



UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA  
Facultad de Veterinaria



# **Management of trauma patients based on a retrospective review of small animal clinical cases: A protocol guide in emergency approach for veterinary students and novel practitioners**

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**TUTOR:** Maria Aguirre Sanceledonio

**CO-TUTOR:** David Oliveiro Rodriguez Lozano

**Curso Académico 2018-2019**

# INTRODUCTION





Underlying problem may not be evident for 24-48 hours post-presentation

# Polytrauma patients

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## Severe blunt trauma in dogs: 235 cases (1997–2003)

Stephen A. Simpson, DVM; Rebecca Syring, DVM, DACVECC and Cynthia M. Otto, DVM, PhD, DACVECC

The Field Triage by veterinary practitioners is a critical aspect of trauma systems because it helps to identify potentially seriously injured patients and inform transport decisions.

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## The impact of surgical timing and intervention on outcome in traumatized dogs and cats

Nathan W. Peterson, DVM, DACVECC; Nicole J. Buote, DVM, DACVS and James W. Barr, DVM, DACVECC



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September 14-18  
Hyatt Regency  
New Orleans, LA



### What To Do Before Referral

INTERNATIONAL VETERINARY EMERGENCY AND CRITICAL CARE SYMPOSIUM 2018

Jamie M. Burkitt Creedon, DVM, DACVECC  
University of California-Davis, Davis, CA, USA

**The 3 body systems that can lead to immediate loss of life are the neurologic, respiratory, and cardiovascular.**

**In veterinary medicine, severe trauma patients have a high degree of mortality, specially patients that need early surgical interventions, optimal timing is crucial for successful trauma surgeries in veterinary medicine.**



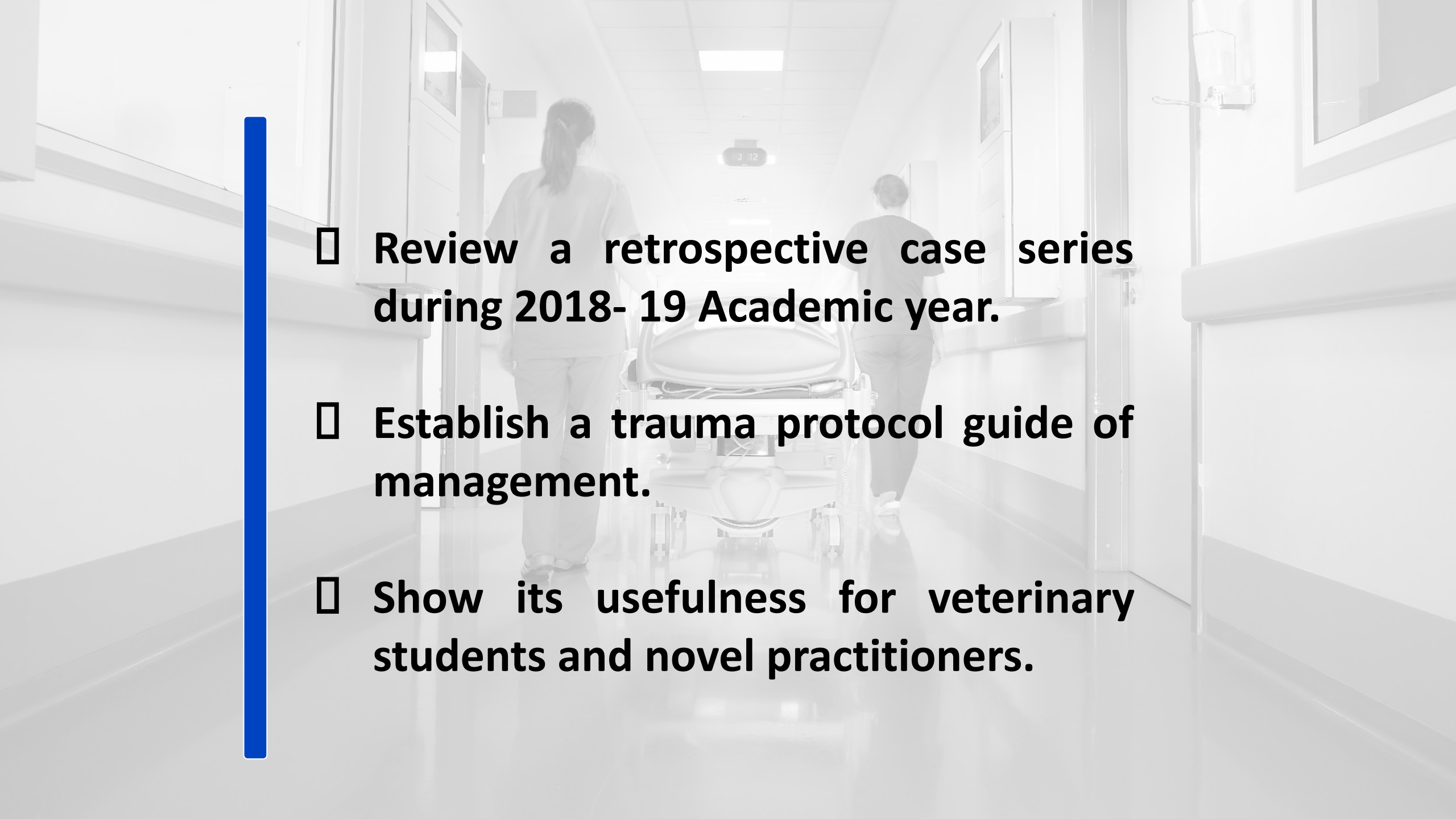
### Trauma and Emergency Surgery: Not the Same Thing

INTERNATIONAL VETERINARY EMERGENCY AND CRITICAL CARE SYMPOSIUM 2010

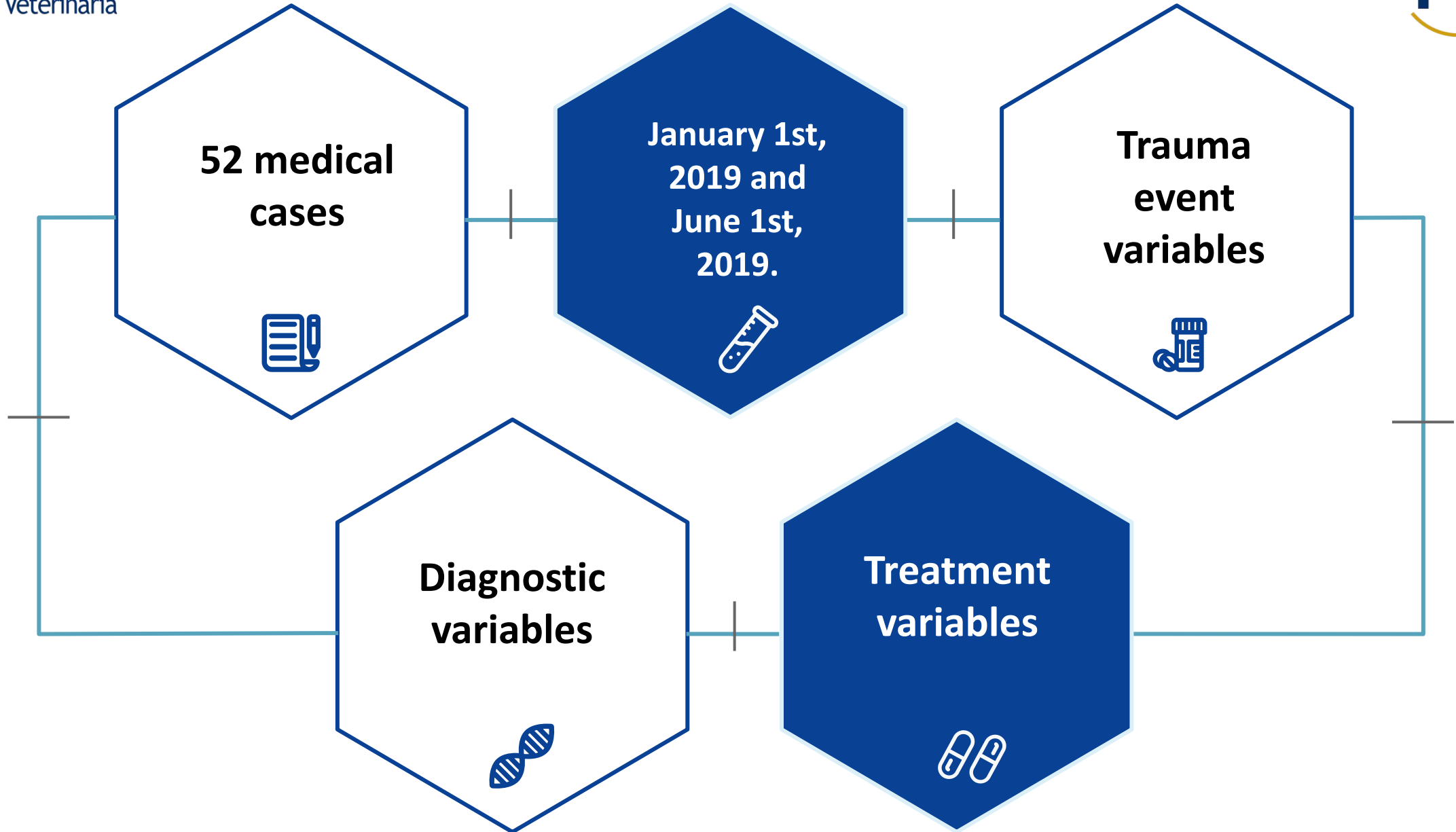
David Spreng, Dr.med.vet, DACVECC, DECVS  
University of Bern, Bern, Switzerland

