

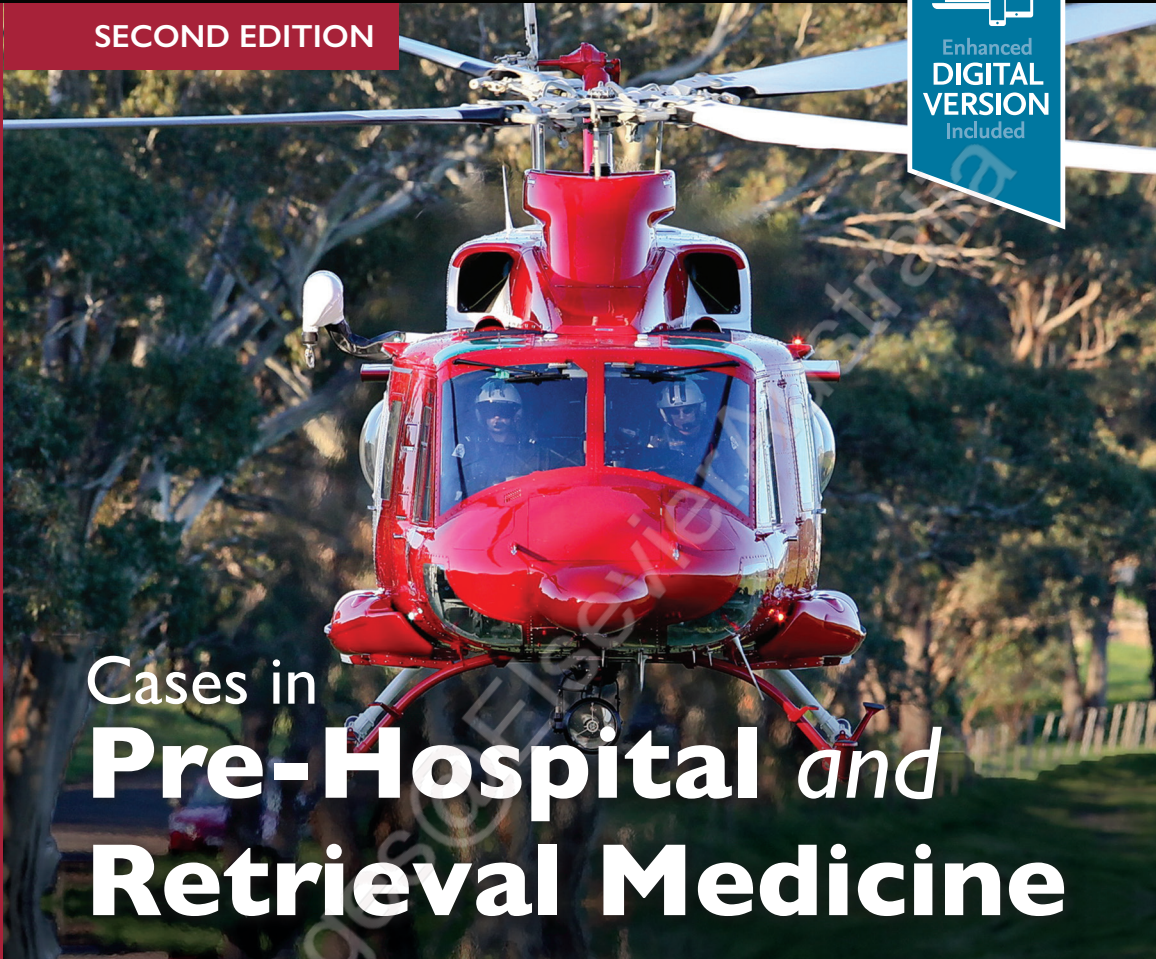


SECOND EDITION

Enhanced
DIGITAL
VERSION
Included

Daniel Ellis
Matthew Hooper
Neel Bhanderi
Fran Lockie

Cases in
**Pre-Hospital and
Retrieval Medicine**



Cases in **Pre-Hospital and Retrieval Medicine**



SECOND
EDITION



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Daniel Ellis
Matthew Hooper
Neel Bhanderi
Fran Lockie

CASES IN
**Pre-Hospital and
Retrieval Medicine**
2nd Edition

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Our families, our mentors and teachers, and for those patients who have benefited
and will continue to benefit from the ongoing development of Pre-Hospital and
Retrieval Medicine*

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CASES IN
**Pre-Hospital and
Retrieval Medicine**
2nd Edition

Daniel Ellis
Matthew Hooper
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Fran Lockie



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Forewords to the 1st Edition

Pre-hospital care of the injured and ill is a complex and challenging field of medical endeavour. The breadth of clinical presentations encompasses all fields of trauma and acute internal medicine. Ideally, patients should receive the most advanced care possible at the earliest time, integrated with expedient transport to the most appropriate definitive care facility. The ability to deliver this is resource- and system-dependent with unique modifiers including aircraft and road transport logistics, environmental impacts and integration with other responding emergency services.

