TRAJMA: modeling, STAT and helicopters...

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Outline

• PART I: What do we know?
• PART II: Plans for learning more
• PART III: Veterinary Animal Trauma Centers
References, Conflict

dogtherapy.wikispaces.com
PART I: What do we know

• Canine trauma patterns

• Intervention literature
  – Pre-clinical models
  – Clinical

• Scoring systems
Large Epidemiologic Studies


<table>
<thead>
<tr>
<th>Signalment and history</th>
<th>Mostly young males</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geriatric</td>
<td>9%</td>
</tr>
<tr>
<td>Pre-existing illness</td>
<td>6%</td>
</tr>
<tr>
<td>Cause</td>
<td>Vehicular trauma 53%-91%</td>
</tr>
<tr>
<td></td>
<td>Crush/compressive 2.5%-2.6%</td>
</tr>
<tr>
<td></td>
<td>Acceleration/deceleration 2.6%</td>
</tr>
<tr>
<td></td>
<td>Unknown 3.8%-12.4%</td>
</tr>
<tr>
<td></td>
<td>Polytrauma 36%-72.3%</td>
</tr>
<tr>
<td>Survival to discharge</td>
<td>85-88%</td>
</tr>
<tr>
<td>Trauma Patterns</td>
<td>Thoracic Injury 38-72%</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>Pulmonary contusions</td>
<td>17%, 38.7%, 44%, 58%</td>
</tr>
<tr>
<td>Pneumothorax</td>
<td>17.5%, 24%, 38.7%, 47%</td>
</tr>
<tr>
<td>Pneumomediastinum</td>
<td>5-8%, Diaphragm hernia 6%</td>
</tr>
<tr>
<td>Hemothorax</td>
<td>5-18%</td>
</tr>
<tr>
<td>Rib fractures</td>
<td>14%</td>
</tr>
<tr>
<td>Hemothorax</td>
<td></td>
</tr>
<tr>
<td>Pneumomediastinum</td>
<td>5-8%, Diaphragm hernia 6%</td>
</tr>
<tr>
<td>Pulmonary bulla</td>
<td>2-14%, Flail chest 2%</td>
</tr>
<tr>
<td>Flail chest</td>
<td></td>
</tr>
<tr>
<td>Head injury</td>
<td></td>
</tr>
<tr>
<td>24-25%</td>
<td></td>
</tr>
<tr>
<td>TRAUMA PATTERNS</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Orthopedic injury</strong></td>
<td><strong>Pelvic fracture 28%</strong></td>
</tr>
<tr>
<td>63.5% of surgical interventions</td>
<td><strong>Femur fracture 16%</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Scapular fracture 7%</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Radius fracture 2%</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Distal limb fractures 8%</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Spinal fractures 10%</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Sacral fractures 3%</strong></td>
</tr>
<tr>
<td><strong>Soft tissue injury</strong></td>
<td><strong>Abrasions 56%</strong></td>
</tr>
<tr>
<td>36.5% of surgical interventions</td>
<td><strong>Lacerations 26%</strong></td>
</tr>
<tr>
<td></td>
<td><strong>SC emphysema 10%</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Major degloving 8%</strong></td>
</tr>
</tbody>
</table>
# TRAUMA PATTERNS

