

Guidelines For The Provision Of Medical Care In South Georgia and other Antarctic Marine Areas By Seaborne Adventure Tourism Operators:

Prepared by World Extreme Medicine for the Government of South Georgia & the South Sandwich Islands

Introduction

The Antarctic Treaty sets out an international framework for the governance of Antarctica. Tourism is regulated through the Protocol on Environmental Protection to the Antarctic Treaty and subsequent specific agreed instruments. Treaty Parties regulate activities in Antarctica under their own jurisdiction, however, which can result in slightly different requirements between competent authorities. There are no specific regulations at this time in relation to the provision of specific medical equipment.

The aim of this document is to identify the specific medical risks associated with travel to South Georgia with wider applicability to the southern oceans. Assess the current medical professional standards being delivered and make recommendations regarding appropriate medical provision of care.

Antarctic Tourism

The interest in the medical capabilities of visiting cruise vessels to the Government of South Georgia & the South Sandwich Islands (GSGSSI) became particularly acute after the very unfortunate death of a visitor to South Georgia in January 2012. Acting on the recommendations of the Coroner, a review of activities and medical arrangements was initiated by GSGSSI in 2013.

The following season GSGSSI reported in total 55 cruise ship visits, carrying 7,024 passengers. This was an increase of 1,232 passengers over the previous season, bringing visitor numbers back in line with figures recorded four seasons previously. This figure has since increased to 8500 passengers in the last season. Vessel feedback and the first hand experience at King Edward Point indicated that visiting cruise ships had variable levels of medical capability whilst some were able to function independently, others had to draw on the limited resources of the medical facilities at the British Antarctic Survey base. This was a quote from staff at the South Georgia Base at King Edward Point:

‘For the second season running and despite having raised this issue previously, a visiting cruise ship arrived without an adequate stock of medication and requested the provision of painkilling medication from the limited base supplies held by the base doctor at King Edward Point. On this occasion the base was left devoid of their entire supply of one specific painkilling drug until this could be replenished some weeks later’.

The medical officers at King Edward Point are equipped and insured to provide daily medical care to the base staff and only to provide emergency assistance to visitors. (If they are viewed not to have appropriate medical cover provided by the tour operator). This should be a rare event if the cruise operators ensure an independent medical infrastructure.

Over the same period there was also a slight increase in the number of yacht visits over the previous season with 18 visits by 15 different yachts, amounting to a total of 214 people. There were 4 overland expeditions, 3 of which were yacht supported and one that was supported by a cruise ship.

If one includes the figures from the NW peninsula of Antarctica, which due to its accessibility can attract over 40,000 tourists a year, then South Georgia & the South Sandwich Islands and the peninsula can be responsible for nearly 50,000 tourists during a season.

The expansion of tourism has also seen an increase in adventure tourism with a larger number of tourists engaging in scuba diving, kayaking, climbing and skiing expeditions and short trips.

Sub Polar Vessels And Categorisation

Ships operating in the sub polar waters are by necessity different from tourist vessels in other waters. The environment influences the size and configuration of the ships. IAATO categorise these vessels depending on the number of passengers:

1. C1 Traditional expedition ships that carry 13-200 passengers and are making landings
2. C2 Mid-sized vessels that carry 201-500 passengers and are making landings
3. CR Vessels that carry more than 500 passengers and do not make landings (except possibly at Grytviken, subject to the vessel passenger capacity).
4. YA Sailing or motor yachts that carry 12 or fewer passengers

The size of the vessel and number of passengers is important as many of the medical recommendations below are based on larger vessels operating in significantly quieter and safer waters.

Current Regulation of Medical Standards of Antarctic Tourism

Both the Antarctic Treaty System and the International Association of Antarctica Tour Operators emphasize the importance of safety, the necessity for adequate contingency planning, search and rescue and appropriate insurance.

International Maritime Law provides some guidelines for the provision of medical care, but it covers all vessels at sea and the minimum medical standards have been developed for crew and not for tourists and are not specific for subpolar waters.

The Cruise Liners International Association in 1998 in association with the American College of Emergency Physicians developed and published the guidelines on appropriate emergency care and health care maintenance for passengers and crew on board ships. They were thorough, however the guidelines were relevant to vessels operating in less hostile environments than subpolar waters with different passenger demographics and a different collection of presenting medical conditions. All of which significantly alter the medical provision of care.

Currently there are no formal guidelines or medical standards covering the delivery of medical care in subpolar waters.