**Non-surgical treatment has to be considered and usually is the first choice because the surgical trauma itself aggravates the trauma load of the patient**

**OBJECTIVE**

- 
- **Review a retrospective case series during 2018- 19 Academic year.**
  - **Establish a trauma protocol guide of management.**
  - **Show its usefulness for veterinary students and novel practitioners.**

**MATERIAL  
AND  
METHODS**





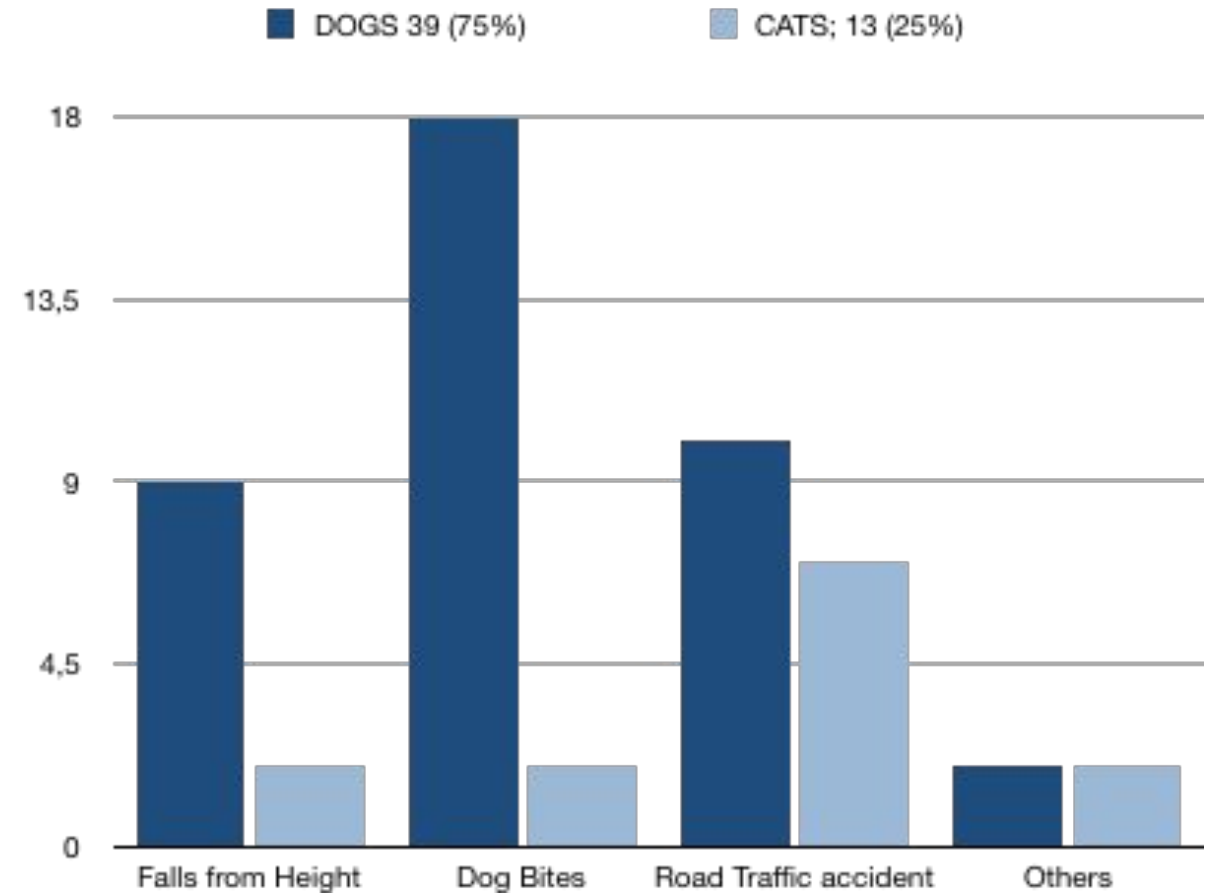
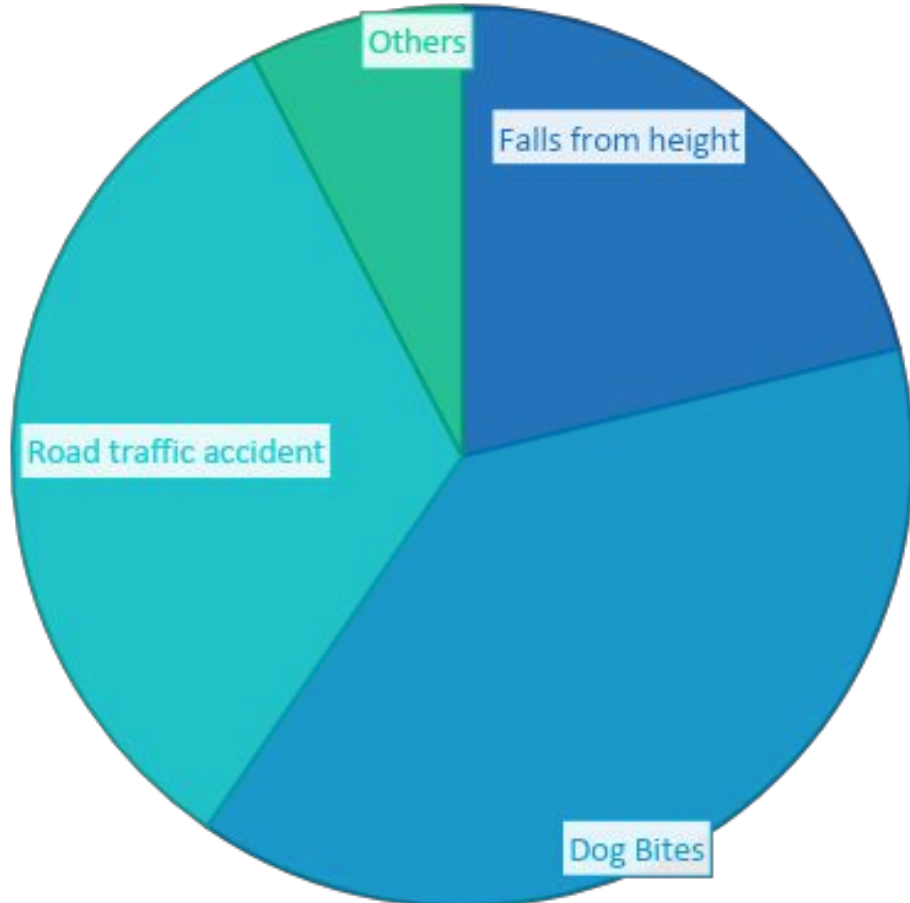


