

Criticalist Approach to ER



24 Hour Emergency & Referral Hospital

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Outline

- Trauma patient
- Hemoabdomen
- Parvo
- Feline urethral obstruction

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Recall

- Initial Evaluation
 - Brief history
 - Primary survey
 - Rapid diagnostic tests
- Assessment & Plan
 - Therapeutic plan
 - Diagnostic plan
- Ideal & Minimum
- Formulate DDx list and refine as work thru above

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Trauma

- Polytrauma common (>70%)
- Thoracic cavity commonly involved
- Pain consistent
- Shock variable but reversal critical

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Trauma - shock

- Physical exam parameters
 - Mentation
 - Mm/crt
 - Heart rate
 - Respiratory rate
 - Dorsal or femoral pulses
 - Peripheral temperature
- Ancillary test parameters
 - Lactate
 - Hypotension

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HBC

- 3yr MN Great Dane
- No prior health concerns
- HBC approx. 30min prior to presentation
- Active bleeding since trauma
- No reported LOC
- Ambulatory (3legs) initially
- Progressively weaker and quieter since trauma

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HBC

- Primary Survey
 - QAR but aware of surroundings
 - PLRs wnl, no visible facial wounds
 - RR increased but no effort
 - MM light pink, CRT ~ 2 sec
 - Sinus tachycardia 182pm
 - Weak dpp
 - Chest clear
 - Active hemorrhage from distal FL
 - Small superficial abrasions & bruising along thorax & FL
- Initial Assessment
 - Critical – active hemorrhage
 - Compensatory hemorrhagic shock
- Initial Plan
 - Control hemorrhage
 - IV assess
 - Analgesia
 - Crystalloid bolus(s)

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Hemorrhagic shock - treatment

- Compressible hemorrhage
 - Compression or ligation
 - Crystalloid boluses
 - 10-20ml/kg q15min
 - Voluven bolus
 - 5ml/kg
 - WB or component
 - Refractory cases
- End points
 - Improved perfusion parameters
 - SAP > 90mmHg/MAP > 60mmHg
 - Normal lactate within 6hrs



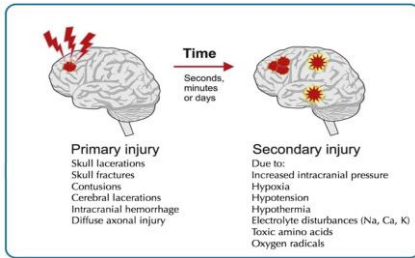
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HBC

- Preliminary Diagnostics
 - PCV 48%, TP 60 g/L
 - BG 7mmol/L with normal Elytes
 - Lactic acidosis (lactate 5.2 mmol/L)
 - SAP 92 mmHg
 - EKG 146 bpm
- aFAST
 - 0/4 quadrants for FF, bladder intact and visible GB
- tFAST
 - No pleural or pericardial effusion
 - No appreciable Blines
- Revised Assessment
 - Responding to therapy – CV stable
 - Hemorrhage controlled (temporarily)
- Revised Plan
 - Primary hemostasis and wound closure
 - IV cephalozin for wound(s)
 - Detailed exam
 - Monitor for delayed internal complications (24hrs+)

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Traumatic brain injury (TBI)



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TBI

- 6yrs MI SheppardX
 - No significant prior health concerns
 - Missing 4hrs ago
 - Found on side of road 2hrs prior to presentation
 - Altered and unable to walk since found

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TBI

- Primary Survey
 - Altered
 - RR/effort increased but auscultation wnl
 - Visible flail chest – right side
 - MM light pink, CRT < 2 sec
 - Sinus tachycardia 175bpm
 - Palpable dpp
 - Facial lacerations and ventral abdominal abrasions
 - No visible external hemorrhage
- Neurological Exam
 - Altered but responds to noxious stimuli
 - Non-ambulatory but PP in all 4 limbs
 - No appreciable back/neck pain (mentation)
 - PLRs present bilaterally but decreased
 - Left hyphema & anisocoria (L<R)
 - Menace intact
 - Slight head tilt to right

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TBI

- Initial Assessment
 - Critical – HBC and TBI
 - Concurrent thoracic trauma
- Initial Plan
 - O₂ supplementation (mask)
 - IV access
 - Analgesia
 - 30° incline
 - Avoid jugular compression

- aFAST
 - Positive 2/4 quadrants (scant)
 - Intact urinary bladder/GB
- tFAST
 - No pericardial effusion
 - Scant pleural effusion
 - Positive glide sign
 - Early B-lines
- NIPB
 - SAP 96mmHg, MAP 72 mmHg