Common medical conditions presenting in Antarctic tourism

There is very little published research on the common medical conditions presenting to medical staff providing clinical cover for vessels in subpolar waters.

Two papers published in 2007 and 2014 followed over 3000 passengers on 37 voyages in one season in Antarctica. The main issues identified were:

1. Motion Sickness
2. Infections
3. Musculoskeletal injury (approximately 33% ashore)
4. ENT
5. Dermatology
6. Psychiatric

The results of the papers are in keeping with previous research carried out over a number of years on expeditions to remote environments.

Looking at the research and drawing on experience, it appears there are 7 principal clinical areas and groups which need examination, assessment and preparation for intervention:

1. Crew
2. Passengers
3. Ship related medical conditions
4. Shore related medical conditions
5. Environmental medical conditions
6. Trauma and critical medical care
7. Prolonged field care

Crew

Theoretically the crew should be experienced in the environment and should be less likely than the passengers to present with the 6 principal medical conditions above. They will however suffer and present with the standard medical problems seen by any primary care physician around the world. Their exposure to the passengers will result in an increase in non endemic communicable diseases of aerosol and faecal oral origin. They may well present with specific diseases endemic in their country of origin or indeed countries travelled through enroute to the embarking vessel:

1. Endemic diseases
2. Upper respiratory tract infections
3. Gastroenteritis infections
4. Environmental medical conditions

Passengers

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The passengers will present with the 6 principal medical conditions above. In addition the medical staff need to be prepared to manage the rare traumatic or medical emergency. The age range of the passengers will mean they have a predisposition to cerebrovascular and cardiovascular events in particular, which may be exacerbated by environmental factors such as cold, dehydration through motion sickness or infection. Passengers may also bring diseases endemic to their country of origin:

1. Motion Sickness
2. Respiratory Infections
3. Musculoskeletal injury (approximately 33% ashore)
4. ENT
5. Dermatology
6. Psychiatric
7. Endemic disease
8. Trauma and medical emergencies

Ship Related Medical Conditions

The environment on board a vessel in the sub polar waters has the capacity to generate injuries and illnesses associated with movement and exposure to individuals from a diverse environmental background and hence potentially interesting communicable endemic diseases:

1. Motion Sickness
2. Musculoskeletal injuries
3. Upper Respiratory Tract Infections
4. Gastroenteritis infections
5. Trauma

Shore Related Medical Conditions

From the point of embarkation from the main vessel until their return, the passengers and crew are exposed to a completely different set of risks. The primary risks during this period are related to:

1. Movement across an unstable environment, whether that be a RIB, glacier, snow, uneven ground
2. Environmental conditions: cold terrestrial and cold immersion
3. Cardiovascular disease (CVA) and Coronary Heart Disease (CHD) related to exertion
4. Wildlife: including seal bites

Hence the primary medical conditions anticipated will be:

1. Musculoskeletal injury
2. Cold injury
3. Trauma
4. Drowning and near drowning
5. Medical emergencies

Environmental Medical Conditions

The principal medical conditions will be related to the terrestrial cold and possible immersion. Hence the physician will should predominantly be prepared to manage:

1. Accidental Hypothermia
2. Cold injuries; NFCl, frostnip and frostbite
3. Immersion hypothermia
4. Ophthalmic conditions
5. ENT medical conditions

Trauma and Critical Medical Emergencies

The predominant age of the passengers and some of the staff will mean they are at an increased risk of suffering from potential critical medical and surgical emergencies, in particular CVAs and CHD events. In addition there is always the risk of significant trauma at any stage in a voyage, both on shore and onboard the vessel.

Prolonged Field Care

The very nature of the environment and the relative isolation of the destinations means that the patient requiring medical intervention will likely require management for up to several days by the primary responsible physician. The capacity of the physician to be able to work independently is imperative and fundamental to the care of the sick patient. Infrastructures can be put in place, which allow satellite reachback and senior clinical advice and intervention, but the treating physician will require adequate skills and clinical facilities and equipment to diagnose, manage and transfer patients who are potentially critically unwell over a prolonged period of time.

Minimum Medical Professional Clinical Standards Required To Provide Adequate Medical Cover In South Georgia And Other Subpolar Waters

In 2015 the Faculty of Pre-Hospital Care, Royal College of Surgeons of Edinburgh published their guidelines for the medical provision of care in wilderness environments. It was recognised that the scope of practice for wilderness medicine covers elements of primary healthcare, pre-hospital emergency medicine and preventative medicine. Some unique competencies were also identified. Further to this, the panel recommended the use of a matrix and advisory expedition medic competencies relating to the remoteness and medical threat of the expedition.

