

Contents

About the Editors	xxvii
List of Contributors	xxix
Prologue	xxxiii
Foreword	xxxvii
Preface	xxxix
Acknowledgments	xli
About the Companion Website	xlili

Part 1 Emergency Triage Methods and Techniques 1

1 How to Triage Emergency Conditions in the Horse	3
<i>Rolfe M. Radcliffe and Jamie J. Kopper</i>	
Introduction	3
Emergency Triage Steps	3
Step 1: Patient Stabilization	3
Step 2: Formulating a Diagnostic Plan	3
Step 3: Emergency Treatment Guidelines	4
Step 4: Assessment and Monitoring	5
Step 5: Decision Making During Triage	5
References	9
2 Working Safely with Horses During Emergencies: Behavioral Considerations	11
<i>Sue McDonnell, Cade Torcivia, and Jaime Miller</i>	
Introduction	11
Staff Considerations	11
Work Environment Considerations	12
Restraint Considerations	12
Consideration of Handling Aids	13
Examination Stocks	13
Chain Over Nose	14
Neck Skin Twitch	14
Gum Chain	14
Lip or Nose Twitch	15
Veterinary Procedure Considerations	18
Working with “Wild,” Feral, and Previously Unhandled Horses	18
References	19

3 Emergency Supplies and Equipment for Triage 21*Santiago Mejia and Elizabeth Williams Louie*

General Equipment List 21

General Equipment 21

Creams, Ointments, and Dressings 22

Medication Stock 23

Emergency Drugs 24

Catheter Supplies, IV Fluids, and Electrolytes 24

Controlled Substances 24

Bandage and Splints 25

Antiseptics 25

Podiatry Equipment 25

Intravenous Catheterization 26

Catheter Supplies 26

Medication Administration 27

Bandaging, Cast, and Splint Supplies 29

Splints 30

Wound Repair Supplies 31

Joint Fluid Collection 33

References 35

4 Basic Clinical Triage Procedures 37*Barbara Delvescovo, Rebecca C. McOnie, Kelly Knickelbein, Katharyn J. Mitchell, and Nicole Scherrer*

Establishing Intravenous Access and Catheter Placement 37

Fluid Administration Techniques 39

Intravenous Fluids (IVF) 40

Enteral Fluids 40

Rectal Fluids 41

Intraosseous Fluids 41

Methods of Medication Administration 42

Oral (PO) Administration 42

Rectal (PR) Administration 42

Intravenous (IV) Administration 43

Intramuscular (IM) Administration 43

Subcutaneous (SC) Administration 44

Transdermal Administration 44

Nasogastric Intubation 44

Sedation Techniques in Horses 46

Electrocardiogram 47

Abdominocentesis 47

Synoviocentesis 52

Thoracocentesis 54

Tracheal Wash and Bronchoalveolar Lavage 55

Tracheal Wash 55

Bronchoalveolar Lavage (BAL) 57

Diagnostics for Ophthalmology 58

General Ophthalmic Exam 58

Schirmer Tear Test 58

Fluorescein/Rose Bengal Staining 59

Corneal Culture and Cytologic Examination 59

Tonometry	60
Ultrasound	60
Rectal Examination	61
Field Necropsy	62
Isolation and Biosecurity	64
Identification of Patients at Risk	64
Emergent Patient Handling	64
Isolation/Quarantine	65
Isolation in Field Settings	65
References	65

5 Advanced Clinical Triage Procedures 67

Barbara Delvescovo, Brenna R. Pugliese, Klaus Hopster, Kelly Knickelbein, and Nicole Scherrer

Regional Perfusion Techniques	67
Fracture Stabilization Methods	69
Cast Application Techniques	71
Emergency Tracheostomy	73
Chest Tube Placement	74
Pericardiocentesis	76
Preparation for Field Anesthesia in the Emergent Horse	78
Pre-anesthetic Stabilization	78
Fluid Therapy	80
Analgesia	80
Oxygen Therapy	80
Transfusion	80
Positioning and Padding	81
Cecal or Colonic Trocarization	81
Caudal Epidural Anesthesia	83
Subpalpebral Lavage System Placement	84
Blood Collection and Transfusion	86
Autotransfusion	87
Possible Complications	88
Fasciotomy	88
Relief of Pneumothorax	88
References	90

