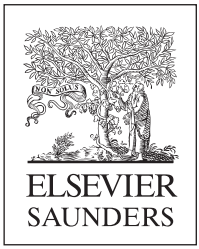
Handbook *of*
Equine Emergencies

Content Strategist: *Robert Edwards*
Content Development Specialist: *Veronika Watkins*
Project Manager: *Anne Collett*
Designer/Design Direction: *Christian Bilbow*
Illustration Manager: *Jennifer Rose*
Illustrator: *Antbits Ltd*

Handbook *of*
Equine Emergencies

Debra Archer, BVMS PhD CertES DipECVS MRCVS FHEA

Philip Leverhulme Equine Hospital,
School of Veterinary Science,
University of Liverpool, UK



Edinburgh London New York Oxford Philadelphia St Louis Sydney Toronto 2013

ELSEVIER
SAUNDERS

ISBN 978-0-7020-4545-5

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

Library of Congress Cataloging in Publication Data
A catalog record for this book is available from the Library of Congress

Notices
Knowledge and best practice in this field are constantly changing. As new research and experience broaden our understanding, changes in research methods, professional practices, or medical treatment may become necessary.

Practitioners and researchers must always rely on their own experience and knowledge in evaluating and using any information, methods, compounds, or experiments described herein. In using such information or methods they should be mindful of their own safety and the safety of others, including parties for whom they have a professional responsibility.

With respect to any drug or pharmaceutical products identified, readers are advised to check the most current information provided (i) on procedures featured or (ii) by the manufacturer of each product to be administered, to verify the recommended dose or formula, the method and duration of administration, and contraindications. It is the responsibility of practitioners, relying on their own experience and knowledge of their patients, to make diagnoses, to determine dosages and the best treatment for each individual patient, and to take all appropriate safety precautions.

To the fullest extent of the law, neither the Publisher nor the authors, contributors, or editors, assume any liability for any injury and/or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, products, instructions, or ideas contained in the material herein.

Printed in China

Preface

Any emergency situation can be potentially stressful at the best of times and those that occur in equines bring their own unique challenges for the veterinary surgeon. Dealing with the horse, pony, donkey or mule is only part of it; good communication with the client, being aware of legal and safety issues and interacting in a professional manner with other emergency services or members of the public are all key in handling an emergency situation well. It has been a challenge to cover a broad range of equine emergency situations that may be encountered and yet keep this book concise and to a size that can be carried around easily. Varying levels of veterinary expertise and differing opinions, regional variation in diseases and emergency situations that may be encountered, differences in facilities and equipment available and owner economics will play a key part in the approach used and no single approach will necessarily be best. There is also a lack of evidence-based studies regarding the best approach or therapy to use in many situations. I hope that I have managed to provide a practical and concise approach to a variety of emergency situations that will be of use to a wide range of veterinary surgeons. This approach is based on standard or best current practice and relevant evidence-based approaches or outcomes where available. This handbook does not aim to cover a range of diagnostic techniques or referral-level care as this information can be accessed in a number of excellent, more specialist texts and to which readers are referred to. Where relevant, links to useful websites are also provided. It is hoped that the supplementary web-based information will complement the text in this book and provide a quick and easy-to-use summary together with video and audio files. Being prepared for all eventualities can make life much easier and less stressful when that call comes in, and knowing a few handy tips and particular things to avoid or look out for has certainly helped me over the years. I hope that this book will assist in providing this information and will ultimately help to provide the best care for our equine patients.

DA
2013

Acknowledgements

I am extremely grateful to the many knowledgeable, dedicated and kind veterinary colleagues that I have met or worked with and to the many equine patients and their owners who have taught me so much. As a new veterinary graduate working in practice, dealing with an emergency such as an injured horse late at night was much easier to deal with in a supportive environment (thank you to Brian, Martin, Tally, Nina, Alasdair, Alex and team at Scott Veterinary Clinic). I would also like to thank all my colleagues at the Philip Leverhulme Equine Hospital for their help and support. I am very grateful to a number of people who been kind enough to provide feedback on certain areas of the material in this book, including Rachael Conwell, Fernando Malalana, Harry Carslake, Richard Hepburn, David Bardell, Edd Knowles, the Resident team at the hospital, Josh Slater, Derek Knottenbelt, Alex Dugdale, Jonathan Pycock, Nicky Jarvis, Alex Thiemann, Alasdair Foote, David Green, Paul Farrington, Karen Coombe, Peter Green, Nicola Harries, Sarah Gasper, Peter Milner, Peter Clegg, Neil Townsend and Jim Green. Thanks also to Robert Edwards, Veronika Watkins and Anne Collett at Saunders Elsevier for their enthusiasm for this project and for being so patient. And finally, a special thank you to my parents and brother, and to Bruce and Callum.

