvisheder som er svære at forudsige og kende til, før man har dyret på bordet, hvilket fortsat giver uro i maven og tvivl på egen selvtillid.”

- ”Virkelig god, krydser fingre for at den kommer med i akut rotationen. En senere udbygning kunne være fedt med også at fjerne et stykke nekrotisk væv. Tak for en god oplevelse :)”

- ”Meget god! Måske der kunne komme nogle billeder af normal væske og hæmorragisk/nekrotisk væske ifm. ventrikelskylning samt nogle billeder af nekrotisk ventrikelvæv som man burde fjerne? :-)”

- ”Synes det var en mega god simulation. Det ville være super at implementere det i undervisningen.”

- ”Rigtig god simulation for sondering, trocharisering (men manglede lidt at øve at lede efter rette sted at trocharisere selv), samt repositionering og gastropexi. Skal I udvide med noget, ville jeg foreslå billeder af nekrose af ventrikel og milt, samt øve miltekstirpation.”

- ”Rigtig god. Vil stadig være i tvivl om identificering og fjernelse af nekrotiskvæv.”

- ”Super fedt, man støder på mange ting som man ikke kan læse sig til. F.eks. hvordan man skal holde på nålen med nåleholderen for at nå derned, hvor man skal suturere.”

- ”Den var super! Det kirurgiske giver specielt bedre mening efter at have prøvet det.”

- ”Rigtig god simulation, som ingen bog kan leve op til. Erfaring er jo altid godt og jeg har set én GDV patient, men at stå med det selv er bare ikke det samme. Jeg vurderer stadig min selvtillid til kun at være hverken/eller, da der stadig er delelementer jeg ikke ville kunne håndtere (gastrektomi + splenektomi), men havde I spurgt om udelukkende gastropexi ville jeg have svaret meget anderledes, da jeg nu ved, hvordan man gør og jeg er meget mindre forvirret omkring det. Super fed simulation!! Jeg håber, den bliver aktuel i undervisningen :-

)”

- ”God måde at øve en GDV på, og især brugbar som kommende dyrlæge der skal ud i praksis, så man har prøvet at øve det før man skal i gang med det selv. Tak for at i har brugt tid på det”

- ”Efter simulationen føler jeg mig meget sikker i diagnostik og stabilisering af patienten inkl sonde og trokarisering. Jeg har fået et meget bedre overblik over hvordan selve operationen foretages. Jeg kunne se, at mine evner var langt bedre end forventet. Hvis jeg havde mulighed for at øve selve operationsdelen flere gange, ville jeg nok ende med at føle mig rimelig tryk i proceduren. Jeg mangler dog vurdering og udførsel af fjernelse af nekrotisk væv. Ligeledes hvordan man griber det an, hvis milten er drejet og skal fjernes. Alt i alt synes jeg det var en rigtig god simulationsøvelse, der var overskuelig og lærerig. Jeg fik endnu bedre styr på det jeg vidste noget om (diagnostik og stabilisering) og fik en god intro til operarationen.”

- ”Stor ros til udviklingen af modellen og jeg håber jeg kan prøve den en anden gang :D”

- ”Tak for en god øvelse, den har forklaret mig meget og fantastisk at få det lidt i hænderne.”

- ”Tak for en god simulation!”

- ”Virkelig god simulation! Jeg synes det fik oversat den lille smule teori man har haft om det rigtig godt til praksis, og jeg føler helt klart, at jeg har bedre styr på trinene og udførelsen nu. Det ville være fedt, hvis der også blev lavet en udvidet version med miltekstirpation samt med billeder af forskellige stadier af nekrose af ventriklen, da det jo er svært at have på en simulation 😀 ″

- ”Rigtig god simulator! Fik virkelig meget ud af at få det i hænderne på en simpel måde i rolige omgivelser!”

- ”Virkelig en god og let tilgang til en kompliceret patient! Føler mig meget bedre forberedt efter simulationen - TAK for det :-)”

- ”Super nice bamse og projekt”

- ”Jeg tror godt jeg kunne havde trykket af jeg var lidt mere nervøs og uviden inden simulatoren... hvad man ikke ved har man ikke ondt haha. sorry hvis det giver dårligere data. jeg synes faktisk jeg føler mig klar til en GDV patient efter simulatoren undtagen lige det med miltekstirpation og fjernelse af nekrotisk væv og det er jo ikke sådan liiige. men det ka i jo så heller ikke lære os med simulatoren så det er nok derfor jeg føler mig usikker på det. har som sagt prøvet at fjerne milt på kadaver men tror ikke jeg gjorde det korrekt så har dårlig selvtillid der men havde ikke en tutor der.”