6 Emergency Diagnostic Assessment During Triage 91

Toby L. Pinn-Woodcock, John Pigott, and Sally Anne L. DeNotta

Diagnostic Testing	91
Point-of-Care Testing	91
Laboratory Diagnostic Considerations During Emergency Triage	91
How to Interpret and Implement Culture and Susceptibility Results	91
How to Collect and Prepare Specimens for Cytology	95
Emergency Imaging	97
Radiography Techniques	97
Endoscopy Examination	98
Ultrasound Examination	98
Sonographic Evaluation of the Equine Acute Abdomen	101
Thoracic Ultrasonography	102
General Considerations	102
References	103

Part 2 Emergency Conditions of the Horse 105

7 Wounds, Trauma, and Other Injury 107

Rolfe M. Radcliffe, Heidi L. Reesink, and Dean A. Hendrickson

Introduction 107

Emergency Wound Triage 107

Emergency Wound Evaluation and Management 107

Wound Examination 107

Diagnostic Techniques 109

Wound Cleaning and Lavage 110

Wound Debridement 110

Wound Management Decisions 112

Wound Dressings 113

Bandages, Splints, Casts 114

Emergency Wounds of the Limbs 114

Examination of the Limb Wounds 114

Wounds Involving Bone 116

Wounds Involving Synovial Structures 117

Wounds Involving Tendons and Ligaments 120

Wound Management and Closure Techniques 121

Complications of Limb Wounds 123

Prognosis and Outcome 123

Hoof Trauma 124

Wound Examination 124

Types of Hoof Injury 124

Lacerations Involving the Coronary Band 124

Hoof Repair Techniques 125

Complications of Hoof Injury 125

Prognosis and Outcome 125

Emergency Wounds of the Body and Head 126

Wound Management and Closure Techniques 126

Bandaging Techniques for the Body and Head 127

Complications of Body and Head Wounds 127

Prognosis and Outcome 128

Abdominal Injury 128

Patient Stabilization 128

Penetrating Abdominal Injury 128

Blunt Abdominal Trauma 129

Thoracic Injury 129

Patient Stabilization 129

Penetrating Thoracic Injury 129

Blunt Thoracic Trauma 130

Necrotizing Skin Problems 131

Thermal Injury 131

Frostbite Injury 131

Patient Stabilization 131

Venomous Bites 132

Snake Bite Envenomation 132

Patient Stabilization 132

Gas Gangrene 133

Patient Stabilization 133

Gunshot Injury	134
Patient Stabilization	134
Gunshot Wound Injury	134
References	138

8 Musculoskeletal Injury 141

<i>Ashlee E. Watts</i>	
Acute Severe Lameness – The Phone Conversation	141
Acute, Severe Lameness – The Physical Examination	141
Acute Severe Lameness – The Ambulation Examination	142
Acute Severe Lameness – Diagnostic Anesthesia	143
Stepwise Blocking of the Foot	143
Acute, Severe Lameness – Diagnostic Imaging	143
Specific Conditions	143
Foot Injuries – Sub-solar Foot Abscess	143
Foot Injuries – Penetrating Foreign Body	146
Foot Injuries – Hoof Wall Avulsion	148
Synovial Sepsis	149
Fractures and Luxations	150
Cellulitis	153
Tendon/Ligament Injury – Complete Rupture	153
Tendon Injury Without Complete Rupture	154
Muscle Injury	154
Acute Laminitis	155
Conclusion	156
References	160

9 Oral and Maxillofacial Emergencies 161

<i>Alexandra L. Wright and Edward T. Earley</i>	
Introduction	161
Oral and Maxillofacial Examination	161
Case Management	161
Dental Trauma	161
Equine Odontoclastic Tooth Resorption and Hypercementosis (EOTRH)	165
Skull Fracture	167
Lingual Trauma	172
Conclusion	175
References	175