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TBI

- Revised Assessment
 - Critical – HBC and TBI
 - Flail chest with suspect contusions
 - Scant pleural/peritoneal fluid
 - Suspect hemorrhage

- Therapy
 - Crystalloid bolus(s) 20ml/kg judicious
 - Hyperosmolar therapy 7.5% HTS
 - 2.5-4ml/kg IV over 5-10min
 - Titrate analgesia
 - Fentanyl infusion
 - Metacam once stable
 - Soft padded bedding +/- ucath to prevent urine scalding
 - Sedatives
 - Gabapentin +/- diazepam/Ace

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TBI Monitoring

- Serial assessment (q1-3hrs)
 - Mentation
 - Brain stem reflexes (eg PLRs)
 - Motor
- Reassess perfusion & analgesia
 - Continuous EKG & intermittent NIBP
 - Serial aFAST/tFAST for ongoing hemorrhage
- Trend RR/effort
 - Titrate O₂ support

- Target end points
 - MAP > 80mmHg
 - PaO₂ > 90 mmHg
 - SpO₂ > 95 %
 - PaCO₂ 40-50 mmHg

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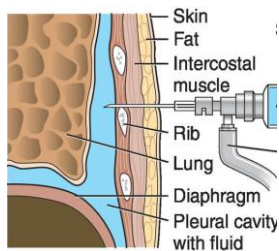
Highrise Cat

- Primary Survey
 - Alert but distressed
 - Blood on face
 - Dyspneic with minimal chest wall movement
 - PP pale/ CRT unable to assess
 - Auscultation – dull
 - Femoral pulses weak
 - Visible movement in 3 limbs
- Initial Assessment
 - Critical – dyspneic
 - Painful
 - Likely concurrent injuries
- Initial Plan
 - O2 supplementation
 - Sedation/Analgesia
 - IV assess
 - Thoracocentesis

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Thoracocentesis

- Local block
 - Lidocaine 2mg/kg down to pleura
- Sternal
 - 7th-8th ICS upper 3rd
- Lateral
 - 7-8th ICS at highest point
- Cranial border of rib
- 19g butterfly or 14-18g ONC



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Chest tube placement



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Highrise Cat

- QUATS
 - Hct/TP 38% and 6.2 g/dL
 - Stress hyperglycemia (13mmolL)
 - pCO2 56mmHg
 - Mild metabolic lactic acidosis
- aFAST
 - 0/4 quadrants
- tFAST
 - Absent glide sign
 - No pleural or pericardial effusion
 - Possible Blines/contusions
- Detailed Exam
 - Symphyseal fracture with minimal misalignment
 - Hard palate split
 - Left tibial F#

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Highrise Cat

- Revised Assessment
 - Stable pneumothorax with risk of decline/delayed complications
 - Fractures requiring Sx repair
- Revised Plan
 - Monitor RR/chest tube pending progression
 - Analgesia as needed for pain
 - Metacam (if remains stable)
 - Sx repair once thoracic pathology stable +/- Etube

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Hemoabdomen

- 4yr old FS mix breed
- Routine uncomplicated OHS 24hrs prior
- Quiet overnight but ate small amount
- Progressively weaker overnight
- Reluctant to urinate outside this morning
- Anorexic but drinking excessively

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Hemoabdomen

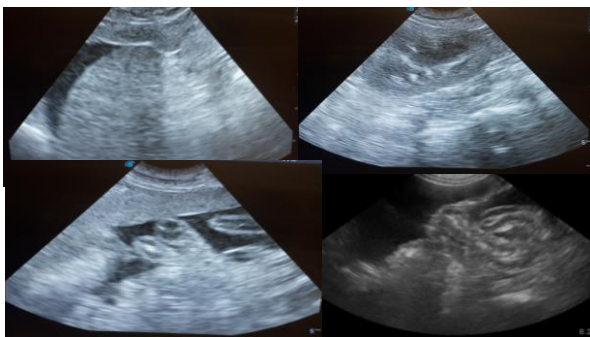
- Primary Survey
 - Dull
 - Carried in – unwilling to walk
 - MM pale. CRT > 2sec
 - Mild tachypnea
 - Tachycardic (176bpm) with intermittent irregular beats
 - Weak to absent pulses deficits
 - Mild discharge from incision
 - Mild discomfort on palpation
- Initial Assessment
 - Decompensatory shock
 - Arrhythmic
 - Pain