Dedication

To Professor Barrie Edwards ('Prof')

Abbreviations and symbols

↑	increased
↓	decreased
±	with or without
~	approximately
α2	alpha 2
AAEP	American Association of Equine Practitioners
AHS	African horse sickness
ADR	adverse drug reaction
ALDDFT	accessory ligament of the deep digital flexor tendon
ALP	alkaline phosphatase
AP	auriculopalpebral
ARF	acute renal failure
asap	as soon as possible
ASNB	abaxial sesamoid nerve block
AST	aspartate aminotransferase
AVD	assisted vaginal delivery
BCS	body condition score
BEVA	British Equine Veterinary Association
BGA	blood gas analysis
BMI	body mass index
BS	broad spectrum
BW	body weight
C	cervical vertebra
C&S	culture and sensitivity
Ca^{2+}	calcium
CDET	common digital extensor tendon

CHO	carbohydrate
CK	creatine kinase
Cl^-	chloride
CN	cranial nerve
CNS	central nervous system
CrCd	cranio-caudal
CRT	capillary refill time
CSF	cerebrospinal fluid
CT	computed tomography
CV	cardiovascular
CVD	controlled vaginal delivery
CVM	cervical vertebral malformation
d	day(s)
DDFT	deep digital flexor tendon
DDSP	dorsal displacement of the soft palate
DDx	differential diagnosis
DE	digestible energy
DFTS	digital flexor tendon sheath
DIC	disseminated intravascular coagulation
DIPJ	distal interphalangeal joint
dL	decilitre(s)
DMI	dry matter intake
DP	dorsopalmar/dorsoplantar
DV	dorsoventral
EDTA	ethylenediaminetetraacetic acid
EEE	Eastern equine encephalitis
EGS	equine grass sickness
EHV	equine herpes virus
EI	equine influenza
EIA	equine infectious anaemia
EIPH	exercise-induced pulmonary haemorrhage
EMS	equine metabolic syndrome
EPM	equine protozoal myeloencephalitis
ERS	exertional rhabdomyolysis syndrome

ERU	equine recurrent uveitis
EVA	equine viral arteritis
FEI	Fédération Equestre Internationale
FNA	fine needle aspirate
g	gram(s)
G	gauge
G –ve	Gram negative
G +ve	Gram positive
GA	general anaesthesia
GFR	glomerular filtration rate
GGT	gamma glutamyltransferase
GIT	gastrointestinal tract
GLDH	glutamate dehydrogenase
GP	guttural pouch
GPM	guttural pouch mycosis
h	hour(s)
Hb	haemoglobin
HIE	hypoxic ischaemic encephalopathy
HQ	hindquarters
HR	heart rate
HYPP	hyperkalaemic periodic paralysis
ICS	intercostal space
IM	intramuscular
IOP	intraocular pressure
IV	intravenous
kg	kilogram(s)
L	litre(s)
LA	local anaesthetic
LCT	large colon torsion
LDH	lactate dehydrogenase
LF	left forelimb
LH	left hindlimb
LM	lateromedial
LMN	lower motor neurone