In this selection of clinical scenarios, Dan Ellis and Matthew Hooper have provided an extensive insight into the challenges that the pre-hospital and retrieval team faces in urban, regional and rural settings. They have drawn on their experience in civilian and military emergency medical services in UK, Australia and internationally, as well as their passion for teaching a generation of clinicians. Each case takes the reader through the mission with exposure to a wealth of clinical, logistic and problem-solving insights. Indeed, the great strength of this text is its artful blending of evidence-based clinical assessment and management with the operational skills and common sense essential for safe and effective participation in these most difficult environments. The question and discussion format lends itself to integration with a clinician training programme, with current literature references included for further study.

This text integrates knowledge of emergency medicine and critical care with a comprehensive exposure to pre-hospital and retrieval protocols and procedures derived from the authors' many years of participation in fixed and rotary wing missions. As such, it is a unique and invaluable reference for all pre-hospital and retrieval clinicians and supporting personnel.

Allan MacKillop, FANZCA FFPMANZCA
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Experience gained at London HEMS and in aeromedical operations in Australia has given the authors unique exposure and experience in the delivery of pre-hospital and retrieval medicine. Their passion and commitment to this complex arena is obvious to those who have worked with them and distilled in this text for those who have not.

Much is written about the theory of pre-hospital medicine but little is based in real-life scenarios, such as those the authors have faced. This book gives the reader a genuine view of the dilemmas and solutions of every day pre-hospital and retrieval care for both the patient and the clinical team.

The style of the text reflects the authors' depth of clinical understanding, their enthusiasm for human factors and the need for a team approach. The commentaries and discussions draw on their real-life experiences and are underwritten by well-chosen references.

The best performing units in the world deliver clinical excellence, not because they provide unique treatments or have access to highly technical equipment but because they deliver the most basic of care in a quality-assured manner with exquisite attention to detail. Such care is exactly what this book expounds.

It is with great pleasure that I commend this book to the pre-hospital and retrieval enthusiast from any background.

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Preface

The first edition of *Cases in Pre-Hospital and Retrieval Medicine* was conceived in 2005 and published in 2010. During the last decade, Pre-Hospital and Retrieval medicine (PHRM) has grown into a distinct sub-specialty with wide recognition in several countries across the globe. It is well known that early intervention is key in managing critically ill and injured patients and it has become increasingly apparent that this intervention can and should be commenced before the patient gets to a major hospital. Clinicians working in this challenging environment have therefore further evolved to have specific, early resuscitation, stabilisation and critical care skills. *Cases in Pre-Hospital and Retrieval Medicine* is aimed at these clinicians.

Having worked extensively in the pre-hospital and retrieval environments of Australasia and the United Kingdom we felt that while several textbooks covered the relevant material, none had presented it in such a 'user friendly' case-based format. This particular format allows readers to become more immersed in the unpredictable and challenging pre-hospital and retrieval environments. In addition, we believed it would encourage the sort of lateral thinking required to provide safe, effective and high-level clinical care in such situations.

This book is not a replacement for any of the existing pre-hospital and retrieval texts; rather it is a complement to them. It provides an opportunity to consolidate the many disparate themes of this growing specialty and tie them together in a realistic, recognisable format that has a beginning, middle and end. The discussion presented for each case is not intended to provide a definitive review. Instead, reflection on personal experience and discussion with colleagues is recommended as there may be regional variation in several areas. When used in this way, we hope to have provided a valuable tool for teaching and learning that will appeal to a wide audience.