<table>
<thead>
<tr>
<th>SIRS</th>
<th>Present with fever, tachycardia, tachypnea and leukocytosis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Increased concentrations of pro-inflammatory cytokines, lysosomal enzymes</td>
</tr>
<tr>
<td>Hypovolemic shock</td>
<td>24% received packed RBCs and 28% received fresh frozen plasma</td>
</tr>
<tr>
<td></td>
<td>Median lactate at admission 3.5 mmol/L</td>
</tr>
<tr>
<td></td>
<td>Mild uncompensated metabolic acidosis</td>
</tr>
<tr>
<td>Arrhythmias 22-38</td>
<td>Sinus tachycardia, ventricular rhythms, third degree AV block</td>
</tr>
<tr>
<td>Hematologic/biochemical abnormalities</td>
<td>AST, ALT, glucose, BE, lactate, WBC, platelet count,</td>
</tr>
<tr>
<td><strong>Organ dysfunction MODS (4%)</strong></td>
<td><strong>Coagulation system</strong></td>
</tr>
<tr>
<td>--------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Metabolic, renal, hepatic and gastrointestinal dysfunction</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Hyperglycemia associated with head trauma</strong></td>
<td></td>
</tr>
<tr>
<td><strong>ARDS 3%</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Negative predictors</strong></td>
<td><strong>Head trauma, cranium fractures, recumbency @ admission (41%), development of hematochezia (5%), ARDS suspected (3%), DIC (2%), MODS (4%), pneumonia (4%), PPV (4%), vasopressor use, arrest (2%), ATT score, hemoabdomen, body wall hernia, severe soft tissue injury, vertebral fractures</strong></td>
</tr>
</tbody>
</table>
• 100 consecutive cats
• 2.8 years (vs. 7.2 years)
• Trauma type
  • Unknown: 32
  • Vehicular: 30
  • Fall: 25
  • Bite: 7
  • Blunt: 4
  • Penetrating: 2
• Whole body radiographs
• Categories
  – Thoracic: 53
  – Abdominal: 39
  – Pelvic: 34
  – Spinal: 26
  – Peripheral ST injury: 28
• Outcome
  – Euthanized: 23
  – Died: 4
  – STD: 73
PART I: What do we know

- Canine trauma patterns
- Intervention literature
  - Pre-clinical models
  - Clinical
- Scoring systems
2.5 yo MC mix, 20 kg

HBC 15 minutes pre-arrival
99.9/180/pant/pale/>3sec; PCV=21%, TS=4.0, lactate 3.5, glu 160
No obvious head injury or open wounds, sternally recumbant

Immediate fluid selection (first 15-20 minutes):
A. 1.8 L LRS
B. 200 ml HES
C. 400 ml P148
D. 40 ml human serum albumin
E. Fresh whole blood

Survival to discharge: 85-88%
Human Trauma

- Age 1-45: Leading cause death
- Birth-36: Exceeds all other causes combined
- Early deaths
  - Hemorrhage
  - Brain injury
- Late deaths
  - Multi-organ failure (MOF)
  - Sepsis

Pre-clinical models

• Hemorrhagic shock
  – Uncontrolled bleeding
  – Controlled bleeding
    • fixed volume
    • fixed pressure

• Multiple trauma
  – Hind limb crush
  – Bilateral femoral fracture
  – Epidural balloon (head trauma)

• Advantages
  – Variables minimized
  – Instrumentation
  – Species

• Disadvantages
  – Anesthesia
  – Short term
  – Charged topic
Evidence Based Medicine

- Randomized Controlled Double Blind Studies
- Randomized Controlled Studies
- Case Control Studies
- Case Series
- Case Studies
- Ideas, Editorials, Opinions
- Animal Research
- In Vitro Research
2.5 yo MC mix, 20 kg

HBC 15 minutes pre-arrival

Immediate fluid selection (first 15-20 minutes):
A. 1.8 L LRS
B. 200 ml HES
C. 400 ml P148
D. 80 ml human serum albumin
E. Fresh whole blood
Best, but feasible...?