# RESULTS AND DISCUSSION



# Injury Source; RESULTS

Injury Source



# Injury Source: DISCUSION



THIS  
STUDY

## MOST FREQUENTLY

- ❑ Multiple areas
- ❑ Extremities

## DOG PENETRATING BITE CHEST

- ❑ 1 case

*Cabon  
et al*

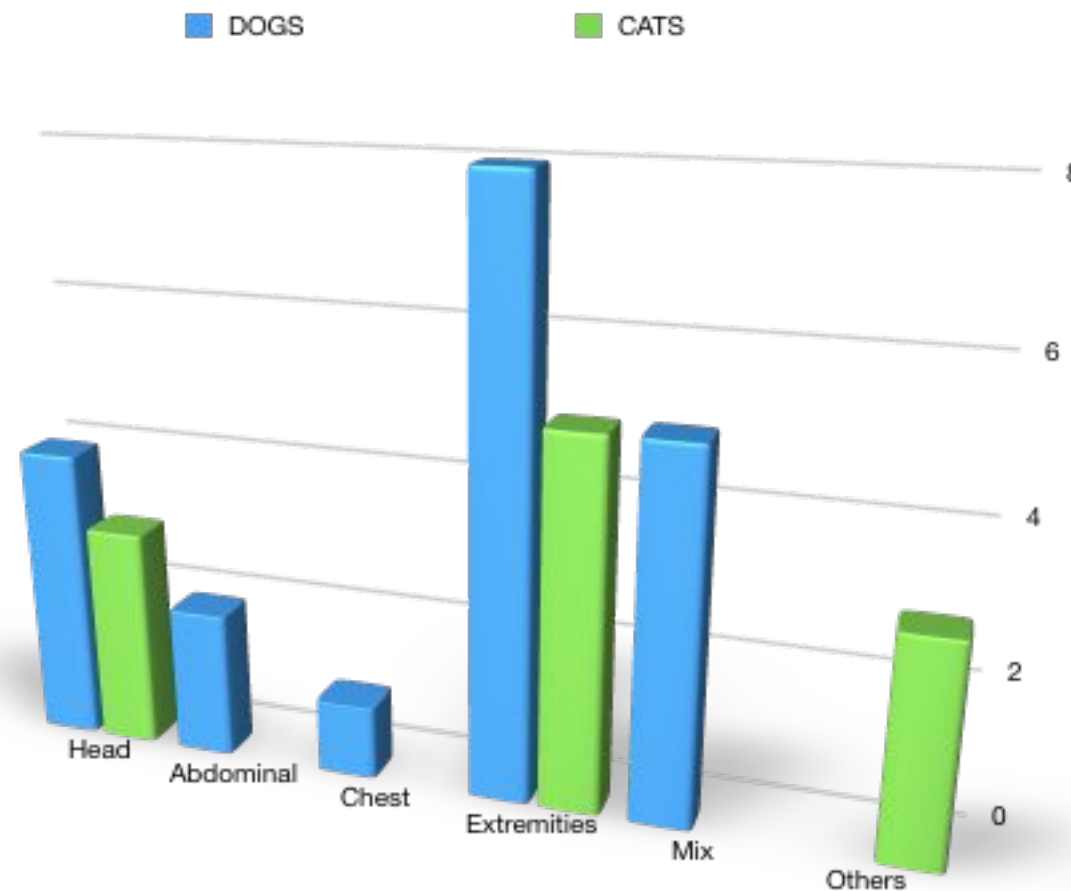
- ❖ Thorax region most frequently: 22-25%
- ❖ Followed : Head and extremities

Thoracic bite trauma in dogs and cats: a retrospective study of 65 cases

Q. Cabon<sup>1</sup>; C. Deroy<sup>1</sup>; F.-X. Ferrand<sup>1</sup>; P. Pillard<sup>1</sup>; T. Cachon<sup>1</sup>; D. Fau<sup>1</sup>; I. Goy-Thollot<sup>2</sup>; E. Viguier<sup>1</sup>; C. Carozzo<sup>1</sup>

<sup>1</sup>VetAgro Sup Campus Vétérinaire de Lyon, Surgery – Small Animal, Marcy l'Etoile, France; <sup>2</sup>VetAgro Sup Campus Vétérinaire de Lyon, SIAMU, Marcy l'Etoile, France

**VCOT Open**  
Veterinary and Comparative  
Orthopaedics and Traumatology



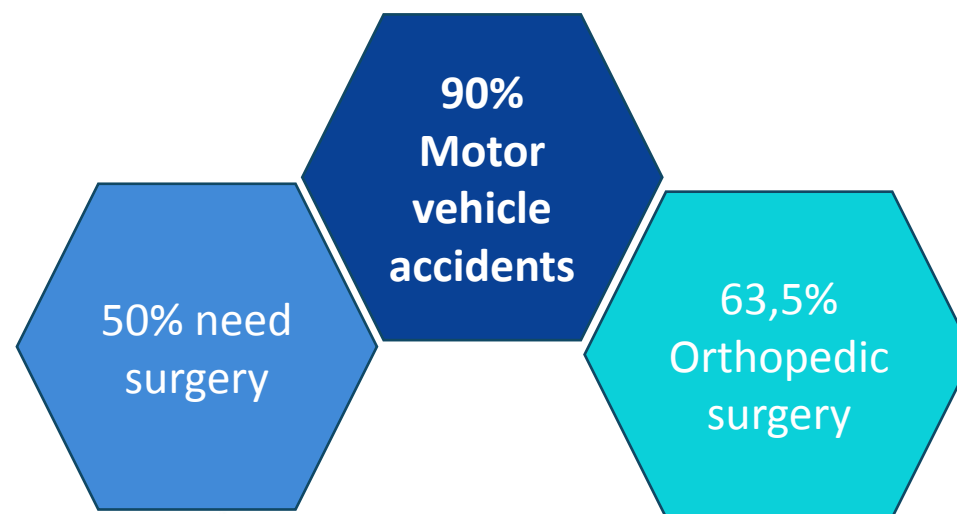
# Types of trauma; RESULTS



TYPE OF TRAUMA	INJURY SOURCE	TOTAL	DOGS	CATS
<b>BLUNT TRAUMA</b> 31 Patients 59,61%	Road Traffic Accidents	17	10	7
	Fall From height	10	8	2
	Knock against the wall	1	1	0
	Kicked by a horse	1	1	0
	Violence act	1	0	1
	Domestic accident	1	0	1
<b>OPEN WOUNDS</b> 18 Patients 34,61%	Dog bites	18	16	2
<b>MIX</b> (Blunt trauma + open wounds) 3 Patients 3,76%	Dog bites	2	2	0
	Dog bites + Fall from height	1	1	0

## THIS STUDY

- Blunt trauma by car traffic accidents 59,61%
- Extremities most affected
- Orthopedic surgery most common



Severe blunt trauma in dogs: 235 cases (1997–2003)

Stephen A. Simpson, DVM; Rebecca Spring, DVM, DACVECC and

# Injuries: RESULTS/DISCUSSION

Evaluation of a focused assessment with sonography for trauma protocol to detect free abdominal fluid in dogs involved in motor vehicle accidents

Soren R. Boysen, DVM; Elizabeth A. Rozanski, DVM, DACVECC, DACVIM; Amy S. Tidwell, DVM, DACVR; Jen L. Holm, DVM; Scott P. Shaw, DVM; John E. Rush, DVM, MS, DACVIM, DACVECC



Frequently injuries

## Non-survival

- Pulmonary contusions 44%
- Pneumothorax 30%/17,5%/21%

HEAD TRAUMA

## Extremities

- Fractures and luxation
- Most common pelvic and femoral fractures

CHEST TRAUMA

## Brain injury

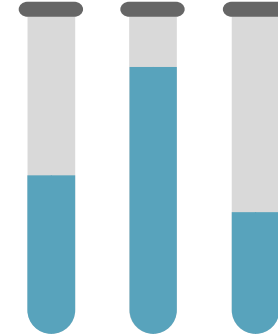
- High mortality in Veterinary and Humans
- This study: 1,92% of non- survivors