LN	lymph node(s)
LRS	lactated Ringer's solution
LSN	last seen normal
MC/MT3	third metacarpal/metatarsal bone
MCPJ	metacarpophalangeal joint
MCV	mean corpuscular volume
Mg^{2+}	magnesium
$MgSO_4$	magnesium sulphate
min	minute(s)
mL	millilitre(s)
MM	mucous membranes
MRI	magnetic resonance imaging
MTPJ	metatarsophalangeal joint
Na^+	sodium
NB	navicular bursa
NI	neonatal isoerythrolysis
NMS	neonatal maladjustment syndrome
NSAID	non-steroidal anti-inflammatory drug
O_2	oxygen
OBL	oblique
OP	organophosphate
P3	third (distal) phalanx
PCR	polymerase chain reaction
PCV	packed cell volume
PHF	Potomac horse fever
P1	first phalanx
PIPJ	proximal interphalangeal joint
PLR	pupillary light reflex
PM	post-mortem
PMI	point of maximal intensity
PO	per os
PPID	pituitary pars intermedia dysfunction

psi	pounds per square inch
PSSM	polysaccharide storage myopathy
PU/PD	polyuria/polydipsia
q.	every
RAO	recurrent airway obstruction
RBC	red blood cells
RFM	retained foetal membranes
RHS	right-hand side
RR	respiratory rate
SAA	serum amyloid A
SC	subcutaneous
SDFT	superficial digital flexor tendon
SI	small intestine
SIRS	systemic inflammatory response syndrome
SL	suspensory ligament
SPAOPD	summer-pasture-associated obstructive pulmonary disease
SPL	subpalpebral lavage system
T°	temperature
TBSA	total body surface area
TG	triglycerides
THO	temporohyoid osteoarthropathy
TP	total protein
TPR	temperature, pulse and respiration
UMN	upper motor neurone
URT	upper respiratory tract
US	ultrasonography
VD	ventrodorsal
VEE	Venezuelan equine encephalitis
WBC	white blood cells
WEC	worm egg count
WEE	Western equine encephalitis
WNV	West Nile virus

CHAPTER 1

The basics

General approach to dealing with equine emergencies

Equine emergencies can present a diverse range of challenges. Being prepared to deal with all eventualities (having a plan A, B and sometimes C!) will not only optimise the care that can be given to the patient but also will minimise some of the stress associated with these situations. The key aims are to:

- Provide life-saving interventions and ensure human safety is not compromised.
- Obtain a full history and perform a full clinical examination.
- Perform appropriate and relevant further diagnostic investigations.
- Inform the owner/carer of treatment options, enabling them to make informed decisions.
- Identify cases where more specialist investigations and/or treatment may be required and initiate discussions with the client at an early stage.
- Administer appropriate analgesic, antimicrobial or other medications based upon available clinical evidence – responsible use of antimicrobials is essential (e.g. see British Equine Veterinary Association 'Protect ME' guidelines www.beva.org.uk)
- Provide physical protection or support (e.g. bandaging ± splinting) where required.
- Interact in a professional manner with other emergency services and veterinary surgeons.
- Specify when or in what circumstances re-evaluation should be performed.
- Provide advice on prevention where appropriate.

Useful information and paperwork to have

- If new to a practice or performing locum work, having some basic information and paperwork to hand can save a lot of stress and hassle.
- If new to working in a particular region or country it is important to be aware of equine diseases that are particularly common to that region (including common causes of toxicosis, e.g. poisonous plants or evenomation such as snake bites) and to be aware of any current/recent disease outbreaks.
- Useful information and documents to have on hand when dealing with emergencies include:
  - contact telephone numbers of practice partners/assistants
  - practice consent forms (including euthanasia, general anaesthesia and sedation)
  - headed practice paper
  - contact telephone numbers for local/regional referral centres and maps/directions (to give to clients)
  - names and contact numbers of local horse transporters and equine ambulance services
  - names and contact numbers of horse disposal agents/horse cremation companies
  - contact details for relevant local/national governmental animal health authorities, e.g. DEFRA.

Equipment

- A list of standard and supplementary equipment is given in Table 1.1 – this list is not exhaustive but will provide a guide as to what might be needed when dealing with equine emergencies.
- In some situations it may be easier to have specific kits that can be taken to an emergency (e.g. dystocia).

Eye kit – suggested contents

- Ophthalmoscope (if not in standard kit).
- Pen torch.
- Fluorescein stain.
- +/– Rose Bengal stain.
- Mydriatics – tropicamide, atropine.
- Ocular local anaesthetic solutions (e.g. proxymetacaine).
- Local anaesthetic for regional nerve blocks.
- Topical ophthalmic antimicrobial medications (e.g. gentamicin, chloramphenicol).
- Topical ophthalmic steroid medications.
- Small bag of sterile saline.
- Suture material – sizes 2, 3 and 3.5 metric absorbable (3-0, 2-0 and 0 USB), 3.5 metric (0 USB) non-absorbable.
- +/– Subpalpebral lavage kit.