- Fresh whole blood: This is by far the best and most effective fluid for resuscitation of hemorrhagic shock

- Canine hemorrhage: bled to MAP 30 mm Hg: pRBCs vs WB
  WB, (not PRBC) resuscitation restores normal myocardial function
Veterinary Trauma: Clinical Research
Intervention literature (clinical)

- PubMed
  - MeSH: Trauma (many) and “Dog”
  - Limits: clinical-trial, meta-analysis, randomized controlled trial, English
  - N=105

- Removed
  - Orthopedic or elective surgical procedures
  - Pre-clinical
  - IVDD
  - Humans being bitten by dogs
Intervention literature (clinical)

Effects of morphine and fentanyl constant rate infusion on urine output in healthy and traumatized dogs

Marlo K Anderson DVM & Thomas K Day DVM, DACVA, DACVECC
Louisville Veterinary Specialty and Emergency Services, Louisville, KY, USA

• Prospective randomized controlled
• Trauma (n=18) vs healthy (n=23)
• 5 Groups
  • Morphine 0.12 mg/kg/hr in LRS @ 60 ml/kg/d (n=8 healthy, n=9 trauma)
  • Fentanyl 3 ug/kg/hr in LRS @ 60 ml/kg/d (n=7 healthy, n=9 trauma)
  • LRS (n=8 healthy) @ 60 ml/kg/d

Veterinary Anaesthesia and Analgesia, 2008. 35, 528–536
Intervention literature (clinical)

Effects of morphine and fentanyl constant rate infusion on urine output in healthy and traumatized dogs

Marlo K Anderson DVM & Thomas K Day DVM, DACVA, DACVECC
Louisville Veterinary Specialty and Emergency Services, Louisville, KY, USA

• Measured outcomes (24-hours)
  • Total fluid administration
  • Urine output
  • USpG

Table 1 Type of trauma and the number of dogs receiving morphine or fentanyl for each category

<table>
<thead>
<tr>
<th>Category of trauma</th>
<th>Morphine analgesia</th>
<th>Fentanyl analgesia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superficial wounds</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Deep wounds</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Thoracic trauma</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Single fracture</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Multiple fractures</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Neurologic injury</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Polytrauma*</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

*Number of patients from the above categories that suffered more than one category of trauma.
Intervention literature
(clinical)

Effects of morphine and fentanyl constant rate infusion on urine output in healthy and traumatized dogs

Marlo K Anderson DVM & Thomas K Day DVM, DACVA, DACVECC
Louisville Veterinary Specialty and Emergency Services, Louisville, KY, USA

Figure 1 Urine output (mean ± SD) in traumatized dogs receiving a CRI of morphine (Tmorphine) or fentanyl (Tfentanyl) and in control dogs receiving a CRI of lactated Ringer’s (CLRS), morphine (Cmorphine), or fentanyl (Cfentanyl).

(p = 0.003)

Figure 4 Urine specific gravity at the end of the experiment (mean ± SD) in traumatized dogs receiving a CRI of morphine (Tmorphine) or fentanyl (Tfentanyl) and in control dogs receiving a CRI of lactated Ringer’s (CLRS), morphine (Cmorphine), or fentanyl (Cfentanyl).

(p < 0.050)

Veterinary Anaesthesia and Analgesia, 2008. 35, 528–536
Outline

• Canine trauma patterns
• Intervention literature
  – pre-clinical
  – clinical
• Scoring systems
Scoring Systems

• Clinical
  – Benchmark performance
  – Establish protocols (therapy, triage, diagnostics)

• Research
  – Measure of effective randomization
  – Decrease bias and confounding