# Diagnostic test: RESULTS and DISCUSSION

HEMATOLOGY		BIOCHEMISTRY	
Hemoglobine	↓ 1	ALT	↑ 8
Reticulocitos	↑ 4	GGT	↑ 2
Hematocrito	↓ 2	Urea	↑ 1 1 ↓
Neutrofilos	↑ 3	Creatinina	↑ 1
Monocitos	↑ 1 1 ↓	Glucosa	↑ 3
Eosinofilos	↓ 4	Fosfatasa alcalina	↑ 1
Basofilos	↑ 1	Globulinas	↑ 1
Trombocitos	↑ 1 1 ↓	Colesterol	↑ 1
		Na	↓ 1
		K	↑ 2 1 ↓
		Cl	↑ 1
		Ca	↓ 2
		P	↑ 1 2 ↓

**BLOOD TEST**  
14/52 patients



**NOT  
SIGNIFICATIVE**

# Diagnostic test: RESULTS and DISCUSSION



Gold Fluid Therapy Plan

**Hyperglycemia:**  
Possible parameter associated with high morbidity and mortality.

More studies

## Predictors of Patients Who Will Develop Prolonged Occult Hypoperfusion following Blunt Trauma

Andrew M. Schulman, MD, Jeffrey A. Claridge, MD, Gordon Carr, BA, Diana L. Diesen, BA, and Jeffrey S. Young, MD



Electrolytes

- PROGNOSIS PARAMETERS
- Glucose
- Lactate
- PCV

Lactate > 3,5 mmol/L  
required intensive care unit

Serial measurements in patients with free liquid

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**Severe blunt trauma in dogs: 235 cases (1997–2003)**

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# Diagnostic test: RESULTS and DISCUSSION

Species (% total)	DOGS 39 (75%)		CATS; 13 (25%)	
	Hospitalized; 23 (58,9%)	Not hospitalized; 16 (41,02%)	Hospitalized; 8 (61,53%)	Not hospitalized; 5 (38,46%)
AFAST Performed	18 (78%)	5 (31,25%)	3 (37,5%)	3 (60%)
TFAST Performed	0 %	0 %	0	0
RX	22 (95%)	5 (31,25%)	8 (100%)	3 (60%)
Biochemistry/CBC	12 (52,17%)	0 %	2 (25%)	0 %
CT	1 (4,34%)	0 %	0 %	0 %
Detect free abdominal fluid	4 (17,39%)	0 %	0 %	0 %
Detect free thorax fluid	0 %	0 %	0 %	0 %



## A-FAST

- 55,76% of all patients

### Free Abd. Fluid

- 7,69% of patients with A-FAST realized

### Free liquid collected

- 2 cases Hemoperitoneum
- 1 case uroabdomen
- No data in other cases

**Most useful**

## T-FAST

- Any patient

## X-RAYS

- 73% of all patients

**Most used**

## TC

- 1,92 % of all patients to confirm urinary bladder rupture

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**Abdominal and thoracic focused assessment with sonography for trauma, triage, and monitoring in small animals**

Gregory R. Lisciandro, DVM, DABVP, DACVECC

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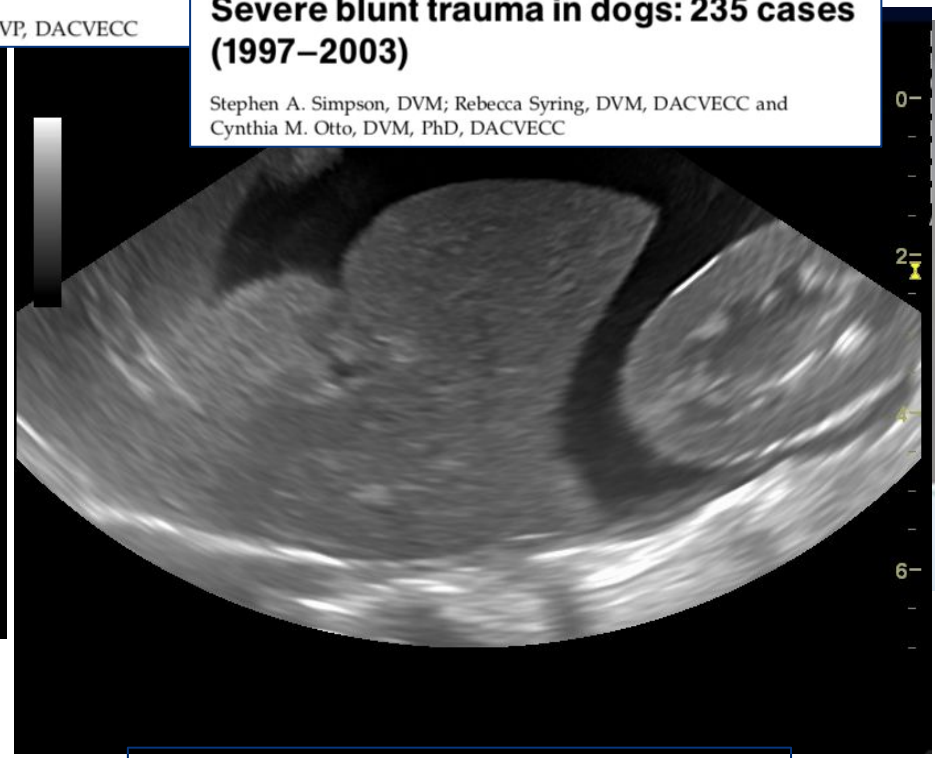


**X-Rays**

Limitation as a sole diagnostic tool

**A clinical review of pathophysiology, diagnosis, and treatment of uroabdomen in the dog and cat**

Jennifer R. Stafford, DVM, DACVECC, DACVIM and Joseph W. Bartges, DVM, PhD, DACVIM, DACVN



**A-FAST**

**Choice technique in Veterinary medicine**



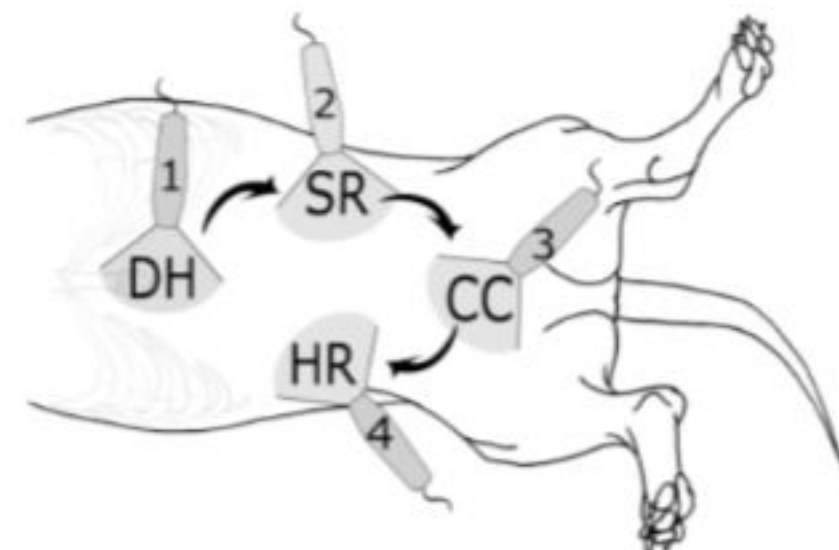
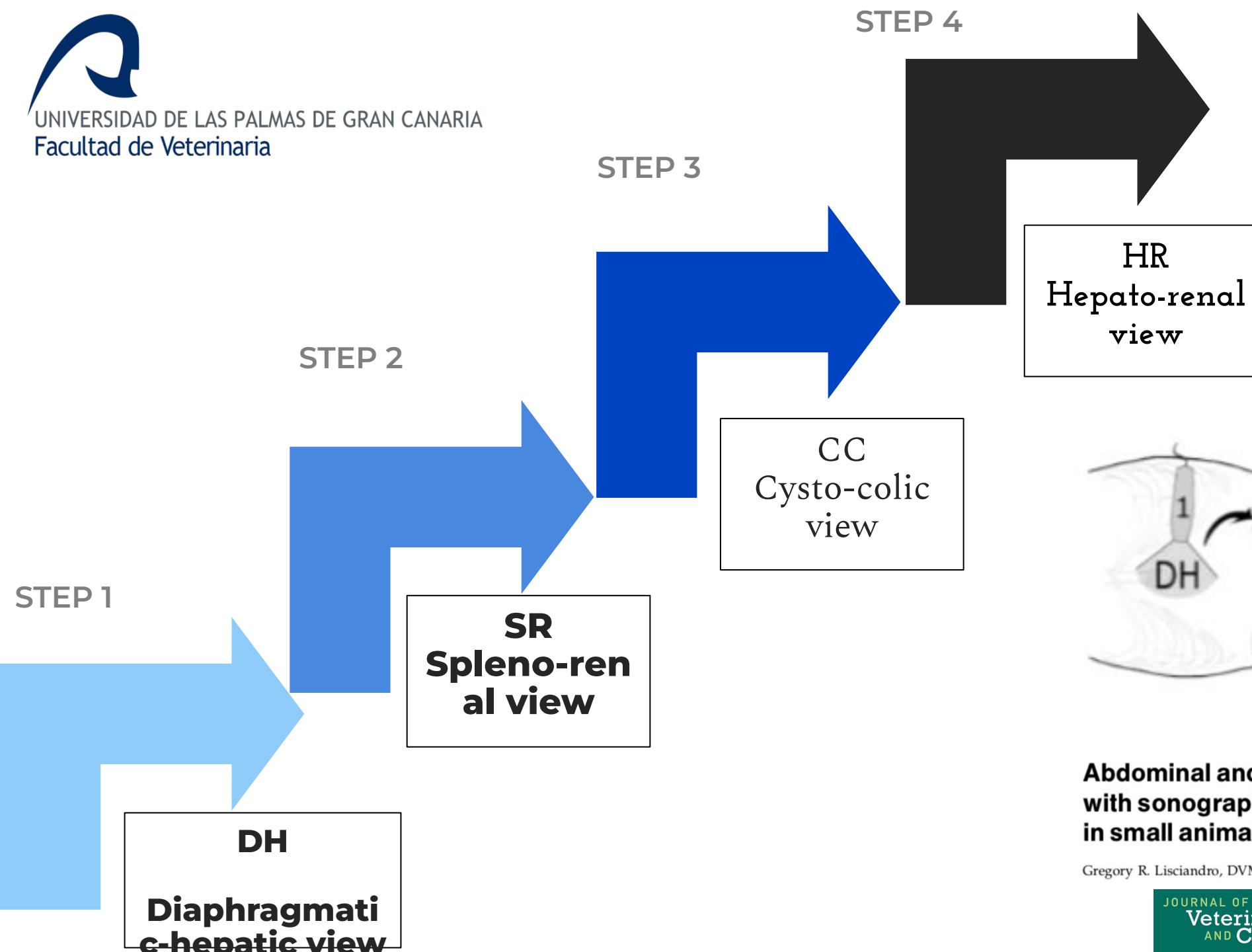
**CT**