Larger commercial vessels (including cruise ships) responsible for the care of passengers and crew and working in the remoteness of the environment in the subpolar waters would necessitate an advanced wilderness medicine practitioner with the capacity to function independently and over protracted periods and managing critically ill patients without the possibility of senior intervention and advice.

It is recognised that smaller vessels (including yachts) may not have the capacity to employ experienced medical professionals for the number of passengers. And it is accepted that

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under these conditions a non-health care professional with a nationally recognized first aid certificate, caring for patients as a secondary role would be acceptable.

However:

We feel that a robust system of medical reachback which allows the non medical professional to seek expert advice would be essential on yachts (commercial and private) and other smaller vessels.

All those crew responsible for the care of passengers removed from the normal medical infrastructure of the vessel should have a nationally recognised first aid certificate. This would include boat handlers and guides.

We would recommend a four tier modularised system based upon the size of vessels entering the sub polar waters. These are directly related to the IAATO vessels categorisation which is already in use:

1. C1 1 clinical module, 5 guide kits, 1 deployable medical kit
2. C2 2 clinical modules, 10 guide kits, 1 deployable medical kit
3. CR 2 clinical modules, 10 guide kits, 1 deployable medical kit
4. YA 2 guide kits

Category	C1	C2	CR	YA
Annex A Ship Clinical Kit	Yes 1 module	Yes 2 modules	Yes 2 modules	NA
Annex A1 Advance Airway Module	Yes	Yes	Yes	NA
Annex A2 Advance Monitoring Module and CPR	Yes	Yes	Yes	NA
Annex A3 Paediatric module	If Applicable	If Applicable	If Applicable	NA
Annex A4 Evacuation module	Yes	Yes	Yes	NA
Annex B Specialist Recommended Medical Hardware	Recommended	Recommended	Recommended	NA
Annex C Medical Professional Onshore / Deployable Medical Kit	Yes 1 deployable kit	Yes 1 deployable kit	Yes (If landing 1 deployable kit)	NA
Annex D Non Medical Professional onshore medical Kit & Guide Kit	Yes 5 guide kits recommended	Yes 10 guide kits recommended	Yes If landing 10 guide kits recommended	Yes 2 kits recommended
Annex E Supplemental Medical Kits for Adventure Activities	If Applicable	If Applicable	If Applicable	If Applicable

Medical Professionals (all C1, C2 and CR Vessels)

Qualifications and Experience:

1. All clinical staff hold current full registration and a license to practice.
2. All clinical staff have at least three years of post-graduate / post-registration experience in general and emergency medicine

Certifications

1. All clinical staff certified in advanced life support such as ACLS, ALS, PHLIS and ATLS/BATLS or an equivalent certification or physician specialist training
2. Ships carrying children ≤ 12 years old should have at least one physician certified in PALS, APLS or an equivalent certification or specialist training
3. All clinical staff certified in MIMMS or equivalent
4. All clinical staff have an up to date Hep B immunity certificate
5. All clinical staff have an appropriate DBS or equivalent

Skills

1. All clinical staff should be confident in a number of practical medical skills
 - a. Orthopaedic procedures - fracture and dislocation management
 - b. Minor surgical skills
 - c. Patient procedural sedation
 - d. Basic dental skills
 - e. Basic gynaecological conditions and interventions
 - f. Standard ENT and Ophthalmology conditions and emergencies
 - g. Critical care skills for prolonged field care

Non Medical Professionals Providing Medical Cover (including Yachts)

Qualifications and Experience

1. Recognised first aid certificate covering
 - a. Basic medical emergencies
 - b. First on scene medical and trauma intervention
 - c. Basic life support skills
 - d. Comfortable delivering IM injectables
 - e. Wound management and closure

C1, C2 and CR Vessels Minimal Medical facilities

1. Contains adequate space for diagnosis and treatment of patients with 360° patient accessibility around at least one bed.
2. Has hand wash sinks with hot/cold mixing tap, liquid antibacterial soap, paper towels and waste bin in or adjacent to all clinical exam rooms. For exam rooms without sinks, alcohol hand sanitizers should be available.
3. Has adequate space for storage of medical supplies, equipment and drugs.
4. Has an examination, treatment and inpatient area adequate for the size of the ship.
5. Has at least one examination / stabilization room.
6. Has the capacity to create at least one ICU room.
7. Maintains a minimum number of inpatient beds of one bed per 200 passengers and crew.
8. Maintains an isolation room or the capability to provide isolation of patients.
9. Refrigerator and freezer for the safe storage of medicines and supplies.