Table 1.1 List of standard and optional equipment that may be required when dealing with equine emergencies

Equipment	Standard	Supplementary
General equipment	Stethoscope Thermometer Direct ophthalmoscope Bowls Clippers Disposable latex gloves (sterile and non-sterile) Rectal gloves Duct tape Chlorhexidine and povidone iodine scrub Surgical spirit Torch/head torch (ideally one that sits at eye level) Penknife Twitch Funnel jug and stirrup pump Hoof knives and hoof testers Shoe removal kit and apron/chaps Stomach tubes (small (foal), medium and large) Lubricant (KY jelly/obstetric lubricant) Haussman gag, dental syringe and mirror Clinical and sharps waste and normal waste bags Paper roll Nylon headcollar and strong lead rope	Refractometer Bucket Small oxygen cylinder, tubing and demand valve Portable lactate measuring device Tracheostomy tube Sterile small and large plastic drapes Plastic bags and labels Urinary catheter
Equipment for administering medications	Syringes (1 mL, 2.5 mL, 5 mL, 10 mL, 20 mL, 35 mL, 50 mL, catheter tipped 60 mL) Needles (14–25G, various lengths) IV catheters (12 and 14G, 8-cm length), extension set, bungs	
Medications (see Table 1.2)	Antimicrobials – IV/IM and oral preparations and in sterile vials (joint medication) Analgesics (NSAIDs/opioids) – IV/oral preparations Sedatives – α2 agonists, butorphanol, acepromazine Tetanus toxoid and antitoxin Topical medications/ wound preparations Oral electrolyte solutions/MgSO4 Steroids (injectable/oral preparations) Antispasmodic medication (butylscopolamine) Oxytocin Clenbuterol and atropine (IV preparations) Sterile fluids (1 L and 5 L bags LRS) and giving sets (small and large animal IV sets) Euthanasia solutions (see p. 389)	

(Continued)

Table 1.1 List of standard and optional equipment that may be required when dealing with equine emergencies (Continued)

Equipment	Standard	Supplementary
Suturing equipment	Scalpel blades (Nos. 10, 11, 15, 22) Scalpel handles (No. 3 and 4) Sterile basic suture pack Sterile cotton swabs Skin stapler / staple remover Suture materials (non-absorbable and absorbable)	
Dressings, bandaging and splints	Cotton wool rolls and poultice material Bandaging material, primary dressings, soft conforming and knitted bandages, cohesive bandages and elastoplast Materials for splinting limbs (p. 383) Foot support – laminitis cases	Nappies (foot dressings)
Laboratory tests/further investigations	Blood tubes – plain/EDTA/lithium heparin/ sodium citrate Formalin in small jars (biopsy specimens) Swabs	Blood culture medium
Biosecurity	Alcohol hand gel Normal moist handwipes Disinfectant Disposable overalls, boot covers Inexpensive stethoscope that can be disposed of	
Clothing/ protective wear	Waterproof coat/trousers Sturdy shoes/boots	Hard hat Reflective tabard/ arm band (vet/ veterinarian)
Extras	Mobile telephone and charging device Veterinary formulary Maps Digital camera	

Emergency field anaesthesia kit (store appropriately when not in use)

- Ketamine/diazepam/α2 agonists.
- Selection of appropriate needles and syringes.
- IV catheters, extension set, bung and suture material.
- Adrenaline 1 mg/mL.
- +/– Endotracheal tubes (pony 20 mm, horses 25 mm, 30 mm).

Foaling/foal resuscitation kit

May be more important where dealing with large numbers of brood mares during foaling season.