10 Diseases of the Abdomen 177

<i>Megan Burke, Julie Dechant, and Alicia Long</i>	
Evaluation of the Horse with Colic	177
Goals	177
History	177
Physical Examination	178
Diagnostic Procedures	178
Decision for Referral or Surgery	178
Lesions by Anatomic Location	180
Esophageal Obstruction	180
Stomach	182

Small Intestine	185
Obstructive Lesions	185
Strangulating Lesions	186
Cecum	188
Cecal Tympany	188
Cecal Impaction	188
Ileocecal, Cecocecal, and Cecocolic Intussusception	189
Large Colon	191
Obstructive Lesions	191
Strangulating Lesions	198
Small Colon and Rectum	199
Triage at the Farm	199
Emergency Triage Steps	200
What Can Be Done at the Farm	202
What Can Be Done at the Referral Hospital	203
Advice on How to Decide Between Options When Referral Is Time-Critical	203
Important Decisions During Management	203
Colic in the Late-Term Pregnant Mare	205
Clinical Signs	205
Triage Over the Phone	205
Triage at the Farm	205
What Can Be Done at the Farm	206
What Can Be Done at the Referral Hospital	206
Advice on How to Decide Between Options When Referral Is Time-Critical	206
Important Decisions During Management	207
Postoperative Colic Problems	207
Clinical Signs	207
Triage Over the Phone	207
Triage at the Farm	208
Emergency Triage Steps	208
What Can Be Done at the Farm	208
What Can Be Done at the Referral Hospital	208
Advice on How to Decide Between Options When Referral Is Time-Critical	208
Important Decisions During Management	208
Peritonitis	209
Clinical Signs	209
Triage Over the Phone	209
Triage at the Farm	209
Emergency Triage Steps	209
What Can Be Done at the Farm	210
What Can Be Done at the Referral Hospital	210
Advice on How to Decide Between Options When Referral Is Time-Critical	210
Important Decisions During Management	210
Acute Diarrhea	211
Introduction	211
Pathophysiology	211
Evaluation of the Horse with Diarrhea	211
Emergency Triage Steps	214
Patient Stabilization	214
How to Formulate a Diagnostic Plan	214
What Can Be Done at the Farm	215

What Can Be Done at the Referral Hospital	215
Advice on How to Decide Between Options When Referral Is Time Critical	215
Treatment Recommendations	216
Fluid Support	216
Adsorbents	216
Anti-Endotoxic Therapies	216
Antimicrobials	217
Prebiotics, Probiotics, Fecal Transfaunation	217
Additional Therapies	218
Nutritional Support	218
Important Decisions During Management	219
Decision for Hospital Referral vs Farm Management	219
Decision for Medical vs Surgical Treatment	219
How to Manage Complications	219
Estimating Prognosis	220
Decision for Euthanasia	220
Carbohydrate (Grain) Overload	220
Emergency Triage Steps	221
Patient Stabilization	221
How to Formulate a Diagnostic Plan	221
What Can Be Done at the Farm	221
What Can Be Done at the Referral Hospital	221
Advice on How to Decide Between Options When Referral Is Time-Critical	222
Treatment Recommendations	222
Important Decisions During Management	222
Decision for Hospital Referral vs Farm Management	222
How to Manage Important Complications	222
Estimating Prognosis	222
Decision for Euthanasia	223
References	226

11 Respiratory Emergencies 235

Rebecca C. McOnie, Eileen S. Hackett, and Norm G. Ducharme

Introduction	235
Cornerstones of Emergency Triage	235
Establish a Patent Airway	235
Oxygen Supplementation	235
Seal and Decompress the Pleural Space	236
Halt Hemorrhage	236
Localizing the Cause of Respiratory Distress	237
Recognition of Respiratory Patterns	237
Airway Endoscopy	237
Thoracic Ultrasonography	237
Thoracic Radiography	238
Emergent Respiratory Problems	238
Upper Airway Obstruction and Trauma	238
Lower Airway Obstruction	243
Pulmonary Parenchyma and Pleural Space Conditions	244
Synchronous Diaphragmatic Flutter	247
Hemorrhage from the Nostrils	248
References	253