Both pre-hospital and retrieval medicine are sufficiently distinct from other critical care medical specialties to warrant consideration for independent specialty recognition. Whilst we believe that both fields of practice have enough in common to allow a single area of specialty to develop over time, we have maintained an arbitrary divide between the sections of the book to reflect that some clinicians are involved only in pre-hospital care and others only in medical retrieval. A third section for special circumstances and service development is aimed at highlighting the importance of crew resource management and the developing area of clinical coordination as well as covering medical tasks that remain on the fringe of pre-hospital and retrieval medicine, but which we believe are integral to the specialty. This second edition now includes a fourth section to cover Paediatric and Neonatal Retrieval. Worldwide, this area is rapidly expanding as paediatric and neonatal services become more centralised. At the time of writing this edition, there are not many PHRM textbooks that specifically concentrate on Paediatric and Neonatal Retrieval medicine in case-based format. Paediatric and Neonatal critical care medicine can be of low volume but is a highly specialized area of retrieval medicine. These patients present with wide range of complex pathologies and can take an increased amount of time to resuscitate and stabilise prior to moving from the referring site. The cases in this section therefore highlight this

PREFACE

and aim to give the reader some pragmatic key learning points to use in the real-world environment. . This is not a textbook for the latest management of emergency medical pathophysiology in itself, nor will it turn the reader into a trauma, intensive care, major incident or extrication specialist. Rather, we have used real emergency medical issues to highlight the role of the pre-hospital and retrieval specialist. This specialist must operate in a complex environment where approaching the scene, liaising with other emergency personnel and maintaining dynamic situational awareness can be at least as important as providing timely and high-level medical interventions.

All of the questions in *Cases in Pre-Hospital and Retrieval Medicine* are drawn from our collective experience over many years as pre-hospital and retrieval doctors and, thus, are based on real cases. We have also utilised the experience of acknowledged colleagues who have provided both images and commentary. On occasion, we have varied the images and the cases to augment key learning points and ensure patient confidentiality. However, we have attempted to always ensure that the reality of each case is reflected in the questions and discussions.

This text has become both a highly regarded tool for education and a ready reference guide for clinicians, especially doctors, working in the out-of-hospital environment. By offering generic but relevant ‘real case’ discussion, we hope that the book will remain a useful resource for many years to all our colleagues engaged in this exciting and continually evolving specialty. We also envisage that this text will continue to support emerging specialists training for examinations in PHRM as well as our paramedic and nursing colleagues.

Daniel Ellis
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Adelaide, South Australia
January 2022

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Dan graduated from the medical schools of Guy's and St Thomas' Hospitals (University of London) and directed his initial training towards a career in emergency and critical care medicine. He gained early experience in pre-hospital medicine while working in the ambulance service in Jerusalem and then as a military doctor in Israel. After returning to the United Kingdom, he continued basic and advanced level training in emergency medicine, intensive care medicine and Pre-Hospital and Retrieval Medicine (PHRM).

Dan has worked extensively in PHRM for over 25 years including stints with the London Helicopter Emergency Medical Service (HEMS), the Children's Acute Transport Service (CATS) in London, Essex and Herts Air Ambulance (Medical Lead), Careflight Queensland (Regional Director of Operations and Training) and MedSTAR Emergency Medical Retrieval Service in South Australia, including over 5 years as the MedSTAR Clinical Director. Whilst in London he was an active member of the British Association for Immediate Care (BASICS) in London and was involved in two major incidents, including the terrorist attacks in London on 7 July 2005. He has worked as a Consultant in Emergency, Intensive Care and Pre-hospital and Retrieval Medicine both in the UK and Australia. In 2013, Dan was part of the Australian Medical Assistance Team (AUSMAT) deployed to the Philippines for Typhoon Haiyan. He holds an academic title with the James Cook University teaching the postgraduate educational modules for aeromedical retrieval.

Dan is an examiner for the Diplomas in Immediate Medical Care (DipIMC) and Retrieval and Transfer Medicine (DRTM) at the Royal College of Surgeons of Edinburgh as well as a member of the Court of Examiners for the Diploma in Pre-Hospital and Retrieval Medicine (Conjoint Faculty of Pre-Hospital and Retrieval Medicine, hosted by the Australasian College for Emergency Medicine). He is the current Chair of the PHRM Accreditation Committee. Dan has also spoken at local, national and international conferences on major incidents, pre-hospital and retrieval medicine and critical care and has published widely including chapters in several PHRM textbooks.

Dan is married with two children and currently lives in Adelaide, South Australia.