Choice technique in human medicine

**A clinical review of pathophysiology, diagnosis, and treatment of uroabdomen in the dog and cat**

Jennifer R. Stafford, DVM, DACVECC, DACVIM and Joseph W. Bartges, DVM, PhD, DACVIM, DACVN

**QUICK !!!  
NO NECESSARY SENIOR VETERINARY!!!**



**Abdominal and thoracic focused assessment with sonography for trauma, triage, and monitoring in small animals**

Gregory R. Lisciandro, DVM, DABVP, DACVECC



## Abdominal and thoracic focused assessment with sonography for trauma, triage, and monitoring in small animals

Gregory R. Lisciandro, DVM, DABVP, DACVECC

- Patient positioning
  - Gall bladder
  - Urinary bladder
- Right lateral recumbency\*\*\*
  - Present or absent/ contour and wall: Normal or not
  - Present or absent/ contour and wall: Normal or not

### DH view

- Pleural fluid
  - Pericardial fluid
- Present or absent: Mild/moderate/severe
  - Present or absent: Mild/moderate/severe

### Positive or negative (0 negative, 1 positive)

- Diaphragmatic-hepatic site.    **0 or 1**
- Spleno-renal site                    **0 or 1**
- Cysto-colic site                      **0 or 1**
- Hepato-renal site                    **0 or 1**

AFS=1 Positive in one site  
 AFS=2 Positive in two sites  
 AFS=3 Positive in three sites  
 AFS=4 Positive in all sites

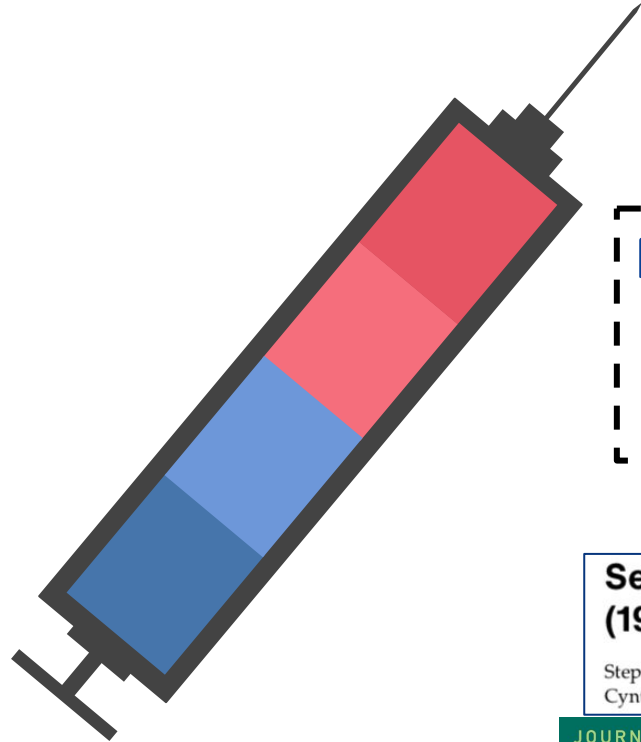
**Protocol that the veterinarian clinician should be followed to detect free abdominal fluid and other conditions such a rupture bladder.**

### ABDOMINAL FLUID SCORE: 0-4

(0 negative all quadrants to a maximum score of 4 positive all quadrants)



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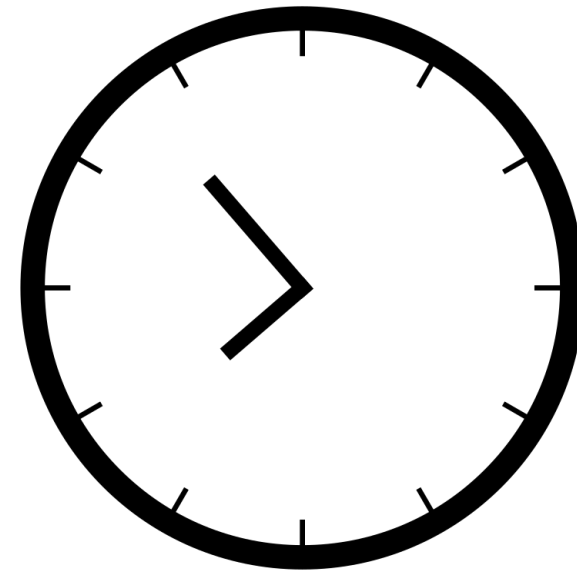


**Needle Abdominocentesis  
+  
Fluid analysis**

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**Serial A-FAST examination  
Every 4 hours or less!!**

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with sonography for trauma protocol  
to detect free abdominal fluid in dogs involved  
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with sonography for trauma, triage, and monitoring  
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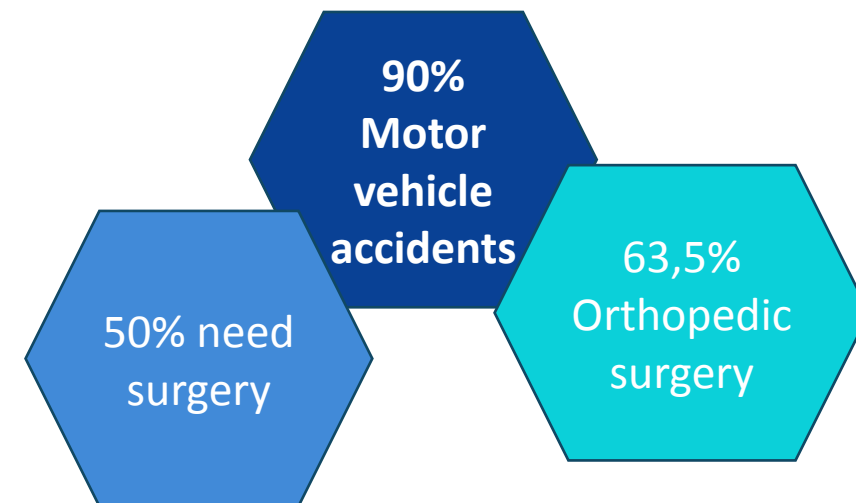
Species (% total)	DOGS 39 (75%)	CATS 13 (25%)
Patients in shock	10 (19,23%)	4 (7,69%)
Oxigen Therapy	2 (8,69%)	0 %
Fluid therapy	13 (25%)	2 (3,84%)
Collected and analyze free fluid	2 (3,84%)	0 %
Transfusion (Blood products)	0 %	0 %
CPR	0 %	0 %
Surgery Treatment	7 (13,46%) 1 other centre	5 (9,61%) 1 other center

?????????