12 Cardiovascular Emergencies 255

Cristobal Navas de Solis and Katharyn J. Mitchell

- Dysrhythmias–Diagnosis and Treatment 255
 - Emergency Triage Steps 255
 - Important Decisions During Management 259
- Congestive Heart Failure 265
 - Emergency Triage Steps 266
 - Emergency Treatment Guidelines 268
 - Important Decisions During Management 269
 - How to Manage Important Complications 269
 - Estimating Prognosis and Decision for Euthanasia 269
- Bacterial Endocarditis 270
 - Emergency Triage Steps 270
 - Important Decisions During Management 270
- Myocardial Injury and Myocarditis 271
 - Emergency Triage Steps 271
 - Important Decisions During Management 272
- Pericardial Disease 272
 - Emergency Triage Steps 272
 - Important Decisions During Management 272
- Cardio-Pulmonary Resuscitation 273
 - Emergency Treatment Guidelines 273
 - Important Decisions During Management 275
- Blood Coagulation Disorders 278
 - Emergency Triage Steps 278
 - Important Decisions During Management 280
- References 281

13 Diseases of the Urinary Tract 283

Jamie J. Kopper and Jarrod Troy

- Urinary Bladder Prolapse 283
 - Diagnosis 283
- Obstructive Urolithiasis (Urethrolithiasis) 285
- Ruptured Bladder 286
 - Diagnosis 286
 - Stabilization 287
 - When to Refer 287
 - Urinary Bladder Rupture Surgical Intervention 288
- Acute Kidney Injury (AKI) 289
 - Diagnosis 290
 - Treatment 290
- Acute Renal Failure (ARF) 291
 - Treatment 291
- Pigmenturia 291
- References 295

14 Reproductive Emergencies 297

Soon Hon Cheong, Mariana Diel de Amorim, and Maia R. Aitken

- Emergency Conditions of the Mare – Prepartum 297
 - Monitoring the Pregnant Mare 297
 - Managing the High-Risk Pregnant Mare 298
 - Uterine Torsion 298
 - Hydrops of the Fetal Membranes 299

Body Wall Rupture	301
Premature Signs of Impending Parturition (Placentitis or Abortion)	302
Abortion	303
Premature Placental Separation	304
Dystocia	305
Emergency Conditions of the Mare – Postpartum	308
Periparturient Hemorrhage	308
Uterine Prolapse	310
Metritis and Retained Fetal Membranes	311
Postpartum Eclampsia	313
Other Reproductive Emergencies	314
Mare Reproductive Trauma	314
Mastitis	315
Emergency Conditions of the Stallion	316
Scrotal Enlargement	316
Phimosis and Paraphimosis	317
Trauma of the Penis	318
Penile Prolapse and Priapism	320
Post-Castration Complications	321
References	325

15 Neurological Emergencies of the Horse 327

Sarah F. Colmer and Amy L. Johnson

Acute Ataxia	327
Encephalitis	333
Bacterial Meningitis	335
Introduction	335
Trembling in Horses	336
Traumatic Brain Injury	339
Introduction	339
Spinal Cord Injury	340
Seizures	342
Dysphagia	344
Urinary Incontinence	346
References	351

16 Emergency Problems of the Eye 353

Kelly Knickelbein and Nicole Scherrer

Ophthalmic Basics	353
Ophthalmic Examination	353
Sedation	354
Preparation	355
Local Anesthesia	355
Orbital Abscess/Cellulitis	356
Emergency Stabilization	356
Diagnostic Plan	356
Treatment	356
Orbital Fractures	356
Emergency Stabilization	356
Diagnostic Plan	357
Treatment	357
Eyelid Emergencies	357
Emergency Stabilization	358

Diagnostic Plan	358
Treatment	358
Injury to the Cornea and Sclera	359
Emergency Stabilization	359
Diagnostic Plan	359
Treatment	359
Corneal Abrasion and Ulceration	360
Emergency Stabilization	360
Diagnostic Plan	360
Treatment	360
Corneal Foreign Bodies	363
Emergency Stabilization	363
Diagnostic Plan	363
Treatment	363
Chemical Injuries	363
Emergency Stabilization	363
Diagnostic Plan	363
Treatment	363
Anterior Uveitis	364
Emergency Stabilization	364
Diagnostic Plan	364
Treatment	364
Glaucoma	364
Emergency Stabilization	364
Diagnostic Plan	365
Treatment	365
Acute Blindness	365
Emergency Stabilization	365
Diagnostic Plan	365
Treatment	366
References	368