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Matt graduated from the University of Adelaide School of Medicine and subsequently commenced specialist emergency medicine training in South Australia, Western Australia and Queensland. He developed a keen interest in pre-hospital and retrieval medicine during this time, gaining further experience in the United Kingdom initially as a paediatric intensive care retrieval fellow with London's Child Acute Transport Service (CATS) and then as a specialist registrar in pre-hospital trauma care with the London Helicopter Emergency Medical Service (HEMS). In 2002, he was awarded the gold medal by examination for the Diploma in Immediate Medical Care from the Royal College of Surgeons of Edinburgh before returning to Australia to complete Fellowships with both the Australasian College for Emergency Medicine and the Joint Faculty of Intensive Care Medicine.

Prior to returning to Adelaide in 2007, Matt was involved in the redevelopment of retrieval services in Queensland as the Regional Director of Operations and Training for CareFlight Medical Services. He holds an academic title with the James Cook University and has been involved in the development of the postgraduate educational program for aeromedical retrievals.

From late 2007, he led the development and implementation of South Australia's single, integrated emergency medical retrieval service - MedSTAR. He has also held the positions of Medical Donor Advisor for North Queensland, Chief Medical Officer for the South Australian Ambulance Service and Director of Cardiothoracic Intensive Care at the Royal Adelaide Hospital and has worked as an Intensive Care Consultant in Townsville Hospital, Flinders Medical Centre and Calvary Adelaide.

Matt is an examiner for the Diplomas of Retrieval and Transfer Medicine at the Royal College of Surgeons of Edinburgh as well as a member of the Court of Examiners for the Diploma in Pre-Hospital and Retrieval Medicine (Conjoint Faculty of Pre-Hospital and Retrieval Medicine, hosted by the Australasian College for Emergency Medicine). He is also a Squadron Leader with the Royal Australian Airforce Specialist Reserves.

Following a career long interest, he is completing a Masters in Palliative Medicine at Cardiff University.

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In 2016, Neel decided to emigrate to Australia where he gained the Fellowship from the Australian College of Emergency Medicine and worked as an Emergency Specialist at the Townsville Hospital in North Queensland. In 2017 he landed his ideal job plan as a Consultant Emergency Physician at the Royal Adelaide Hospital and a Consultant Pre-Hospital and Retrieval Specialist with MedSTAR Emergency Medical Retrieval Service. His interest in teaching led him to become the Head of Unit for Education and Training at MedSTAR in 2021. He is also a member of the Court of Examiners for the Diploma in Pre-Hospital and Retrieval Medicine (Conjoint Faculty of Pre-Hospital and Retrieval Medicine, hosted by the Australasian College for Emergency Medicine).

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Fran lives in Adelaide with his wife and three children.

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Section C

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Appendix 1

- Thoracotomy: London HEMS
- Thoracostomy: London HEMS

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Introduction

Approach to Cases in Pre-Hospital and Retrieval Medicine

This case-based book uses real pre-hospital and retrieval situations presented in a question format, followed by an extensive discussion. Each question and discussion consists of approximately 1000–2000 words and is usually illustrated with a photograph. The cases have been arbitrarily divided into those with a predominantly pre-hospital theme, those based around adult retrieval medicine, a section focusing on special circumstances and service development and a fourth section on paediatric and neonatal retrieval. In addition, a series of appendices provides information of use to pre-hospital and retrieval practitioners. Each case can be read as a ‘stand-alone’ scenario, although each section has a structure that builds on the key concepts discussed in earlier cases. As such, each section is ideally approached in numerical order.

Practical points

This book is primarily designed for the ‘hands-on’ pre-hospital and retrieval clinician. It is also likely to be of significant interest and use to a broad range of emergency services, aviation and other non-medical personnel. Each question is written with the assumption that a doctor forms part of a highly trained pre-hospital and retrieval medicine (PHRM) team. Although the composition of such teams varies widely internationally, the key learning points for each question are relevant to all professional medical, paramedical and nursing personnel engaged in this challenging and unpredictable area of practice.

Medical practice will also vary regionally. For this reason, this book does not always provide extensive detail regarding precise therapies, clinical guidelines and drug doses. It is not a definitive text on emergency or critical care medicine. Instead, it provides a scenario-based approach to highlight key areas of pre-hospital and retrieval medicine.

Definitions

PHRM refers to a system of specialist clinical practice inclusive of the following.

Clinical coordination

Clinical coordination involves the dedicated multidisciplinary (medical, nursing, paramedical, logistics) coordination system or processes led by appropriately qualified and credentialled specialist medical practitioners in PHRM, offering high-level clinical and logistical advice and decision making. Ideally, clinical coordination should be provided from a dedicated, centralised, operational centre with 24/7 access via a single point of communication.