HELP

## TREATMENT: RESULTS and DISCUSSION

SURGICAL TREATMENT IN DOGS			
BLUNT TRAUMA	ROAD TRAFFIC ACCIDENTS	2 Orthopedic surgery	EXTREMITIES
	FALL FROM HEIGHT	2 Orthopedic surgery	EXTREMITIES
		1 Repair of rupture of urinary bladder	URINARY BLADDER
SURGICAL TREATMENT IN CATS			
BLUNT TRAUMA	ROAD TRAFFIC ACCIDENTS	2 Orthopedic surgery	EXTREMITIES
		Enucleation and colocation feed tube.	EYE
	DOMESTIC ACCIDENT	Orthopedic surgery	SPINAL FRACTURE



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# OUTCOME: RESULTS and DISCUSSION



100% TRAUMA PATIENTS (01/01/19-01/06/19); 52 PATIENTS									
DOGS 39 (75%)					CATS; 13 (25%)				
Survival		Not survival			Survival		Not survival		
35	67,30 %	4	7,69%	Euthanatized;3 Died; 1 (2,56%)	10	19,23 %	3	5,76 %	Euthanatized; 3 Died 0

100% TRAUMA PATIENTS (01/01/19-01/06/19); 52 PATIENTS									
Species (% total)	DOGS 39 (75%)				CATS; 13 (25%)				
	SURVIVAL; 35 (89,74%)		NOT SURVIVAL; 4 (10,25%)		SURVIVAL;10 (69,23%)		NOT SURVIVAL; 3 (30,76%)		
<b>Blunt Trauma</b>	19	54,28 %	1	2,564 %	9	61,53 %	2	23,07	
<b>Open wounds</b>	14	40 %	2	5,128 %	1	7,69 %	1	7,69 %	
<b>Mix; Penetrating and blunt trauma</b>	2	5,714 %	1	2,564 %	0	0 %	0	0 %	



# PROGNOSIS: RESULTS and DISCUSSION



Grade	Perfusion	Cardiac	Respiratory	Eye/muscle/integument	Skeletal	Neurological
0	mm pink & moist CRT ~ 2 sec Rectal temp 37.8°C (100°F) Femoral pulses strong or bounding	HR: Dog: 60–140 Cat: 120–200 Normal sinus rhythm	Regular resp rate with no stridor No abdominal component to resp	Abrasion, laceration: none or partial thickness Eye: no fluorescein uptake	Weight bearing in 3 or 4 limbs, no palpable fracture or joint laxity	Central: conscious, alert →sl dull; interest in surroundings Periph: normal spinal reflexes; purposeful movement and
1	mm hyperemic or pale pink; mm tacky CRT 0–2 sec Rectal temp 37.8°C (100°F) Femoral pulses fair	HR: Dog: 141–180 Cat: 201–260 Normal sinus rhythm or VPCs ~20/min	Mildly incr resp rate & effort ± some abdominal component Mildly incr upper airway sounds	Abrasion, laceration: full thickness, no deep tissue involvement Eye: corneal laceration/ulcer, not perforated		
2	mm v pale pink & v tacky CRT 2–3 sec Rectal temp <37.8°C (100°F) Detectable but poor femoral pulses	HR: Dog: >180 Cat: >260 Consistent arrhythmia	Mod incr resp effort with abdom component, elbow abduction Moderately incr upper airway sounds	Abrasion, laceration: full thickness, deep tissue involvement, and arteries, nerves, muscles intact Eye: corneal perforation, punctured globe or proptosis		
3	mm gray, blue, or white CRT >3 sec Rectal temp <37.8°C (100°F) Femoral pulse not detected	HR: Dog: <60 Cat: <120 Erratic arrhythmia	Marked resp effort or gasping/lagional resp or irregularly timed effort Little or no detectable air passage	Penetration to thoracic/abd cavity Abrasion, laceration: full thickness, deep tissue involvement, and artery, nerve, or muscle compromised		

## Performance evaluation and validation of the animal trauma triage score and modified Glasgow Coma Scale with suggested category adjustment in dogs: A VetCOT registry study

Kristian Ash, BVMS; Galina M. Hayes, BVSc, DACVECC, DACVS, PhD ; Robert Goggs, BVSc, DACVECC, DECVECC, PhD  and Julia P. Sumner, BVSc, DACVS

### Motor activity

- Normal gait, normal spinal reflex
- Hemiparesis, tetraparesis, or decerebrate activity
- Recumbent, intermittent extensor rigidity
- Recumbent, constant extensor rigidity
- Recumbent, constant extensor rigidity with opisthotonus
- Recumbent, hypotonia of muscles, depressed or absent spinal reflexes

### Brain stem

- Normal pupillary light reflexes and oculocephalic reflexes
- Slow pupillary light reflexes and normal to reduced oculocephalic reflexes
- Bilateral unresponsive miosis with normal to reduced oculocephalic reflexes
- Pinpoint pupils with reduced to absent oculocephalic reflexes
- Unilateral, unresponsive mydriasis with reduced to absent oculocephalic reflexes
- Bilateral, unresponsive mydriasis with reduced to absent oculocephalic reflexes

### Level of consciousness

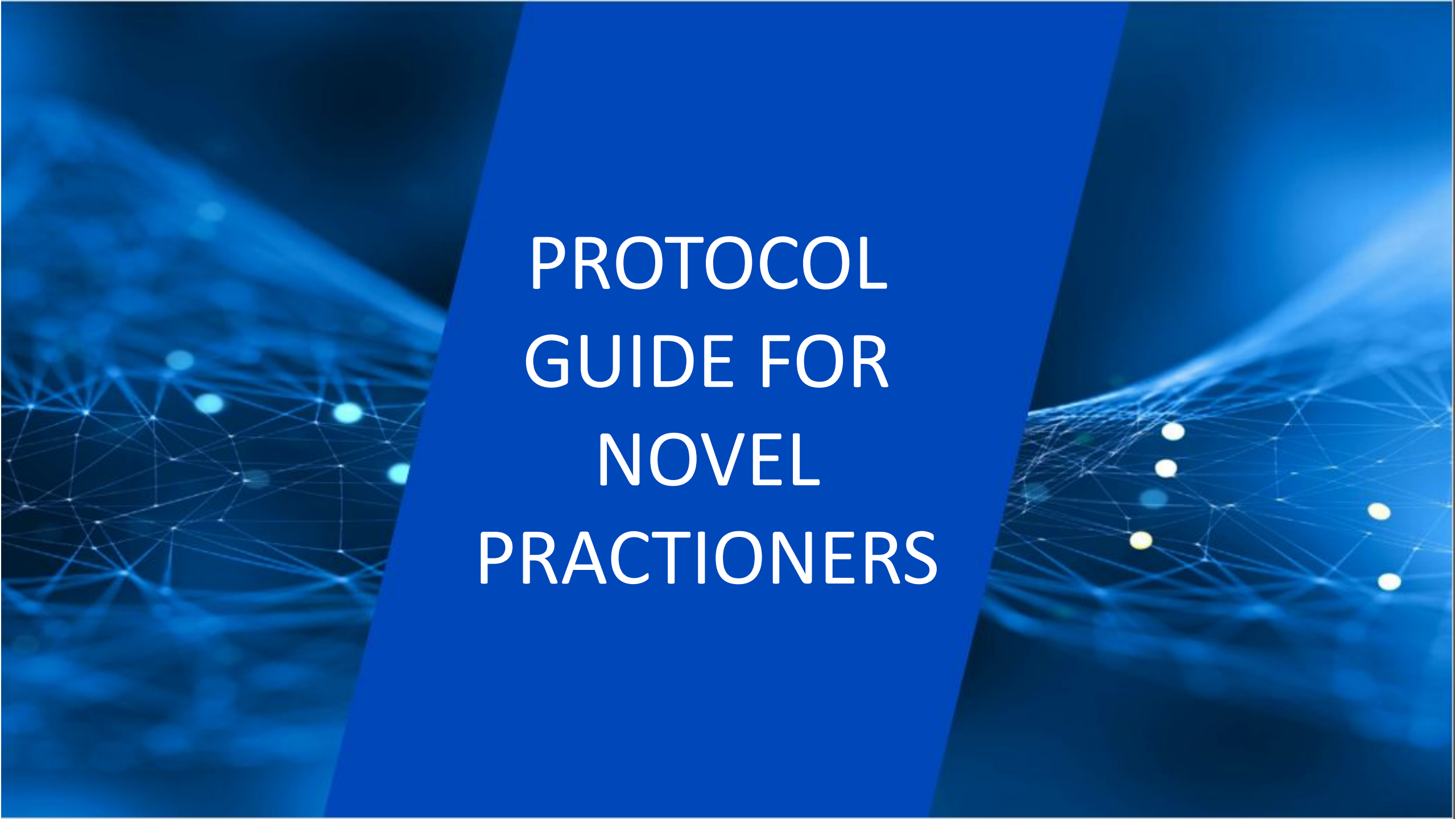
- Occasional periods of alertness and responsive to environment
- Depression or delirium, capable of responding but response may be inappropriate
- Semicomatose, responsive to visual stimuli
- Semicomatose, responsive to auditory stimuli
- Semicomatose, responsive only to repeated noxious stimuli
- Comatose, unresponsive to repeated noxious stimuli