Part 3 Specific Problems in Horses and Donkeys 371

17 Infectious Disease and Biosecurity	373
<i>Brandy A. Burgess</i>	
Zoonotic and Contagious Diseases of the Horse	373
Common Modes of Transmission	373
Risk Assessment	375
Managing Infectious Diseases	375
Managing Patient Contact	375
Personal and Environmental Hygiene	382
Surveillance	384
Education and Awareness of Personnel	386
References	386
18 Systemic Inflammatory Response Syndrome, Shock, and Sepsis	389
<i>Samuel D. Hurcombe and Jamie J. Kopper</i>	
Definitions, Criteria, Clinical Signs and Patient Stabilization	389
Systemic Inflammatory Response Syndrome	389
Shock	389
Sepsis	389
References	397

19 Coagulation and Hemorrhage in Horses and Foals 399*Rebecca Bishop and Pamela Wilkins*

Overview of Coagulation and Coagulopathy 399

Introduction 399

Review of Coagulation and Fibrinolysis 399

Identification of Coagulation Disorders 400

Clinical Examination 400

Diagnostic Tests 401

Emergency Conditions Associated with Blood Loss 407

Acute Blood Loss 407

Recognition of Hemorrhage 407

Treatment 407

Chronic Blood Loss 410

Blood Transfusion for Normovolemic (Chronic) Anemia 410

Chronic Blood Loss 410

Immune-Mediated Hemolytic Anemia (IMHA) 410

Equine Infectious Anemia (EIA) 411

Piroplasmosis 411

Red Maple Leaf Toxicity 411

Emergency Conditions Associated with Coagulopathy 412

Disseminated Intravascular Coagulation (DIC) 412

Clinical Signs 412

Diagnosis 412

Treatment 413

Immune-Mediated Thrombocytopenia (ITP) 414

Clinical Signs 414

Diagnosis 414

Treatment 414

Clotting Factor Deficiencies 415

Heritable Clotting Factor Deficiencies 415

Liver Failure 416

Snake Bite 416

Hypercoagulation 416

Clinical Signs 416

Diagnosis 417

Treatment 417

Prognosis 418

Management Decisions in Blood Loss and Coagulopathy 418

When to Refer 418

Prognosis 418

Euthanasia 418

References 421

20 Foal Emergencies 425*Jenifer R. Gold*

Introduction 425

Normal Physical Examination 425

Mare History – Pregnancy, Parturition, Passage of Placenta 425

The Critically Ill Neonate 427

Stabilization of the Critically Ill Neonate 427

Cardiovascular Support 427

Fluid Therapy: Hypovolemia 427

Fluid Therapy: Dehydration 428

Glucose Therapy	429
Electrolyte Therapy	429
Positive Inotropes and Vasopressors	429
Neonatal Clinical Abnormalities	430
Prematurity/Dysmaturity	430
Diagnostics	430
Clinical Pathology Finding	430
Emergency Triage Steps	431
Failure of Passive Transfer	432
Etiology	432
Clinical Signs	432
Clinical Pathology	432
Emergency Triage Steps	432
Oral Supplementation	432
Intravenous Immunoglobulin Supplementation	432
Prevention	433
Sepsis	433
Etiology	433
Clinical Signs	433
Clinical Pathology Findings	434
Diagnosis	435
Emergency Triage Steps	435
Neonatal Encephalopathy (NE)	435
Etiology	436
Clinical Signs	436
Diagnosis	437
Note of Importance	437
Emergency Triage Steps	437
Neonatal Isoerythrolysis (NI)	438
Etiology	438
Clinical Signs	438
Diagnosis	438
Emergency Triage Steps	439
Prevention	439
Pneumonia	439
Etiology	439
Clinical Signs	440
Diagnosis	440
Emergency Triage Steps	440
Respiratory Distress	440
Etiology	440
Clinical Signs	440
Diagnosis	441
Emergency Triage Steps	441
Apnea	441
Etiology	441
Clinical Signs	441
Diagnosis	441
Emergency Triage Steps	441
Congenital Heart Disease	441
Etiology	441
Clinical Signs	442