Hayes, Mathews, Kruth, JVIM, 24:457-466
Trauma Scoring Systems


<table>
<thead>
<tr>
<th>Grade</th>
<th>Perfusion</th>
<th>Cardiac</th>
<th>Respiratory</th>
<th>Eye/Muscle/Integument</th>
<th>Skeletal</th>
<th>Neurological</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>mm pink &amp; moist</td>
<td>HR: C - 60-140</td>
<td>regular resp rate with no stridor</td>
<td>abrasion, laceration: none or partial thickness</td>
<td>weight bearing in 3 or 4 limbs, no palpable fracture or joint laxity</td>
<td>central: conscious, alert →sl dull; interest in surroundings</td>
</tr>
<tr>
<td></td>
<td>CRT ~ 2 sec</td>
<td>F - 120-200</td>
<td>no abdominal component to resp</td>
<td>eye: no fluorescein uptake</td>
<td></td>
<td>periph: normal spinal reflexes; purposeful movement and nociception in all limbs</td>
</tr>
<tr>
<td></td>
<td>rectal temp ≥ 37.8°C (100°F)</td>
<td>normal sinus rhythm</td>
<td>mildly ↑ resp rate &amp; effort, ± some abdominal component</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>femoral pulses strong or bounding</td>
<td></td>
<td>mildly ↑ upper airway sounds</td>
<td>abrasion, laceration: full thickness, no deep tissue involvement</td>
<td>closed appendicular/rib fx or any mandibular fx</td>
<td>central: conscious but dull, depressed, withdrawn</td>
</tr>
<tr>
<td>1</td>
<td>mm hyperemic or pale pink; mm tacky</td>
<td>HR: C - 140-180</td>
<td>moderately ↑ resp effort with abdom component, elbow abduction</td>
<td>abrasion, laceration: full thickness, deep tissue involvement, and arteries, nerves, muscles intact</td>
<td>multiple Grade 1 conditions (see above)</td>
<td>periph: absent purposeful movement with intact nociception in 2 or more limbs or nociception absent only in 1 limb; ↓ anal and/or tail tone</td>
</tr>
<tr>
<td></td>
<td>CRT 0-2 sec</td>
<td>F - 200-260</td>
<td>moderately ↑ upper airway sounds</td>
<td>eye: corneal perforation, punctured globe or proptosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>rectal temp ≥ 37.8°C (100°F)</td>
<td>normal sinus rhythm or VPC’s &lt; 20/min</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>femoral pulses fair</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>mm v pale pink &amp; v tacky</td>
<td>HR: C - &gt;180</td>
<td>marked respiratory effort of gasping/agonal respiration or irregularly timed effort</td>
<td>penetration to thoracic/abdo cavity</td>
<td>vertebral body fracture/luxation except coccygeal</td>
<td>central: nonresponsive to all stimuli; refractory seizures</td>
</tr>
<tr>
<td></td>
<td>CRT 2-3 sec</td>
<td>F - &gt;260</td>
<td>little or no detectable air passage</td>
<td>abrasion, laceration: full thickness, deep tissue involvement, and artery, nerve, or muscle compromised</td>
<td>multiple long bone open fx above tarsus/carpus</td>
<td>periph: absent nociception in 2 or more limbs; absent tail or perianal nociception</td>
</tr>
<tr>
<td></td>
<td>rectal temp &lt; 37.8°C (100°F)</td>
<td>consistent arrhythmia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>detectable but poor femoral pulses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>mm gray, blue, or white</td>
<td>HR: C - ≤60</td>
<td>marked respiratory effort or gasping/agonal respiration or irregularly timed effort</td>
<td>abrasion, laceration: full thickness, deep tissue involvement, and artery, nerve, or muscle compromised</td>
<td>multiple long bone open fx above tarsus/carpus</td>
<td>periph: absent nociception in 2 or more limbs; absent tail or perianal nociception</td>
</tr>
<tr>
<td></td>
<td>CRT &gt; 3 sec</td>
<td>F - ≤120</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>rectal temp &lt; 37.8°C (100°F)</td>
<td>erratic arrhythmia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>femoral pulse not detected</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Development Of A Scoring System For The Veterinary Trauma Patient

Retrospective: N=101 (76 K9)
Prospective: N=88 (62 K9)

Figure 1
Frequency distribution of ATT scores for the retrospective and prospective study populations.

Figure 2
The observed and predicted survival rate for the retrospective and prospective study populations at 7 days after initial presentation.
Evaluation of vehicular trauma in dogs: 239 cases (January–December 2001); JAVMA 2009

Retrospective: N=101 (76 K9)
Prospective: N=88 (62 K9)

N=239

Figure 1

Frequency distribution of ATT scores for the retrospective and prospective study populations.