Vessels Clinical Practice:

1. All passengers and crew will have a medical questionnaire prior to embarkation to enable appropriate risk analysis and medical estimate before the employed clinician becomes responsible for care.
2. The vessel will have an established and reviewed casualty estimate and evacuation plan for all regions of the voyage and planned activities.
3. An audit program of the medical facility and equipment that is conducted by healthcare professionals or persons experienced in health care audit before and after the voyage.
4. Medical facility shall have established medical policy and procedures which have been reviewed by a senior clinician.
5. Designated rapid medical response team which is trained and exercised at least monthly in MIMMS and medical emergencies both on board and on shore
6. A dedicated medical emergency telephone number is advertised for both passengers and crew and is placed on telephone around the ship.
7. When the ship is at sea, at least one clinician must be readily available to provide emergency medical care 24 hours a day.
8. When the ship is in port, at least one clinical provider is available onboard.
9. Ready access to both telephone and confidential email in order to communicate directly with shipboard and shoreside healthcare providers.
10. All crew and passengers should receive treatment in accordance with the general medical councils (or equivalent body) guidelines on standards of care
11. A chaperone system is in place for the treatment and examination of children and the opposite sex where appropriate.

Vessels Documentation:

A medical record system that provides:

1. Well organized, legible and consistent documentation of all medical care.
2. Patient confidentiality. All patient medical records should be regarded as strictly confidential medical information and should not be accessible to non-medical staff without the express written consent of the patient except as necessary to maintain safety on board or ashore, or to comply with any legal requirements to review, report or log the information.
3. All documentation is held in a secure location
4. Documentation is kept for every medical intervention

Equipment On Board Cruise Ship:

1. Vital signs equipment: Sphygmomanometers, stethoscopes, thermometers (including core/rectal temperature capabilities) and pulse oximeter (SaO₂).
2. Airway equipment - bag valve mask, laryngeal mask airway/supraglottic airway, laryngoscopes, endo tracheal tubes, stylet/bougie, lubricant, portable suction equipment, surgical airway capability.
3. At least two cardiac monitors. Recommendations in Annex B
4. At least two defibrillators, one of which should be a portable automated external defibrillator (AED). Recommendations in Annex B
5. Electrocardiograph (ECG) capability. Recommendations in Annex B

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6. Nebulizer capability.
7. Automatic medical ventilator. Recommendations in Annex B
8. Oxygen cylinders CD and at least one oxygen concentrator and a sufficient number of flow regulators, rebreath face masks and connections
9. Wheelchairs.
10. Stair chair and stretcher.
11. Long and short back boards with cervical spine immobilization capabilities. Recommendations in Annex B
12. Trauma supplies as in Annex A
13. Medical supplies as in Annex A
14. Paediatric supplies as in Annex A
15. Laboratory capabilities:
 - a. Near patient testing for Hb and renal function
 - b. Urinalysis, with minimum of specific gravity, protein, red blood cells, white blood cells, nitrites, urobilign, ketones, pH, glucose and albumin
 - c. Pregnancy: qualitative HCG
 - d. Blood glucose
 - e. Cardiac enzymes with a minimum of a CK-MB or Troponin assay
 - f. Malaria RDT
16. All medical equipment is maintained in accordance with recognized biomedical quality control recommendations.

Medical Equipment On Shore For Responsible Medical Professionals:

The Recommended medical bag and contents are in Annex C. It is also recommended that clinicians have access to advanced diagnostic and resuscitation equipment within a short time frame of at least 10 minutes. This may necessitate the carriage of all equipment on shore or may allow advanced emergency equipment to keep onboard but ready for emergency access.