Diagnosis	442
Emergency Triage Steps	442
Dysphagia	442
Etiology	442
Clinical Signs	442
Diagnosis	443
Emergency Triage Steps	443
Colic	443
Etiology	443
Clinical Signs	443
Diagnosis	443
Emergency Triage Steps	444
Foal Diarrhea/Enterocolitis	445
Etiology	445
Clinical Signs	446
Diagnosis	446
Emergency Triage Steps	447
Uroperitoneum	447
Etiology	447
Clinical Signs	447
Diagnosis	448
Emergency Triage Steps	448
Limb Deformities	448
Etiology	448
Clinical Signs	450
Diagnosis	450
Emergency Triage Steps	450
Septic Arthritis	451
Etiology	451
Clinical Signs	451
Diagnosis	451
Emergency Triage Steps	451
Maternal Rejection and the Orphan Foal	451
Colostrum	452
Administration of Colostrum	452
Switching to Solid Feed	452
References	454

21 Hepatic and Metabolic Emergencies 459

Joy E. Tomlinson and Thomas J. Divers

Clinical Signs of Liver Disease	459
Triage of Neurologic Emergency	460
Triage of Colic Emergency	460
Diagnostic Tests for Liver Disease	460
Patient History	461
Serum Biochemistry	461
Urine Dipstick	462
Complete Blood Count and Fibrinogen or Serum Amyloid A (SAA)	462
Coagulation Panel	462
Viral PCR and In Situ Hybridization (ISH)	462
Ultrasonography	462
Biopsy	463
Gastroduodenoscopy	463

Causes of Liver Failure in Horses	463
Parvoviral Hepatitis (Theiler's Disease or Serum Hepatitis)	468
Summary	468
Clinical Signs	468
Biochemical Findings and Diagnostic Criteria	468
Pyrrolizidine Alkaloid (PA) Toxicosis	468
Summary	468
Clinical Signs	468
Biochemical Findings and Diagnostic Criteria	469
Hepaciviral Hepatitis	469
Summary	469
Clinical Signs	469
Biochemical Findings and Diagnostic Criteria	469
Primary Hyperammonemia of Adult Horses	469
Summary	469
Referral Decision	470
Prognosis and Euthanasia Decision	470
Cholangiohepatitis/Cholelithiasis	470
Summary	470
Clinical Signs	470
Biochemical Findings and Diagnostic Criteria	470
Patient Stabilization of Horses with Suspected Cholangiohepatitis/Cholelithiasis	471
Referral Decision	471
Prognosis and Euthanasia Decision	471
Hyperlipemia	471
Summary	471
Clinical Signs	472
Biochemical Findings and Diagnostic Criteria	472
Patient Stabilization of Horses with Hyperlipemia	472
Referral Decision	473
Prognosis and Euthanasia Decision	473
Tyzzer's Disease	473
Summary	473
Clinical Signs	473
Biochemical Findings and Diagnostic Criteria	473
Patient Stabilization	473
Referral Decision	474
Prognosis and Euthanasia Decision	474
Starvation and Refeeding Syndrome	474
Summary	474
Clinical Signs	474
Biochemical Findings and Diagnostic Criteria	474
Patient Stabilization of Starved Horses	475
Referral Decision	475
Prognosis and Euthanasia Decision	475
References	479

22 Triage and Management of Injuries Associated with Fire and Flood Exposure 481

Lauren Bookbinder

Triage and Management of Injuries Associated with Fire Exposure	481
Cutaneous Thermal Injury, Burn Shock, and Smoke Inhalation	481
Emergency Triage Following Fire Rescue (<Six Hours After Injury)	481