The Prognostic Value of the Modified Glasgow Coma Scale in Head Trauma in Dogs

Simon R. Platt, Simona T. Radaelli, and John J. McDonnell

Table 1. Modified Glasgow Coma Scale.

<table>
<thead>
<tr>
<th>Motor activity</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal gait, normal spinal reflexes</td>
<td>6</td>
</tr>
<tr>
<td>Hemiparesis, tetraparesis, or decerebrate activity</td>
<td>5</td>
</tr>
<tr>
<td>Recumbent, intermittent extensor rigidity</td>
<td>4</td>
</tr>
<tr>
<td>Recumbent, constant extensor rigidity</td>
<td>3</td>
</tr>
<tr>
<td>Recumbent, constant extensor rigidity with opisthotonus</td>
<td>2</td>
</tr>
<tr>
<td>Recumbent, hypotonia of muscles, depressed or absent spinal reflexes</td>
<td>1</td>
</tr>
<tr>
<td>Brain stem reflexes</td>
<td></td>
</tr>
<tr>
<td>Normal pupillary light reflexes and oculocephalic reflexes</td>
<td>6</td>
</tr>
<tr>
<td>Slow pupillary light reflexes and normal to reduced oculocephalic reflexes</td>
<td>5</td>
</tr>
<tr>
<td>Bilateral unresponsive miosis with normal to reduced oculocephalic reflexes</td>
<td>4</td>
</tr>
<tr>
<td>Pinpoint pupils with reduced to absent oculocephalic reflexes</td>
<td>3</td>
</tr>
<tr>
<td>Unilateral, unresponsive mydriasis with reduced to absent oculocephalic reflexes</td>
<td>2</td>
</tr>
<tr>
<td>Bilateral, unresponsive mydriasis with reduced to absent oculocephalic reflexes</td>
<td>1</td>
</tr>
<tr>
<td>Level of consciousness</td>
<td></td>
</tr>
<tr>
<td>Occasional periods of alertness and responsive to environment</td>
<td>6</td>
</tr>
<tr>
<td>Depression or delirium, capable of responding but response may be inappropriate</td>
<td>5</td>
</tr>
<tr>
<td>Semicomatose, responsive to visual stimuli</td>
<td>4</td>
</tr>
<tr>
<td>Semicomatose, responsive to auditory stimuli</td>
<td>3</td>
</tr>
<tr>
<td>Semicomatose, responsive only to repeated noxious stimuli</td>
<td>2</td>
</tr>
<tr>
<td>Comatose, unresponsive to repeated noxious stimuli</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 2. Modified Glasgow Coma Scale score category and suggested prognosis.

<table>
<thead>
<tr>
<th>Score Category</th>
<th>Actual MGCS score</th>
<th>Suggested Prognosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>3–8</td>
<td>Grave</td>
</tr>
<tr>
<td>II</td>
<td>9–14</td>
<td>Guarded</td>
</tr>
<tr>
<td>III</td>
<td>15–18</td>
<td>Good</td>
</tr>
</tbody>
</table>

MGCS, Modified Glasgow Coma Scale.

N=38

3 (severe)-18 (great)
Evaluation of an abdominal fluid scoring system determined using abdominal focused assessment with sonography for trauma in 101 dogs with motor vehicle trauma

- Right lateral recumbancy
- Score 0-4
- N=101, 27 positive
- Score 1,2: 13/27
- Score 3, 4: 14/27
  - Lower PCV, TP
  - Increased ALT, blood transfusion

SR: spleno-renal, CC: cysto-colic, HR: hepato-renal, DH: diaphragmatic-hepatic

Outline

• PART I: What do we know (and don’t know)?
• PART II: Plans for learning more
• PART III: Veterinary Animal Trauma Centers
PART II: Plans for learning more

- University of Minnesota
- Emergency Pet Clinic, San Antonio, TX
- Ontario Veterinary College
- University of Pennsylvania
- Purdue University
- Tufts University
GOALS

1. Multicenter research

*Primary goal:* Describe outcome and survival data for canine trauma cases in a prospective manner with particular emphasis on multiple organ failure (MOF), coagulation and systemic inflammatory response syndrome (SIRS).