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Hemoabdomen

- Initial Therapeutic Plan
 - IV access
 - Fluid resuscitation
 - PLA 10-20ml/kg
 - Analgesia
 - Methadone 0.1-0.2mg/kg
- Initial Diagnostic Plan
 - ICU Quats
 - Continuous EKG
 - aFAST
- ICU Quats
 - Hct/TP 28% and 51 g/dL
 - Mild hyponatremia (136 mmol/L)
 - Moderate metabolic lactic acidosis
 - ACT 128 sec
 - Platelet estimate 85-100,000 UL
 - VPCs with periods of Vtach

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Hemoabdomen

- Non-compressible hemorrhage
- Etiology
 - Coagulopathy (e.g. rodenticide)
 - Traumatic
 - Neoplastic
 - Post-op OHS, splenectomy, GDV, liver biopsy
- Hypovolemia > Anemia
- Resuscitation targets
 - SAP 90mmHg/MAP 60mmHg
 - Improved perfusion parameters
 - Mentation
 - Tachycardia
 - CRT/MM
 - RR

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Hemoabdomen

- Medical Management
 - Judicious volume resuscitation
 - Estimation of blood loss
 - 85xBwt x % loss
 - 65xBwt x % loss
 - Crystalloid boluses
 - +/- Voluven boluses
 - Blood transfusions
- Surgical Management
 - Refractory to medical therapy
 - Limited resources
 - aFAST score
 - Initial
 - Serial
 - SAP 90mmHg/MAP 60mmHg

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Hemoabdomen

- Blood transfusions
 - Hypovolemia not anemia
 - Whole blood
 - Fresh
 - Stored
 - Component
 - pRBC
 - FFP
 - Platelets

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Parvovirus

- Primary survey
 - Quiet (especially for puppy)
 - MM pink but tachy. CRT < 2 sec
 - RR/effort wnl
 - Sinus with palpable dpp
 - Temp 37.2C
 - Thin body condition
 - Groaning on abdominal palpation
 - no pain
 - no palpable SI intussusception
- Initial Assessment
 - Dehydrated 5-6%
- Initial Plan
 - Fecal r/o Parvo & endoparasites
 - Outpatient vs Inpatient

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Parvovirus

- Viral infection
 - Symptomatic therapy
 - Biphasic disease
- Principles of management
 - IV rehydration
 - Electrolyte supplementation
 - Antibiotics +/- antiparasitic
 - Antiemetics +/- analgesia
 - Enteral support
- Complications/Limitations
 - Financial constraints
 - Sepsis (septic shock)
 - Aspiration pneumonia
 - SI Intussusception

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Parvovirus

- Diagnostic Plan
 - ICU Quats (baseline)
 - Serial BG/Electrolytes/PCV/TP
 - CBC +/- trend
- ICU Quats
 - Na+/Cl 138/110
 - K+ 3.2 mmol/L
 - BG 4.0 mmol/L
 - Lactate 1.9 mmol/L

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Parvovirus

- Fluid Plan
 - Fluid boluses until normotensive
- Rehydration
 - % dehydration x BWt + maintenance over 12-24hr
- Ongoing losses
- Electrolyte Supplementation
 - K+
 - Dextrose
 - Total protein (< 4.0 g/dL)

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Refractory Hypotension

- Hypovolemic shock
 - Crystalloids
 - Colloids
 - FP/FFP
- Distributive shock (septic)
 - Pressors (Dopamine or NorEpi)
- Anxillary support
 - Active rewarming
 - Normoglycemia

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Parvovirus treatment

- Antibiotics
 - Ampicillin +/- enrofloxacin/amikacin
 - Ceftioxin
- Antiemetics
 - Maropitant vs Ondansetron
 - Metoclopramide
- Analgesia
 - Butorphanol vs Buprenorphine
 - Opioids and GI stasis/cramping

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Nutritional support

- Oral supplementation
 - Higher risk of aspiration
 - Food aversion
 - Cost effective
- NG supplementation
 - Reduced risk of aspiration
 - Gastric decompression
 - Patient friendly

J. Vet Intern Med. 2003 Nov-Dec;17(6):791-8.

Effect of early enteral nutrition on intestinal permeability, intestinal protein loss, and outcome in dogs with severe parvoviral enteritis.

- Earlier clinical recovery and weight gain
- No survival benefit

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Parvovirus (outpatient)

J. Clin. Oncol. 2017 Aug 27;35(18):41-49. doi: 10.1200/JCO.2016.36.8151.

Evaluation of an outpatient protocol in the treatment of canine parvoviral enteritis.