Emergency Diagnostic Evaluation Following Fire Rescue (<Six Hours After Injury)	482
Decision-Making Following Initial Triage	485
What Can Be Done on Farm Versus Referral Hospital	485
Post-Triage Care	486
Post-Triage Continued Diagnostic Evaluation	488
Triage and Management of Injuries Associated with Flood Exposure	488
Flood Preparedness and Rescue	488
Emergency Triage and Diagnostic Evaluation Following Flood Rescue	488
Important Decisions Following Initial Triage	490
What Can Be Done on the Farm Versus Referral Hospital	490
Post-Triage Care	490
Further Reading	493

23 Emergency Conditions of the Racehorse 495

John Pigott and Samuel D. Hurcombe

Specific Considerations	495
Orthopedic Emergencies	495
Emergency Triage Steps	495
Breakdown Injury with Disruption of the Suspensory Apparatus	495
Cellulitis	497
Septic Synovial Structure	499
Laminitis	500
References	507

24 Emergency Conditions of Draft Horses 509

Garett Pearson and Eileen S. Hackett

Introduction	509
Defining Draft Breeds	509
Pharmacology	509
Airway Disorders	511
Gastrointestinal Disorders	511
Musculoskeletal Disorders	512
Urogenital Disorders	513
Skin Disorders	513
References	515

25 Emergency Problems of Donkeys and Mules 517

Erin L. Goodrich and Cynthia Xue

Introduction	517
Clinical Assessment	517
Behavior	517
Restraint	518
Establish Trust and Use Patience with Your Approach	518
Effective Restraint Can Come in Many Forms	519
Physical Examination	519
Clinical Pathology	520
Sample Collection	520
The Hemogram	520
The Serum Biochemistry	520
Important Considerations by Body System	521
Oral Cavity	521
Gastrointestinal Tract	521

Cardiovascular/Hematopoietic Systems	523
Hepatic Disease	523
Respiratory System	524
Musculoskeletal System	524
Nervous System	526
Fluid Therapy	526
Diseases of the Foal and Periparturient Jenny	527
All Mule Foals (Jack × Mare) Are at Risk of Neonatal Isoerythrolysis	527
Euthanasia	527
References	532

26 Toxicologic Emergencies 535

Megan Romano and Karyn Bischoff

Toxicologic Emergencies	535
General Stabilization	535
Specific Medications	549
Decontamination	550
Antidotes and Specific Treatments	551
Sample Collection	551
References	553

Part 4 Support of the Emergency Patient 557

27 Monitoring Methods in Emergency Medicine 559

Sally Anne L. DeNotta

Physical Examination Monitoring Parameters	559
Pain Assessment	559
Monitoring Respiratory Function	560
Monitoring Circulation	562
Conclusion	564
References	564

28 Fluid Therapy for Horses and Foals 565

Eric L. Schroeder, Maia R. Aitken, and Rolfe M. Radcliffe

Introduction	565
Body Fluid and Electrolyte Balance	565
Patient Assessment	567
Understanding Fluid Therapy	568
Route of Administration	570
Type of Fluid	570
Developing a Fluid Therapy Plan	571
Additives to the Base Fluid	571
Monitoring Response to Treatment	574
Discontinuation of Fluid Therapy	574
Colloid Fluid Therapy	575
Blood Transfusion	577
References	581

29 Pressure Support in Horses and Foals 583

Hope F. Douglas and Rolfe M. Radcliffe

Introduction	583
Monitoring	584

Disorders and Treatment: Overall Approach	586
Disorders of Fluid Volume: Problems with the Source	586
Pump Disorder: Failure to Pump	588
Disorders of Vascular Tone: Plumbing Problems	590
Disorders of the Vascular–Tissue Interface: Advanced Plumbing Problems	592
References	596

30 Anesthesia in Emergency Medicine 599

Klaus Hopster

Preparation	599
Assessment	599
Intravenous (IV) Catheter	601
Stabilization	601
Sedation and Induction	602
Maintenance of Anesthesia	602
Pharmacokinetics and Pharmacodynamics in Shocked Patients	603
Airway/Intubation	603
Ventilation	603
Recovery	604
Complications	605
References	606