*Secondary goal:* Successfully plan and perform a multi-center prospective cohort study in anticipation of performing multi-center prospective clinical trials.

2. Define veterinary trauma centers

3. Develop resources to be available (inter)nationally
Bench to Bedside and Lab to Labrador...

Paoloni, Khanna  Nature Reviews Cancer, 8: 2, 147, 2008
Primary hypothesis

Canine trauma patients that develop multiple organ failure (MOF) will have a significantly higher Animal Trauma Triage (ATT) score than canine trauma patients that do not develop MOF
Primary Outcome

Development of multi-organ failure (MOF) – dysfunction in ≥ 2 of the following systems

– Cardiovascular
– Respiratory
– Coagulation
– Central nervous system
– Renal
– Hepatic
– Gastrointestinal
Define veterinary trauma centers
Present to ACVECC Fall 2011

Spontaneous animal trauma model
 Universal guidelines
 Endpoints
 Translational, comparative and species of study

Human trauma surgeons
Outline

• PART I: What do we know (and don’t know)?
• PART II: Plans for learning more
• PART III: Veterinary Animal Trauma Centers (and the UMN VMC...)

Nathan Pasch, UMN CVM Communications
Which of the following is TRUE?

a. The ATC-C is actively designing a helipad  
b. The VMC’s capabilities are common knowledge among pet owning Minnesotans  
c. The ATC-C is developing a plan for the clinical implementation of the trauma center  
d. ECC faculty are in hospital 5 of 7 days a week  
e. Effective October 15, CTs will be available 24/7  
f. The entire ECC team has been involved with defining the ATC

ATC=Animal Trauma Center; ATC-C=Animal Trauma Center-Committee
Which of the following is TRUE?

a. The ATC-C is actively designing a helipad
b. The VMC’s capabilities are common knowledge among pet owning Minnesotans
c. The ATC-C is **developing** a plan for the clinical implementation of the trauma center
d. ECC faculty are in hospital 5 of 7 days a week
e. Effective October 15, CTs will be available 24/7
f. The entire ECC team has been involved with defining the ATC

ATC=Animal Trauma Center; ATC-C=Animal Trauma Center-Committee
ATC-Committee Members

- David Lee, VMC
- Deb Vogt, VMC
- Liz Lafond, AMD, surgery
- Chris Ober, radiology
- Leslie Sharkey, clinical pathology
- Vickie Skala, ECC CVT supervisor
- Jane Quandt, ECC, anesthesia, blood bank
- Kelly Hall, ECC
- Julie Schildt, ECC
- Andrew Vick, ECC CVT, EMT trained
ATC-C Accomplishments

4 meetings (expanding group)

- Logo input
- Define trauma
- Defining classes of trauma
Trauma-Defined

Any tissue injury that occurs more or less suddenly as a result of an external force including but not limited to

– blunt force injury (HBC)
– penetrating injury (gunshot, laceration)
– acceleration/deceleration injury (high-rise injury)
– crushing injury

Muir W, JVECC 2006; 16(4): 253-263
Duke Trauma Center Handbook
Classes of Trauma - Defined

- Class 3: no or mild tachycardia, no hypotension; normal BE, minor or insignificant co-morbidities

- Class 2: hypotension, tachycardia responsive to fluid resuscitation; decreased BE, final co-morbidities major

- Class 1: severe hypotension, severe tachycardia; decreased BE, co-morbidities severe; remains in shock after 1 hour or decompensates after initial volume resuscitation
Trauma-Defined: WHY?