Clinical coordination commences with a referral, usually from a healthcare facility, incident scene or ambulance service. Planning and intervention priorities for each case must be determined quickly and efficiently via Standard Operating Procedures (SOPs) and can include:

- immediate care or advice
- telemedicine

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- need for PHRM team
- urgency of dispatch
- destination planning
- consideration of complex decision making involving logistics, crew configuration and transport platforms
- creation of pre-flight assessment documentation and updates on clinical/logistical considerations during transport.

Operational response

Operational response refers to the dedicated multidisciplinary teams with flexibility to respond to the healthcare facility or incident scene and provide a level of clinical care at least equivalent to the referring facility and preferably enhanced. This team should provide ‘point to point’ care from referral centre to receiving facility overseen by the Clinical Coordination Centre. The response is further defined by the following sub-categories:

- Pre-hospital task (‘primary’) – A pre-hospital task is any clinically coordinated task that involves a patient response in the out-of-hospital environment. A patient assessment and/or intervention may occur by the roadside, in a public place or in a private dwelling. It is a location that does not normally have ‘medical’ personnel on-site to assess and manage the patient. The out-of-hospital environment typically has few, if any, health resources available, such as oxygen, suction and other conventional treatment therapies, although these will arrive with the ambulance/PHRM service.
- Modified primary – Occurs when, due to time and/or distance, a pre-hospital patient (as defined above) has left the scene of the incident and by the time the PHRM team arrives that patient is in a healthcare environment with minimal health infrastructure (e.g. rural clinic, GP practice, back of an ambulance) and with limited clinician input (e.g. nurse/paramedic only, single-handed GP).
- Retrieval task – A retrieval task is a clinically coordinated interhospital transfer of critically ill or injured patients using specialised PHRM staff, transport platforms and equipment. The scope of these tasks encompasses transfers from (and between) all healthcare facilities with an inpatient capability. Note: non-critical, low-acuity interhospital transfers (by road or air ambulance) are not encompassed within the definition of a PHRM response.

Training and education

PHRM teams must possess a broad understanding of critical care medicine. In addition, PHRM teams require specialist skills and training in pre-hospital and retrieval medicine. This includes but is not limited to how critical care medicine is applied in the PHRM environment, interactions with other emergency services personnel, teamwork and human factors, aviation medicine and specific clinical governance structures. However, training and education in PHRM must also encompass the low-frequency, high-acuity, high-consequence challenges inherent in the PHRM environment.

Clinical governance

In addition to specialist medical practitioner-led clinical oversight, PHRM services must also utilise a dedicated multifaceted clinical governance framework. This should encompass multidisciplinary audit, morbidity and mortality reviews, risk management, training and education, competency and credentialling and research. These facets must

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be specifically designed for the pre-hospital and retrieval environment and ideally delivered by specialists in PHRM. Clinical governance also extends to operational performance; i.e. response times, online service availability, etc.

For the purposes of this book, the PHRM team will always have a dedicated person tasking them and acting as the communications hub throughout the mission. For ease of reference, this person is referred to as the coordinator/clinical coordinator and the organisation in which they work will be the tasking agency/coordination centre.

Sample question format

Most cases in this book follow a consistent format.

Incident

This section presents a brief synopsis of the task for which the PHRM team has been activated. This may range from the pre-hospital mechanism of injury through to the presenting patient illness, physiological parameters and location. The information available during the early stages of pre-hospital and retrieval tasking is often sparse. To provide the reader with a sense of realism, this is reflected in the information made available in the synopsis. In some cases, further information or images may be made available as the reader progresses through the question. This aims to improve the fidelity of the question.

Relevant information

This section is usually divided into four sub-headings:

1. PHRM team transport options: a description of the transport resources available on the day. Options may include aircraft (rotary-wing and fixed-wing), land ambulances or a combination of these resources. As airframes may differ across jurisdictions, specifications will only be provided when relevant to the question.
2. Additional resources: in most pre-hospital and retrieval environments, other resources will be available. In the pre-hospital environment, this will include a mixture of Fire & Rescue, Police and Ambulance Service teams. In the retrieval environment it will usually refer to resources available at the local medical facility.
3. Retrieval options/destination: regional resources and geography play a major role in the clinical and logistical decision making required of the coordinator and PHRM team. If indicated, details of nearby hospitals and their facilities will be provided to allow the reader to decide which facility is most appropriate. This may involve bypassing the nearest hospital for one better able to manage the patient's acute or ongoing care. In cases where the receiving hospital is predetermined, information regarding flight times and aircraft endurance are supplied when relevant.
4. Other: key information not included under the above headings can be given in this section. For example, the weather often plays a key role in the pre-hospital and retrieval environment. Additionally, the time of day and traffic conditions may be relevant points for consideration.