Medical Equipment On Shore For Guide/non medical professionals and equipment carried on yachts:

The recommended medical equipment for guides and those non medical professionals responsible for medical care on shore or on yachts is in Annex D

Medical equipment For Specific Events: Diving, Climbing, Skiing

Adventure activities which have specific inherent dangers require specific supplemental medical equipment. The supplemental kit lists are itemised in Annex E

Vessel Pharmacy:

1. Maintain an evidence-based formulary on each ship with sufficient quantities of medications as listed in Annex A.
2. Maintain controlled drug documentation
3. Covering
 - a. Gastrointestinal system
 - b. Cardiovascular system medications
 - c. Respiratory system medications
 - d. Central nervous system medications

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- e. Infectious disease medications
- f. Endocrine system medications
- g. Obstetrics, gynaecology and urinary tract disorder medications
- h. Fluids and electrolytes such as oral and parenteral.
- i. Musculoskeletal and joint disease medications
- j. Eye medications
- k. Ear, nose and throat medications
- l. Skin disease medications
- m. Vaccines
- n. Anaesthesia medications

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Annex A: Ship Clinical kit - 1 clinical module

IV MEDICATION	
Glucose 50%/50ml	5
Amiodorone 300mg/10ml	5
Atropine autoinject 600mcg/5ml	5
Cefotaxime 1g	10
Metronidazole 5mg/ml 100ml infusion	10
Lidocaine 50mg/5ml	10
Paracetamol 1g/100ml	10
Pantoprazole 40mg	10
Water for injections 5mls	50
Tranexamic acid (500mg)	10
Chlorphenamine 10mg/ml	10
Dexamethasone 4mg/ml	10
Furosemide 20mg/2ml	20
Metoprolol 1mg/ml - 5ml	10
Morphine 10mg/ml	20
Naloxone 400mcg/ml	10
Metoclopramide 10mg/2ml	10
Ondansetron 4mg/ml	10
Hydrocortisone 100mg	10
Haloperidol 5mg/ml	10
Midazolam 10mg/5ml	10
Lorazepam 4mg/ml	10
Flumazenil 500mcg/5ml	5
Ketamine 10ml (100mg/ml)	5
Glucagon	5
Clexane 60mg	10
Clexane 80mg	10
Lidocaine 1%	10
Streptokinase 1.5million units	2
Hydrocortisone 100mg	8
Metoclopramide 10mg/1ml	10
Adrenaline 1:1000	20
Novomix 30 Flexpen	10
Novorapid 100u/ml 10 mls	10
MAP	20
Syntocinon 10 units/ml	10
Tetanus protocol pack	10

IV ACCESS	
Venflons Grey 16	50
Venflons Green 18	50
Venflons Pink 20	50
Venflons Blue 22	50

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Syringes 10ml	50
Syringes 50ml	50
Syringes 3ml + needle	50
Syringes 1ml	50
Sharps Box 0.25l	10
Tourniquet	10
Butterflies green & blue	50
IV dressings	100
Needles 21G Green	50
Needles 25G Orange	50
Needles 19G White	50
Needles 23G blue	50
IV Giving Set	50
IV Bungs	50

IV FLUIDS	
0.9% NaCL 1 litre	50
0.9% NaCL 500mls	10

AIRWAY MANAGEMENT	
1 set ET tubes paed and adults	5
Bougie	5
IGel/LMA full set of sizes	5
High Concentration oxygen masks	20
Chest Drain Kit	10
Hand Held Portable Suction unit	10
Laryngoscope and blades full set	2
Bag-Valve-Mask	5
Regulator	5
Aspiration catheters	5
Oxygen valves	5
NP Airways Size full set	10
Guedel Size full set	10
Oxygen tubing	10
Nasal Cannulae	20
Nebuliser masks	10
Peak Flow Meter and disposable mouth pieces	2
Spacer	2
Naonex nasal spray	5

WOUND CLOSURE	
Steristrips	100
Scalpels	20
Glue 3g	14
Sterile Gloves Size 8	5 BOXES
Sterile Gloves Size 7	5 BOXES

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Suture Packs	20
Ribbon Gauze 5cm x 7.5cm	50
Instruments	20 SETS
Sutures 0	20
Sutures 3/0	20
Sutures 4/0	20
Sutures 5/0	20
Scalpel Blades	50