• Metrics
  – Diagnostics
  – Procedures
  – Types of cases
• Areas for growth
• Opportunities for improvement
• Initiation of support system
  • E.g., Class 1 or 2: automatic trigger ECC faculty and/or resident on call
• Protocol development
Abdominal Focused Assessment with Sonography in Trauma, Triage Treatment (FAST) exam results:

Patient positioning: right or left lateral recumbency (right preferred)

Gall bladder: present or absent, contour normal or not, wall thickened or not

Urinary bladder: present or absent, contour normal or not

Positive of negative at the 4-views (0 negative, 1 positive)

- Diaphragmatico-Hepatic site: 0 or 1
- Spleno-Renal site: 0 or 1
- Cysto-Colic site: 0 or 1
- Hepato-Renal site: 0 or 1

Abdominal Fluid Score: 0-4 (0 negative all quadrants to a maximum score of 4 positive all quadrants)

(Note: The FAST exam is a rapid ultrasound procedure used primarily to detect the presence of free abdominal fluid (which is abnormal) as a screening test in order to better direct resuscitation efforts. FAST allows rapid but indirect assessment for evidence of intraabdominal injury, pathology, or disease. The FAST exam is not intended to replace a formal diagnostic ultrasound exam of the abdomen.)
ATC-C Accomplishments

4 meetings (expanding group)
• Logo input
• Define trauma
• Defining classes of trauma
• Review ACS criteria - trauma centers (and more)
Minnesota: Values

A trauma care system that:

• Is based on obtaining the best outcomes for injured patients
• Is mindful of overall system costs and scarce specialist resources
• Is data-driven, with in-house trauma performance programs that guide trauma care
• Includes a supportive environment, which allows for realistic, affordable and accessible site-based education
• Allows for existing referral patterns
• Believes that over-triage is better than under-triage

www.health.state.mn.us/traumasytem
A veterinary trauma center can provide team based, definitive care for any trauma patient. It provides the injured patient with access to the most comprehensive resources for their treatment. Specialists and equipment are available 7-days a week including critical care, surgery, anesthesiology and radiology. An emergency veterinarian is immediately available to the trauma patient while other specialties may be on call off site. In order to enable definitive care for trauma patients, specialists in neurology, dentistry, ophthalmology, nutrition, internal medicine, cardiology, clinical pathology and rehabilitation are also available during standard business hours. The trauma critical care service, also known as the intensive care unit, is under the direction of a criticalist and is staffed by certified veterinary technicians 24 hours a day. Veterinary trauma centers often receive severely injured patients referred from other emergency hospitals and primary clinics. Additionally, veterinary trauma centers must participate in the training of interns and residents and conduct trauma-related research. While the veterinary trauma center is geared toward trauma cases the same level of care is extended to any patient, regardless of the cause of their illness.

Modified: “trauma system implementation and recommendations; Report to the MN Legislature 2010”
ATC-C Accomplishments

4 meetings (expanding group)
- Logo input
- Define trauma
- Defining classes of trauma
- Review ACS criteria - trauma centers (and more)
- Review data capture form
- Initiate review of charging/packaging
  - E.g.,: PE/AFAST/TFAST/PCV/TS/lactate/IVC/volume resuscitation/EKG/BP/SpO₂
ATC-C Next steps
(short term)

• Meet w/ECC DVM and CVT team
  – Data capture form (DCF)
• Solicit feedback from all services
  – Anticipated impacts
  – Metrics
• Interns/residents re: support system (formalize)
• Formalize protocols, documents, initial metrics
• Include UMMC Trauma Medical Director
• Documents available for public consumption
TRAUMA:

modeling, STAT and helicopters...
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Success

To laugh often and much;
To win the respect of intelligent people and the affection of children;
To earn the appreciation of honest critics and endure the betrayal of false friends;
To appreciate beauty; to find the best in others;
To leave the world a bit better, whether by a healthy child,
a garden patch,
or a redeemed social condition;
To know even one life has breathed easier because you have lived.
This is to have succeeded.

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