31 Antimicrobial Therapy and Anti-inflammatory Medications 609

K. Gary Magdesian and Jamie Kopper

Antimicrobial Therapy	609
Antimicrobial Classes	612
Cell Wall Inhibitors	612
Protein Synthesis Inhibitors	617
Nucleic Acid Inhibitors	622
Summary of Clinical Use of Antimicrobials in Critically Ill Patients	625
Anti-inflammatory Medications	625
Non-steroidal Anti-inflammatory Drugs (NSAIDs) and Cyclooxygenase (COX) Selectivity	625
Non-NSAIDs with Anti-inflammatory Effects	627
Immunomodulators	627
Neonatal Dosing	627
Donkeys and Mules	629
References	630

32 Nutritional Support for the Emergent Patient 635

Meri Stratton

Nutritional Support of Adult Horses	635
Patient Assessment	635
Choices for Nutritional Support	637
Offer Highly Digestible Palatable Feed	638
Provide Dextrose-Supplemented Intravenous Fluids	638
Treat with Assisted Enteral Feeding (AEF) Using a Liquid Enteral Diet or Feed Slurry	640
Administer Parenteral Nutrition as PPN or TPN	644
Special Cases: Feeding the Starved Horse	647
Evaluation	648
Dietary Management	648
Prosecuting Starvation Cases: The Veterinarian's Role	649
Nutritional Support of Foals	649

Foals That Require Nutritional Support	649
The Healthy Neonatal Foal That Cannot Consume Enough Milk Because of Complications with the Mare	649
The Foal That Is Unable to Voluntarily or Safely Consume Enough Milk to Meet Nutrient Requirements But Can Tolerate Enteral Feeds	651
The Critically Ill Foal That Cannot Nurse or Tolerate Enteral Feeds for >24 Hours Due to Systemic Complications from Respiratory, GI, Neurologic, or Other Disease	652
32.A Nutrition Resources	654
References	655

33 Resuscitation in the Foal and Adult Horse 657

<i>Maia R. Aitken</i>	
Introduction	657
Basic Life Support	658
Important Considerations for Resuscitation at Birth	658
Advanced Life Support	658
Monitoring	661
Stopping Resuscitation	661
Conclusions	661
References	663

34 Large Animal Rescue Techniques for Emergency Incidents 665

<i>Rebecca (Gimenez) Husted</i>	
Introduction	665
Large Animal Rescue Preparation in the Community	665
A LAR Call Comes In	667
Arrival and Scene Control	668
Establish Control of Animal	669
Veterinary Responsibilities	670
Dual Planning	670
Common LAR Scene Issues	670
How to Use LAR Manipulations	671
Cast Horse Rolls	671
Forward Assist	671
Sideways Slide/Drag	672
Backwards Slide/Drag	672
Vertical Lift	672
Rescue Glide Systems	673
Types of LAR Calls	674
Horse Trailer Wreck or Overturn on the Roadway	674
Horse and/or Rider Hit by Vehicle on the Roadway	674
Loose Horses in the Roadway	674
Horse Trapped in Mud, Pond, Well, Pool, Septic Tank, or Lake Edge	674
Horse Laterally or Sternally Recumbent on the Ground (May Be Entrapped or Entangled)	674
Horse in Anterior or Dorsal Recumbency Position (Entrapped or Entangled)	675
Horse Fallen Through Surface Ice	675
Competition Emergency (Three-Day Event, Rodeo, Racing, Show Jumping, Endurance, etc.)	675
Horse Trapped in Smoking or Burning Structure (Barn, Trailer, Arena)	675
Conclusion	676
Photo Credits and Case Details	679
References	680

35 Emergency Welfare Response 681*Rachel Gardner*

Patient Evaluation 681

Physical Exam 681

Diagnostic Testing 684

Next Steps 684

Transport Considerations 684

Refeeding 684

Recumbent Horses 685

Non-clinical Responsibilities 686

References 687

Part 5 Appendices 689**Appendix 1: Reference Values for Adult Horses, Foals and Adult Donkeys 691****Appendix 2: Equine Emergency Medications and Fluids 697****Appendix 3: Emergency Treatment Protocols 719****Index 735**