DRESSINGS	
Sleek 2.5cm	20
Elasticated tape 2.5	20
Zinc Oxide tape 1.5cm	20
Zinc Oxide tape 5.0cm	20
Nasal tampon	20
Sterile Swabs	2 BOXES
Granuflex	20
Non-adherent dressings 20 x 10cm	100
Adhesive dressings 10 x 9cm	100
Non-adherent dressings 5 x 5cm	100
Non-adherent dressings 10 x 10cm	100
Bactigras 5 x 5 cm	20
Non-sterile swabs	20 PACKS
Moleskin	20
Absorbent dressing pads 10 x 10cm	20
Non-adherent dressings 5 x 5cm	100
Jelonet 5 x 5cm	20
Jelonet 10 x 10cm	20
Atrauman 10 x 7.5	20
Honey dressings 10 x 10	20
Allevyn Heel pads	20
Kinesio Tex Tape	5 rolls
Eye pad	20
Large abdo wound dressing	4

UROLOGY PACK	
Foley Catheter Size 12	2
Foley Catheter Size 14	2
Foley Catheter Size 16	2
Foley Catheter Size 18	2
Catheter Bags	13
Conveen	2
Baird Urine Meter + bag 350ml + 2.85l	2
Pack inco nappies	1
Instagell	40
Female Bed Pan	1

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Male Bed Pan	1
Catheter Insertion Kit	2
Travel John	18
"Go Anywhere Toilet Bag	2

HARDWARE	
Triage card set	20
Magic marker	1
White board and markers	1
MIMMs kit	5
Basic Life Support protocol	1
Medical Field Guide	1
Patient Report Form & Pencil	2
MEDIC flourescent vest	2
Hand and foot warmers	6
Neck collars	4
Spinal board and head blocks	2
stretcher	2
SAM splints	2
Kendrick traction device	1
SAM Pelvic Splint	1
Trauma Shears	1
Petzl Head torch	1
Pentorch	1
Scalpel	1
Safety pins	3
Pocket mask	1
Tongue depressors	5
Hand sanitiser 5ml	1
Dental kit	5
Oxygen /tubing/regulators/face masks	Enough to allow critical care resus for 3 days
Nebulisor, tubing and masks for medication	2 + 20 tubing/mask systems
Oxygen concentrator	1

DIAGNOSTIC BOX	
BraunTympanicThermometer	2
Low recording thermometer	1
Pulse Oximeter	2
Urine Dipstix	4 boxes
Pregnancy test	50
Boso Profitest Sphygmomanometer	4
Tendon Hammer	1
Stethoscope lithman	2
Otoscope and ophthalmoscope	2
Glucometer and sticks	2

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Malaria RDT	10
ORAL MEDICATION	
Paracetamol 500mg	500
Ibuprofen 400mg	500
Diclofenac 50mg	500
Codeine 30mg	500
Tramadol 50mg	500
Buprenorphine (=Temgesic) 200mg	500
Aspirin 300mg	100
Clopidogrel 300mg	100
Suscard Buccal 2mg GTN tab	50
Atenolol 50mg	100
Glucogel Hypostop	20
Furosemide 40mg	100
Captopril 12.5mg	100
Prochlorperazine (Buccastem)	50
Omeprazole 20mg	100
Loperamide 2mg	100
Chlorphenamine (=Piriton) 4mg	100
Cetirizine 10mg	100
Prednisolone 5mg	500
Salbutamol inhaler	20
Salbutamol nebulas 5mg	50
Atrovent nebulas 250mcg	50
Acetazolamide 250mg	100
Dexamethasone 2mg	100
Nifedipine 20mg	100
Co-amoxiclav 500/125mg	500
Flucloxacillin 250mg	500
Cephalexin 500mg	500
Ciprofloxacin 500mg	500
Erythromycin 250mg	500
Metronidazole 400mg	500
Diazepam 5mg	100
Otomise ear spray	10
Ear tampons	10
Norethisterone 5mg	90
OPHTHALMOLOGY	
Chloramphenicol ointment	20
Tetracaine minims	50
Carbomer 980 for dry eyes	20
Fluorescein minims	50
Cyclopentolate minims	20
Aloe Vera	10

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The following modules are part of the clinical module on the vessel but are deployable should there be the need on shore. As such they need to be kept in a state of readiness and in a robust packing system such as a pelican case.

Annex A1: Advanced Airway Module

Guidelines which necessitate that physicians have anaesthetic advanced airway skills with RSI capability would preclude many physicians from being able to work in subpolar waters. The advanced airway module follows the PALM guidelines to enable good and safe management of airways during medical and traumatic emergencies.