### Score

- 6
- 5
- 4
- 3
- 2
- 1

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PROTOCOL  
GUIDE FOR  
NOVEL  
PRACTITIONERS

## Trauma Management of Military Working Dogs

*LTC (Ret) Michael Lagutchik, VC, USA; LTC Janice Baker, VC, USA Reserve; COL John Balser, SP, USA; COL (Ret) Walter Burghardt, BSC, USAF; LTC Matthew Enroth, VC, USA; LTC Shannon Flournoy, VC, USA; LTC (Ret) James Giles III, VC, USA; MAJ Patrick Grimm, VC, USA; LTC Jennifer Hiniker, VC, USA; COL Jacob Johnson, VC, USA Reserve; COL (Ret) Kelly Mann, VC, USA; LTC Matt Takara, VC, USA; MAJ (Ret) Todd Thomas, VC, USA*

**Airways**

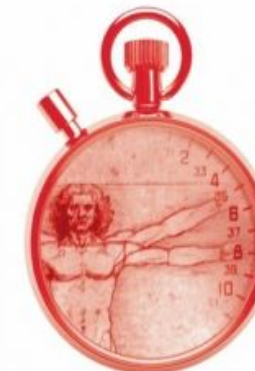
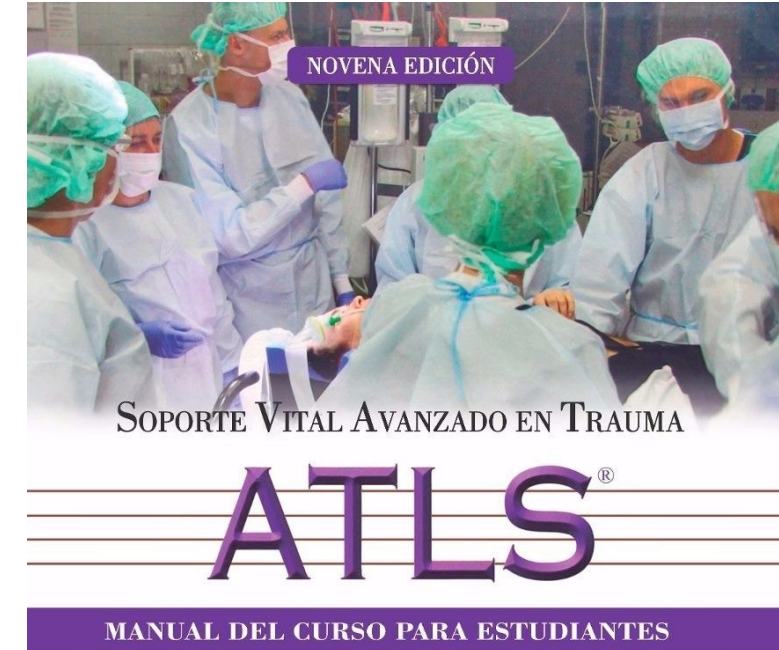
**Breathing and ventilation**

**Circulation with hemorrhage control**

**Disability: Neurologic status**

**Exposure/Environmental control:**

**Prevent hypothermia**



**ATLS**  
ADVANCED TRAUMA LIFE SUPPORT



# A: AIRWAYS

SIGNS OF  
OBSTRUCCION

LEVEL OF  
CONSCIOUSNESS

YES

NO

Stuporose or  
comatose

Abnormal

- ❑ Oxygen therapy
- ❑ Sedation or complete anaesthesia.
- ❑ Suctioning and inspection for foreign bodies.

FOLLOW  
WITH STEP B

HEAD TRAUMA



**CHECK**

- Jugular vein distention
- Position of the trachea
- Chest wall exploration;  
Visual inspection, palpation  
and percussion.
- Auscultation

**PNEUMOTHORAX**

- Open
- Close
- Tension

**Pulmonary  
contusions**

**B: BREATHING  
AND  
VENTILATION**

**HEMOTHORAX**

**RIB CAGE**

- Flail chest
- Muscle rupture
- Penetrating  
wounds

# B: BREATHING AND VENTILATION



□ Provided 100% oxygen by mask or “blow by”

“Conscious dog”

□ Intubation or tracheostomy

- Unconscious dog
- Sedated
- Anesthetized

□ Thoracic X-rays  
□ T-FAST

**DIAGNOSIS**

◆ Pneumothorax

- Open
- Close
- Tension

◆ Pulmonary contusions

◆ Rib cage

- Flail chest
- Intercostal muscle rupture
- Penetrating wounds (lungs)

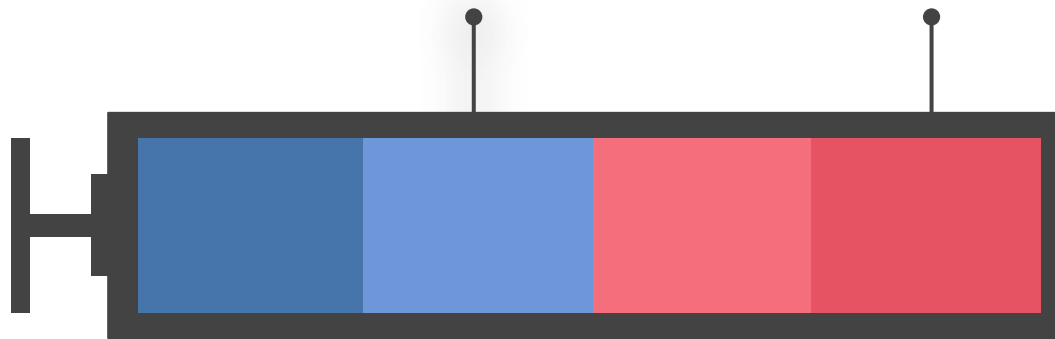
◆ Hemothorax

# “ADEQUATE MANAGEMENT INCLUDES”

Careful handling

Laying the patient with affected side down!!!!

- First oxygenation and ventilation.
- Then, systemic and local analgesia



Provide analgesia

Minimizing restrictive chest bandages.



**Package!!!**



## “OPEN PNEUMOTHORAX”

- Shave the hair around the wound
- Apply an occlusive gauze over the wound
- Apply a chest bandage to secure the seal
- Delay wound closure until the patient is stable



## “THORACOCENTESIS”

- Presence of decrease lung sounds in a patient with respiratory distress
- Rapid clinical deterioration in a patient with respiratory distress
- In respiratory distress patients after oxygen supply and in absence of respiratory noises legitimize thoracocentesis.