- Sterile lubricant, calving ropes, stomach tube and stirrup pump.
- Small oxygen cylinder and demand valve.
- Endotracheal tubes – 8 and 10/12 mm, 55-cm long.
- 5 mL and 2 mL syringes, 20 G, 25mm (1") and 14 G, 25–40 mm (1–1.5") needles.
- Clean towels.
- Large syringe and suction tubing/bulb syringe.
- Self-inflating resuscitation bag (ambubag).
- Adrenaline 1 mg/mL.
- Pen torch.
- 1 L bags LRS × 4.
- Fluid giving set.
- 14G IV catheters and suture material.
- 6F dog urinary catheter.
- ± Foetotomy kit.
- ± Spinal needles (epidural anaesthesia) 19G, 90 mm (3.5").

Horse handling and restraint

- Your own personal safety and that of other people around you is critical – emergency situations can sometimes allow little time to consider these factors.
- Ensure that you have suitable protective footwear.
- When dealing with an unpredictable horse (fractious/trapped/neurological abnormality), wearing protective headgear (e.g. hard hat) may be sensible.
- Check that people holding horse/assisting you are competent and are not placed in unnecessary danger.
- Be aware of danger zones – kicks, bites, injuries caused by being hit by horse's head, collapse.
- Even when horses appear heavily sedated they can be unpredictable and can still kick and bite accurately – ensure handlers are aware of this.

Communication with clients and legal records

- Emergency situations can sometimes provide little time to communicate findings and discuss treatment options with the owner/carer and sometimes they may not be present when you arrive – it is important to be aware of the legal issues and national equine veterinary body recommendations regarding treatment of horses (including euthanasia) in these situations (see p. 328).
- The priority after human safety is to ensure the welfare of the horse and if in doubt, seek an opinion from a veterinary colleague.
- Communication skills will sometimes be put to the test as emergency situations may provoke a variety of emotions in owners, carers, riders and bystanders, ranging from anger, guilt and remorse to grief – remaining calm and professional at all times helps (even if it is sometimes difficult).

- Accurate notes should be made at the earliest possible opportunity – as with all medico-legal documents, where written this should be in a legible fashion using black pen (other colours do not photocopy clearly). These details should include:
  - Date, time and name of client (and if they are the horse's owner)
  - horse name and signalment
  - presenting complaint as described by the client
  - relevant medical history
  - results of clinical examination and any tests performed – a clinical examination checklist is ideal to ensure that normal and abnormal findings are noted
  - problem list
  - preliminary diagnosis and any differential diagnoses
  - definitive diagnosis and when this was made
  - treatment administered
  - summary of advice provided to the client, including when repeat veterinary examination is recommended
  - record details if a second opinion or referral was sought/offered
  - signed consent forms (where relevant).

Biosecurity

- Infectious and potentially zoonotic conditions (see p. 278) will be encountered in some emergency situations.
- Be aware of diseases that are notifiable and their clinical presentations (see Ch. 15).
- Veterinary surgeons have the potential to pass infection between premises via infection on their hands/clothing (including footwear)/vehicle (including via tyres) or equipment.
- Personal hygiene includes:
  - hand washing/use of alcohol-based hand gels
  - wearing of gloves if appropriate
  - prompt change of contaminated clothing and cleaning/disinfection of footwear
  - wearing of protective clothing (e.g. disposable coveralls/gowns and shoe covers) where appropriate.
- Cleaning and disinfection of equipment between patients is vital, including:
  - rectal thermometers
  - nasogastric tubes
  - endoscopes / dental equipment.
- See p. 387 for details of how to isolate a potentially infectious horse on the premises.

Dealing with other emergency services/rescue authorities

- You will be expected to be able to sedate, anaesthetise or euthanase horses, so necessary equipment should be taken with you when dealing with these incidents.
- You should also be suitably attired (protective foot and headwear, although some services will provide the latter) and should be identifiable as a vet (e.g. armband, reflective tabard).
- On arrival at the scene of an emergency, find out who is in charge and identify yourself to them.
- Discuss the plan, including safety issues.
- Remember that human life is always a priority over that of an animal.