Questions and discussion

Questions, answers and discussion will be structured to lead the reader through key learning points in a realistic fashion. Subsequent cases will introduce new material

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while reinforcing key topics and themes (e.g. scene safety or aviation physiology) introduced previously. Where appropriate, references to other cases are given to allow similar themes to be further explored.

Key points

A summary of the key learning objectives will feature at the end of most cases. In addition, references and an additional reading list have been added where relevant.

Glossary and key to cases

A glossary of definitions has also been included to clarify terminology (e.g. what is meant by the term ‘regional hospital’). The glossary also includes a list of common acronyms used in the text.

A full list of key topics covered in specific cases can be found at the end of the book. This provides for rapid reference or review of specific topics.

c0018

CASE 18



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s0010

Incident

p0015

A 24-year-old male has been involved in a shark attack and has suffered multiple injuries predominantly to his torso and lower limbs.

p0010

The incident is 400 km (250 miles) away from the metropolitan area.

p0025

Your initial phone call is from the local ambulance resource who informs you that the patient has had his leg 'amputated' and is 'critically unwell'. They are taking the patient to the local hospital.

82

s0015 **Clinical information**

- u0010 ● P 130.
- u0015 ● BP 80/60 mmHg.
- u0020 ● SaO₂ 95% on non rebreathe mask at 15 litres.
- u0025 ● GCS 11 (E2V4M5)

s0020 **Relevant information**

- u0030 ■ **PHRM team transport options:** Rotary-wing available. Fixed-wing available. Two stretchers. Land ambulances at both ends of the flight.
- u0035 ■ **Additional resources:** Local paramedic-staffed rapid-response vehicle, small country hospital with a GP plus nursing staff.
- u0040 ■ **Retrieval options:** Country hospital 20 minutes from landing strip. Major trauma hospital 1 hour and 35 minutes flight from landing strip including 10-minute road leg in metropolitan area.
- u0045 ■ **Other:** Ambient temperature is 26°C (79°F), average seasonal sea temperature at incident is 16°C (61°F).

s0025 **Question 18.1**

p0080 Assuming you are the clinical coordinator, discuss your options for rendering clinical assistance and logistical support.

p0085 The patient has undergone RSI by the local GP. He has received 2 units of O negative blood (exhausting the local supply) and 2 litres of crystalloid. He remains fully packaged in the vacuum mattress which was applied by the local ambulance service.

s0030 **Clinical observations**

- u0050 ● P 150.
- u0055 ● BP 90/60 mmHg.
- u0060 ● SaO₂ 95% on FiO₂ 0.6.
- u0065 ● ETCO₂ 46mmHg (6.13Kpa).

s0035 **Question 18.2**

p0115 Assuming you are now the lead clinician on the PHRM team arriving at the country facility, what are your priorities for this case?

s0040 **Question 18.3**

p0120 Describe the principles for handing over complex trauma patients to emergency department staff.

s0045 **Discussion 18.1**

p0125 The patient has significant injuries to the lower limbs, including an apparent total amputation. He is already in shock. Even with ideal planning and implementation, the PHRM team is more than 2 hours away. On top of that, the PHRM team is mainly a supportive bridge to definitive care, which is likely to be in excess of 4–5 hours away.

Cases in Pre-Hospital and Retrieval Medicine

p0130 Remote assistance of the local team will be key to ensuring early management goals are achieved. The table below highlights potential actions.