McGill's forceps	1	
KY jelly	1	
Portable suction device	2	And tubing
I-gel/LMA		1 of each size appropriate to the age range on the vessel
Laryngoscope	1	And age appropriate blades
Mini tracheostomy set	1	
Bag & Valve Mask + reservoir, tubing and connections	1	
oxygen	1	CD cylinder or appropriate alternative
Portable automatic ventilator	1	

Annex A2: Advanced Monitoring Module and CPR

The medical professional will carry in their on shore kit, a basic monitoring and diagnostic kit, however for more advanced intervention and monitoring the medical professional will need the capacity to monitor adult and children depending on the clients:

1. Blood Pressure
2. Blood glucose
3. Oxygen Saturation
4. Heart Rate
5. ECG 12 Lead
6. ETCO₂
7. Defibrillation

They will also need to have the medication to carry out advanced life support with medication recommended in the ALS and PALS protocols pertinent and current at the time of debarkation.

The advanced monitoring and CPR Module will be heavy and could be rapidly deployable from the vessel if required. This system of rapid deployment will require testing to ensure the crew are competent in the system of deployment.

Annex A3: Paediatric module

Additional paediatric medication and hardware may be required depending on the clients on the vessel. The medication should mirror the clinical module above and be age appropriate

Annex A4: Evacuation module

An injured patient on shore will need rapid transport to the medical facilities on board the ship to stabilise and initiate medical intervention. A module for evacuation should include:

Spinal board

Head blocks

Cervical collar

Hypothermia blanket

Bubble wrap or blanket system.

This should be ready to deploy with the appropriate modules above

Annex B: Specialist recommended medical hardware

Lifepac monitor	At least 12
RDT tempus pro	With defibrillator capability
EZIO	Introsseous bone drill and appropriate needles
Russell chest seal	For penetrating thoracic trauma
Nightingale dressing	
ISTAT	Laboratory device

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Annex C: Medical Professional on shore medical kit : deployable medical kit

Item	Dose/size
Casualty report form and pencil	1
Marker Pen	1
Trauma Care	
CAT tourniquet	4
Novel haemostatic agent	gauze
Pressure dressing	2
Nasopharyngeal Airway	Size 6
Nasopharyngeal Airway	Size 7
Ashermann chest seal	2
Decompression needle	4
Scissors Tuff Cuts	1
SAM splint pelvis	1
Kendrick traction device	1
Dressings	
Scissors Sharp	1
Bandages assorted	
Ambulance dressing No 3	2
Eye pad and bandage	2
Nitrile Examination Gloves pairs	4
SAM splint	1
Swabs: 10x10 (5)	
Jelonet: 10x10	2
Non-adherent Dressing: 10x9	2
Adhesive Dressing:10x9,10x15	2
Granuflex: 10x10	2
Steristrips pack	1
Wound glue	1
Antiseptic wipes	10
Band-aids: various	
Blister dressing (eg Compeed)	5
Elastic Tape 2.5cm	1
Sleek Tape 2.5cm	1
Zinc oxide Tape 2.5cm	1
Finger tubigrip	1
Clingfilm roll	1
Iodine solution 10ml	2
Water for Injection 10ml	2
Burn bags	2
Safety pins large	10
Disposable scalpel No 10	2
Diagnostic kit	
Thermometer	1
Pulse Oximeter	1

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Otoscope and ophthalmoscope	1
stethoscope	1
Manual BP Cuff	1
Blood glucose monitor	1
Creams	
Aloe vera gel 10ml	1
Suncream 10ml	1
Anusol	1
Ibuprofen Gel	1
Betamethasone Oint 0.1%	1
Fusidic acid cream	1
Clotrimazole 1%	1
Aciclovir (=Zovirax)	1
Painkillers	
Paracetamol 500mg (=Tylenol)	2 tabs x4/day
Ibuprofen 400mg (= Advil)	1 tab x3/day
Diclofenac (= Voltarol)50mg tab	1 tab x3/day
Codeine 30mg tabs	1-2 x 4/day
Tramadol 50mg capsules	1-2 x4/day
Oral analgaesic gel	
Buprenorphine 200mcg tabs	1-2 x3/day
Antibiotics	
Cefalexin 500mg	1cap x3/day
Ciprofloxacin 500mg	1 tab x2/day
Metronidazole 400mg	1 tab x3/day
Allergy / Respiratory	
Chlorphenamine 4mg tabs	1 tab x4/day
Cetirizine 10mg tabs	1 tab / day
Salbutamol Inhaler (100mcg)	2 puff x4/day
Gastrointestinal	
Buccastem 3mg	1-2 tab x2/day
Loperamide 2mg tab	2 tabs, then 1 tab 4 hourly
Omeprazole tabs 10mg	1-2 daily
Senna	2 at night
Cardiac	
Aspirin 300mg dispersible tab	1 tab daily
Suscard Buccal 2mg	1 tab 8 hourly
Other	
Pseudoephedrine tab (Sudofed)	1 tab 6hourly
Handwarmers pair	
Diazepam 5mg	As directed
Eyes	
Chloramphenicol eye oint	Apply 6hourly
Carbomer 0.2% gel tears	Apply 6hourly
Tetracaine 1%	If directed