Referral of horses

- Identify cases that may require more intensive care, detailed investigations or surgical intervention and initiate an honest discussion with the owner/carer at an early stage.
- If referral is declined, the client should be aware of the potential outcomes.
- Contact the referral centre and provide a succinct, clear clinical summary, including presenting signs and treatment administered – these centres are usually very willing to provide advice if you are unsure about referral or treatment options.
- Discuss the likely prognosis and range of costs based on the information provided and whether the referral clinic is able to admit the horse for further treatment.
- Ask the referral centre whether any specific treatment/procedures (e.g. bandaging and splinting, passage of nasogastric tube) are requested prior to transport.
- Ask what the referral centre's payment policy is (e.g. whether a deposit is required on admission).
- Inform the client of these discussions – it does not reflect well on the referral hospital or referring veterinary surgeon if the owner arrives at the hospital unprepared for the likely cost of treatment or a hopeless/very poor prognosis.
- In insured cases, the policy holder should check that the policy is valid, what conditions and costs are covered, any exclusions in place and the insurance company should be contacted at the earliest possible opportunity.
- If transport is not available, transport arrangements should be initiated at an early stage – valuable time can be wasted organising transport in a horse that is sick/deteriorating.
- In the case of a sick neonatal foal, it may be more appropriate to send the foal ahead of the mare in a suitable vehicle (see p.230 for referral of sick foals).
- Contact the referral centre to confirm whether the horse is being sent to the clinic (or not), let them know an estimated time of arrival and provide them with appropriate contact details for the client/transporter.
- Send a written summary of findings of clinical examination (including results of further diagnostic tests), medications given and the time these were administered if possible/ send these details with the client/transporter or by fax/email to the clinic as soon as they are available.
- Provide the client/transporter with accurate directions and contact details for the clinic.
- If there are any significant delays or problems during transport, ensure that the referral centre is contacted.

Next time….

- Emergency situations can sometimes provide little time to think about what to do and treatment may have to be undertaken quickly.
- When things do not go to plan, it is worth thinking about what went wrong and what you would do differently next time (including any extra equipment/medications that you would use) – speaking to other colleagues about their experience often yields many useful tips and advice.
- Remember to also focus on the good – make a note of what worked well and remember it for next time (forgetting this can be frustrating!).

Normal values and drug dosages (see formulary on http://www.equineemergencieshandbook.com/)

Knottenbelt D C 2006 Equine Formulary 4th edn, Saunders Elsevier.

Corley K, Stephen J 2008 The Equine Hospital Manual, Blackwell Publishing.

Table 1.2 Medications that may be commonly administered in emergency situations in adult horses (see formulary on http://www.equineemergencieshandbook.com/)

Drug name	Dosage and route	Use/comments
Acepromazine	0.02–0.06 mg/kg IV 0.03–0.1 mg/kg IM	Sedative, vasodilator, anxiolytic Rarely may case priapism/paraphimosis in male horses
Adrenaline (epinephrine)	0.01–0.02 mg/kg IV (lowdose)	Asystole, anaphylaxis can be repeated q. 3–5 min
Amikacin	10 mg/kg IV or IM q. 24 h (adults)	Antimicrobial G –ve action – combine with penicillin for BS cover
Atropine	0.005–0.02 mg/kg IV	Bronchodilation – severe exacerbation of RAO/SPAOPD causing respiratory distress. Beware gut stasis/excitement.
Buprenorphine	0.004–0.01 mg/kg IV	Analgesia of 4–8 h duration
Butorphanol	0.01–0.04 mg/kg IV 0.04–0.2 mg/kg IM	Analgesic and sedative – often combined with α2 agonist
Butylscopolamine (hyoscine)/ metamizole (Buscopan Compositum®)	5 mL/100 kg BW	Antispasmodic/analgesic – treatment of colic Transient ↑ HR following administration (parasympatholytic activity of butylscopolamine)
Butylscopolamine (hyoscine)	0.3 mg/kg IV	Antispasmodic – colic, assist rectal examination
Carprofen	0.7 mg/kg IV q. 24 h 0.7 mg/kg IM q. 24 h* 0.7 mg/kg PO q. 24 h	NSAID analgesic
Cefquinome**	1–2 mg/kg IV or IM q. 12–24 h	4th generation cephalosporin antimicrobial – BS activity
Ceftiofur**	2.2 mg/kg IV or IM q. 12–24 h* (adults)	3rd generation cephalosporin antimicrobial – BS activity
Clenbuterol	0.8 µg/kg IV q. 12 h 200 µg (total) IV slow or IM (uterine relaxation)	Bronchodilator, tocholytic (uterine relaxation)