Clinical	Logistical
<ul style="list-style-type: none"> ● Time to definitive care <ul style="list-style-type: none"> ○ Where/what is definitive care? ○ Parallel processing ○ Ability to resuscitate in transit 	<ul style="list-style-type: none"> ● Transport platform (see Case 27) <ul style="list-style-type: none"> ○ Rotary-wing <ul style="list-style-type: none"> ● Point to point ● Need for refuel ● Slower in flight ○ Fixed-wing <ul style="list-style-type: none"> ● Secondary transfer ● Faster in flight
<ul style="list-style-type: none"> ● Vascular access <ul style="list-style-type: none"> ○ Diameter ○ Location ○ Number ○ Monitoring 	
<ul style="list-style-type: none"> ● Volume resuscitation ● Blood products to be taken with PHRM team: <ul style="list-style-type: none"> ○ How many units can be taken? ○ Additional blood products available for transport ○ Access to Massive Transfusion Packs (MTP) prepared for transport ● Minimal crystalloid ● Preservation of existing volume ● Tourniquets <ul style="list-style-type: none"> ○ Type ○ Placement ○ Timing 	<ul style="list-style-type: none"> ● Blood options available nearby <ul style="list-style-type: none"> ○ Red cells at facility ○ Red cells at nearby facilities ○ Blood products nearby ○ Use of ambulance resources to distribute
<ul style="list-style-type: none"> ● Tranexamic acid (TXA) ● Haemostatic agents (see Case 28) 	
<ul style="list-style-type: none"> ● REBOA as a bridge? (see Case 28) 	
	<ul style="list-style-type: none"> ● Patient pick-up from airport <ul style="list-style-type: none"> ○ Quicker turnaround ○ Risk of clinical deterioration ● Patient pick-up from facility <ul style="list-style-type: none"> ○ Slower turnaround ○ Stay in 'place of relative safety'

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Clinical	Logistical
<ul style="list-style-type: none">• Remote clinical support<ul style="list-style-type: none">○ Telemedicine	<ul style="list-style-type: none">• Local support options<ul style="list-style-type: none">○ Special-skill GPs○ Visiting hospital specialists
<ul style="list-style-type: none">• Hypothermia<ul style="list-style-type: none">○ Initial patient temperature○ Room temperature in facility○ Cabin temperature on return flight	
	<ul style="list-style-type: none">• Early major trauma centre awareness and preparation

s0050 Discussion 18.2

p0375 The patient remains unstable despite volume replacement. Further injuries should be excluded. The PHRM team deflates the vacuum mattress and gently examines and log rolls the patient to reveal a large quantity of blood in the mattress and the injury shown on the patients left flank in the image below:



f7011

Cases in Pre-Hospital and Retrieval Medicine

p0385 Complete and repeat clinical assessment is important in trauma patients, especially with penetrating disease. Observations made by other providers may not have been handed over or not heard by the receiving team.

p0390 The key objective here remains the time to definitive care, and the PHRM team should be aiming for a rapid, safe turnaround time.

p0395 Ensuring that ongoing bleeding has been stopped is also a priority. Options for management of the newly discovered flank wounds include direct pressure and pressure dressing, topical haemostatic agents and temporary wound closure (deep suture or staple). The team should be aware that bleeding from this wound may be intraperitoneal and bedside imaging should be utilised (see Case 39).

p0400 Ongoing volume replacement, preferably with blood and blood products brought by the PHRM team, may be required, with a focus on minimal volume resuscitation principles (see Case 12).

p0405 Adequate analgesia and maintenance of anaesthesia will be important considerations, especially as the team will have several competing requirements during this task and cognitive overload is a possibility (see Case 11).

p0410 Adequate and secure large-bore interavenous access is essential, and strong consideration should be given to siting an arterial line for monitoring during the long trip to definitive care. A risk benefit analysis is often required to ensure time at the scene is not unduly extended by this procedure. It is also possible to site arterial access in the fixed wing cabin on the way back.

p0415 Communication with the tasking agency throughout will directly benefit patient care by ensuring seamless continuity of care during key interface points. For example, upon landing in the metropolitan area there will be an opportunity for further blood or blood products to be waiting for the team.

Discussion 18.3

s0055

u0305 An effective handover should provide:

u0310

- A synopsis of the patient

u0315

- A description of what has been done during the job and why

u0320

- An unequivocal transfer of the patient's care to another clinician.

u0325 Handover should also be:

u0330

- Brief

u0335

- Succinct: containing all relevant information

u0340

- Clear: the emergency department environment, especially the resuscitation room, is noisy. You must speak loudly and confidently.

p0465

The following template is predominantly for the time-critical patient (e.g. trauma). Variations to this approach may be indicated in complex but more stable patients.

u0345

Handover can be considered a two-phase process:

s0060 Phase 1

s0065 En route to hospital

p0475

Prepare the handover mentally, writing down key points or using an existing template if available (see Appendix 6) Use the headings in the box below to help.