- SubQ fluids, Maropitant, Convenia
- Oral supplementation for dextrose/K+
- 80% survival vs 90%
- Patient selection improves outcome
 - Patient status & owner compliance
- Daily assessments
 - Phone vs in person consult

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Parvovirus (outpatient)

Evaluation of mortality rate and predictors of outcome in dogs receiving outpatient treatment for parvoviral enteritis

- SubQ fluids, antiemetic, antibiotics +/- oral supplementation
- Outpatient treatment
- 75% survival at 3 days
- 81% survival with oral supplementation

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Urethral obstruction

- 5yr old MN DMH
- P.C. Lethargic and vocalizing
- 2-3 day history of decreasing appetite

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Primary survey

- Obtunded and recumbent
- Relative bradycardic (165 bpm) with weak dpp
- Short, shallow breathing
- Temp 36.7C
- Vocalize on abdominal palpation
- Large, firm and non-expressed urinary bladder

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Assessment

- Critical – urethral obstructions
- Likely hyperK+ and uremic/acidosis
- Immediate IV access warranted

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ICU Quats

- PCV 36%, TP 65 g/L
- K+ 9.6 mmol/L, iCa+ 1.08 mmol/L
- BG 11.2 mmol/L
- Marked metabolic lactic and uremic acidosis
- Creatinine 1465 umol/L

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Treatment Plan (UO)

- Cardiac stabilization
 - Ca+ gluconate (0.5mL/kg slow IV)
 - IV fluid bolus (PLA or Normosol-R)
- Treatment of hyperK+
 - Dextrose (0.5mL/kg IV)
 - +/- R-insulin (0.25U/kg IV) + dextrose infusion
- Urethral unblocking
 - Hydro 0.25-0.05mg/kg IV + Diazepam 0.5mg/kg IV
- Adjunct
 - Analgesia PRN +/- antispasmodic

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Treatment Plan (AKI)

- Cardiovascular stable
 - Continue IV fluid boluses until normotensive
 - Ensure normothermic
 - +/- pressor support
- IV fluid support
 - Rehydrate over 12-24hrs
- Monitor Urine output
 - Indwelling ucath
 - Measure UO and adjust fluids q6hrs

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Diagnostic Plan (AKI/UO)

- Minimum
 - Urinalysis +/- creatinine
 - Abdominal Xray (cystic calculi)
- Ideal
 - CBC/Chemistry/UA
 - +/- Urine C&S pending UA
 - Abdominal xrays r/o cystic calculi
 - +/- AUS

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Management Success

J. Am. Vet. Med. Assoc. 2019; Jan-Feb;295(1):130-7. doi: 10.1177/0898.1221.18781494
Controversies in the management of feline urethral obstruction.
J. Am. Vet. Med. Assoc. 2017; Aug 15;291(8):1218-8. doi: 10.2460/javma.2016.41812
Initial treatment factors associated with feline urethral obstruction recurrence rate: 192 cases (2004-2010).

- Survival 90-95%
- Recurrence rate 15-40%
 - Duration and size of indwelling ucath may impact
 - Water intake and environmental modifiers reduce recurrence
 - Urine color at time of removal may impact
 - Prazosin? phenoxybenzamine? Meloxicam? None?

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Outpatient UO

J. Am. Vet. Med. Assoc. 2019; Jun 15;295(12):1459-1500. doi: 10.2460/javma.2012.12.1938
Evaluation for association between indwelling urethral catheter placement and risk of recurrent urethral obstruction in cats.

- Recurrence rate
 - 11% indwelling (5/46) and 31% outpatient (14/45)

J. Am. Vet. Med. Assoc. 2010; Jul 1;277(1):101-6. doi: 10.2460/javma.2010.19.1061
A protocol for managing urethral obstruction in male cats without urethral catheterization.
Cossette, E.S.†, Owens, J.J.†, Chew, D.J., Buffington, C.A.

- 73% success (11/15)
- Cystocentesis, analgesia/sedation and subQ fluids
- Candidate selection

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Penile Urethrostomy

J. Feline Med. Surg. 2019 Aug 19;10(8):621-687777. doi: 10.1177/1098121318807777. Epub ahead of print.

Welfare of cats 5-29 months after perineal urethrostomy: 74 cases (2015-2017).

Stalder M, Caines D, Gault JA, Cobelli J, Gallwey JC, Frank J, DeCrombrughe C.

- QOL – 0% less & 48% better

J. Feline Med. Surg. 2012 Dec;34(12):895-4. doi: 10.1177/1098121312107518. Epub 2012 Nov 20.

Short- and long-term outcome after perineal urethrostomy in 86 cats with feline lower urinary tract disease.

- 88% report good QOL
- 10% severe recurrent UTI

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