**THESE IS SUFICIENT JUSTIFICATION FOR NEEDLE THORACOCENTESIS**



# “THORACOSTOMY TUBE”

If negative pressure can not be achieved with needle thorax

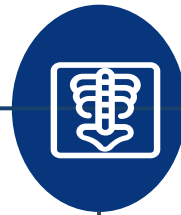
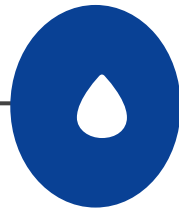
If large amount of blood are aspirated

If repeated thoracocentesis are required to maintain the negative pleural pressure.



Some patients have required emergent thoracotomy

# “PULMONARY CONTUSIONS”



**Haemoptysis**

**Radiographic signs**

- Interstitial-alveolar patterns
- Delay 12-24 hours

**Auscultation chest;  
Decreased lung  
sounds**

Suggest blood due to bronchial rupture  
**VERY GUARD PROGNOSIS**

Suggest air or fluid

# “MANAGEMENT OF PULMONARY CONTUSIONS”

- Minimizing stress
- Provide **oxygen supplementation**
- Careful intravenous fluids to prevent:

**Progression of pulmonary contusions**  
**Development of pulmonary edema**

- Ad **colloids** to fluid therapy treatment to decrease the amount of lung water that may accumulate during shock resuscitation.
- Severe vessel haemorrhage may require **resuscitative thoracotomy**.
- Ventilatory support may be required for patients that fail to respond to correction or stabilization.



## C: CIRCULATION WITH HAEMORRHAGIC CONTROL

### CLINICAL SIGNS IN HYPOVOLEMIC SHOCK

- ☐ Mucous membrane; Pale-grey
- ☐ Altered level of consciousness;  
**Stupor/obtunded/comatose.**
- ☐ Compensatory tachycardia
- ☐ Cold extremities
- ☐ Poor and weak pulse





## “SUSPECTED HYPOVOLEMIC SHOCK DUE TO HAEMORRHAGE”

### EXTERNAL HAEMORRHAGE

- ☐ Identified and controlled **during the primary survey.**
- ☐ Immediate direct **manual pressure** on the wound.
- ☐ Immediate haemostatic gauze use.
- ☐ Tourniquets should be done in massive exsanguination.

### INTERNAL HAEMORRHAGE

- ☐ Identified the area
  - Physical examination
  - T-FAST
  - A-FAST
- ☐ Assume any free cavity fluid is bleeding until proven otherwise.
- ☐ Caution with fluid therapy.

# “SUSPECTED SIGNIFICANT INTRA-ABDOMINAL INJURIES”

- Abdominal rigidity or sensitivity to palpation
- Abdominal distension
- Haematomas in abdominal Wall
- Failure to respond or deterioration

**\*Any wounds required detail examination to determine if the abdominal wall was penetrated.**

Abdominal wall No penetrated ; **NO surgery**  
Abdominal wall penetrated; **YES Surgery**



## “TESTS REQUIRED IN INITIAL EVALUATION”

- **A-FAST:** Extremely reliable in detecting free abdominal fluid and could be performed during resuscitation.
- **Needle abdominocentesis:** Helpful tool to determine type of fluid detected and reject false negatives.

### Intern organs most affected;

- Spleen
- Liver
- Urinary bladder



## D: DISABILITY (NEUROLOGICAL INJURIES)

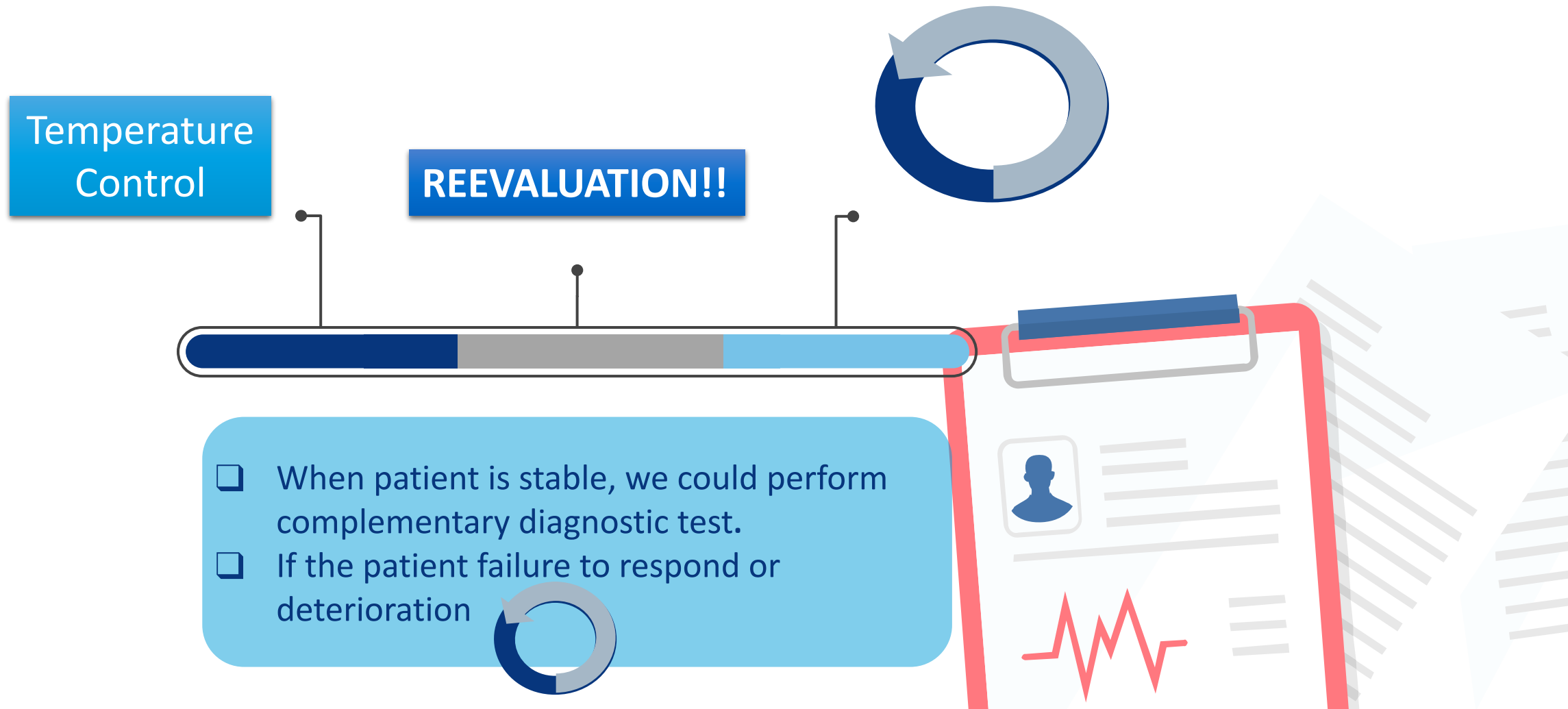
- ❖ **Rapid neurological evaluation is performed at the end of primary survey**
  - ☐ Status mental
  - ☐ Pupillary size
  - ☐ Pupillary reaction
- ❖ **The Modified Glasgow Coma Scale is a quick and sample method to determine the best motor response.**
- ❖ **Decrease in the level of consciousness may indicate**
  - ☐ Decreased brain oxygenation
  - ☐ Decreased brain perfusion
  - ☐ Direct brain injury
- ❖ **If the patient suffered altered level of consciousness**

**REEVALUATION!!!**

- ☐ Oxygenation status
- ☐ Ventilation status
- ☐ Perfusion status



## E: EXPOSURE AND ENVIRONMENTAL CONTROL



**CONCLUSION**

# CONCLUSIONS

- **Trauma management is a real challenge and it could be an overwhelming practice in emergency service.**
- **There is not a specific protocol in veterinary practice and a guide for trauma management is needed, especially for novel practitioners, owing to the application of ATLS protocol for human is legitimized in veterinary emergency practice.**

# CONCLUSIONS

- **Ultrasounds assistance as primary tool of diagnosis should be taken into consideration due to its safety and simplicity and it is a real timekeeper in emergency patients.**
- **Further studies it would be necessary to evaluate high number of medical cases and other prognosis values in order to provide a specific protocol and statistic data evaluation.**

**THANK YOU!!**