s0070 **On arrival**

- u0350
 - Locate the team leader (receiving clinician) and make eye contact.
- u0355
 - If the patient requires immediate intervention (e.g. has a dislodged airway, or sudden and rapid physiologic deterioration) then make this clear immediately. Otherwise, state that the patient has 'no immediate needs'. This encourages the receiving team to focus on the handover rather than attempting to search for potential life-threatening pathology.
- u0360
 - Handover should occur either immediately before or immediately after moving the patient across to the hospital stretcher. Local practice will determine which is more appropriate
- u0365
 - Avoid handing over while moving the patient onto the hospital stretcher. The receiving team may not be paying full attention and things will be missed. The PHRM team can then confirm to the entire receiving team that handover will occur.
- u0370
 - The handover should utilise the following structure and overall take less than a minute:
 - u0375
 - Name/age (if known).
 - u0380
 - Brief details of incident (emphasis on mechanism of injury if relevant).
 - u0385
 - Major issues on arrival of the PHRM team.
 - u0390
 - Airway and breathing.
 - u0395
 - Circulation.
 - u0400
 - Conscious state and limb movements.
 - u0405
 - Injuries from 'top to toe'.
 - u0410
 - Interventions.
 - u0415
 - Procedures.
 - u0420
 - Intravenous fluids given.
 - u0425
 - Drugs given (and timing if relevant).
 - u0430
 - Stability during transfer and immediate needs post-handover.
 - u0435
 - Summary: generally only required if the case is very complex.

b5020 **Example of handover**

p0670 An example of a succinct yet comprehensive handover would be:
p3280 'This is a young (unknown) male who has been attacked by a shark approximately 5 hours ago.
p1285 'On arrival of the Ambulance Service, he was GCS 11 (E2V4M5) with a pulse of 130 and an SBP of 80. When we arrived, he had already been intubated and ventilated by the GP at the local clinic with a reported Grade 2 larynx. His injuries from top to toe include penetrating trauma to the lower torso with possible intra-abdominal injury and pelvic involvement identified on log roll. He also has a complete amputation of the right leg above the knee. The amputated limb has not been located. He has 2 tourniquets applied, one above the other on the right limb and no further bleeding is evident.
p7285 'He has been sedated on propofol and fentanyl infusions for transport.
p3285 'He has 14G cannulae in each antecubital fossae and an arterial line in the left radial artery.
p4285 'In total, he has received 5 units of blood, 1 g of TXA and 2500 mL of pre-hospital crystalloid, but remains volume sensitive.'

Cases in Pre-Hospital and Retrieval Medicine

- u0440 During handover, mention the following (if applicable):
- u0445
 - Say whether a log roll was done and highlight any findings.
- u0450
 - Tourniquets and tourniquet times.
- u0455 Immediately after the handover:
- u0460
 - Assist the receiving team in removing the patient from the PHRM team's equipment (e.g. monitors, ventilators, scoop stretcher, etc.)
- u0465
 - Collect all your non-disposable equipment (you may need to exchange splint devices or infusion pumps with the receiving facility).
- u0470 Leaving the trauma room:
- u0475
 - Inform the team leader that you are leaving the room but will return with completed notes shortly.
- p0615 There are numerous aide memoires already in existence that can be used to facilitate handover. Examples of two such aide memoires are illustrated below.

t0020

Aide memoires used to facilitate handover	
MISTO	SBARR
M – mechanism of injury	S – situation
I – injuries sustained	B – background
S – signs and symptoms	A – assessment
T – treatment initiated	R – response
O – other information (e.g. allergies)	R – requirements

s0075

Phase 2

- p0625 Return to the trauma resuscitation bay. Locate the team leader and give them or the scribe a copy of your pre-hospital notes. If electronic patient records are utilised, ensure notes are transferred or printed appropriately. Ask the team leader if they have any other questions for the PHRM team. The PHRM team can address questions now, although they should avoid interfering in patient care at this point.

b5010

Key points
<ul style="list-style-type: none"> • Aim to balance clinical and logistical demands in the PHRM environment. • Recognise the challenges faced when dealing with complex, unstable patients in remote locations. • Recognise the inherent value in succinct clinical handover and its importance to high-quality and safe patient care. • In handing over patient care, be brief, logical and speak with authority and clarity.

u0480

u0485

u4485

u0490

Additional reading

Hearn S. Peak performance under pressure: lessons from a helicopter rescue doctor. Core Cognition, 2019.

Wood K, Crouch R, Rowland E, et al. Clinical handovers between prehospital and hospital staff: literature review. Emerg Med J 2015; 32:577–581.