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Fluorescein 2%	If directed
Cyclopentolate 1%	If directed
injectables	
3ml syringe and needle	
10ml syringe and needle	
IV cannulae	16 and 18
IV site dressing	
Sharps box	
IO Device	EZIO 1
IO Needles	assorted
0.9% NS	500ml 2
Giving set	2
Adrenaline ampoule 1ml	0.5ml IM 5
Tranexamic acid	500mg IV 4
Morphine 10mg/1ml	10mg IV/IM 2
Naloxone 400mcg	400mcg IM/IV 2
Metoclopramide 10mg	10mg IM/IV 2
Midazolam 10mg	10mg IV/IM 2

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Annex D: Non Medical Professional on shore Medical Kit: Guide kit

Item	Dose/size	Qty	Notes
Hardware			
Heat pads		2	
Gloves	Pair	2	
Syringe 5ml		1	
Needles	green /blue	2	
Scissors - small		1	
Scissors - trauma		1	
Combat Application Tourniquet		2	
Novel haemostatic agent	gauze	2	
Combat pressure dressing		2	
Nasopharyngeal airway	Size 7	2	
Nasopharyngeal airway	Size 6	2	
chest seal		2	
SAM Splint		1	
Alco-wipes		4	Cleaning wounds
Plasters/Bandaids	medium	6	Small cuts/abrasions
Paraffin gauze dressing (eg Jelonet)	10 x 10cm	1	Non-stick dressing for graze or wound
Blister Dressing (eg Compeed)		6	
Granuflex	10 x 10cm	1	Cut to size for blisters / hot spots
Gauze	assorted	15	Wiping/absorbing blood etc, padding
Adhesive dressing (steroplast)	10 x 9	2	
Non-adherent dressings	assorted	3	Non-stick dressing for any wounds
Finger tubigrip		1	To hold dressing on finger
Zinc Tape		1	Adhesive tape
Sleek Tape		1	Adhesive tape
K-lite bandage	7 cm	1	Bandage to hold dressing on, can give some support
Ambulance dressing No 3	20 x 28cm	1	Dressing and bandage all in one
Steristrips	6 x 75mm	1	Closing small wounds
Skin glue		2	Closing small wounds
Injectable			
Adrenaline for IM injection	1 in 1000	2	0.5ml IM can repeat every 5 minutes - life-threatening allergy (anaphylaxis)
Medications			
Paracetamol (= Tylenol)	500mg	16	2 tabs four times a day (max 8 tabs/day) for pain
Ibuprofen (= Advil)	400mg	24	1 tab three times a day for pain/inflammation
Codeine	30mg	14	1-2 tabs four times a day (max 8 tabs/day) for severe pain
Buprenorphine	200mcg	10	1 -2 tabs, three times a day (max 6 tabs/day)

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			very severe pain
Aspirin	300mg	2	1 tab daily for heart attack
Suscard Buccal	2mg	2	1 tab three times a day for heart attack - place between lip & gum (after discussion with doctor)
Buccastem	3mg	5	1-2 tabs 2x a day for nausea/vomit - place between lip & gum
Loperamide	2mg	10	2 tabs after loose stool, 1 tab 4hourly (max 8 tabs/day) for diarrhoea
Chlorphenamine	4mg	7	1 tab four times a day for allergy-itch can make you drowsy
Salbutamol inhaler	200 doses	1	2 puffs inhaled for relief of asthma/wheeze/shortness of breath
Antibiotics			
Cefalexin	500mg	10	1 tab 2 to 4 times a day depending on severity of infection
Eyes			
Chloramphenicol ointment	4g	1	4 times a day eye - for infections & snow blindness
Tetracaine 1%	Single use	1	Anaesthetic eye drops removing foreign bodies and snow blindness

Annex E: Supplemental Medical Kits for Specific Adventure activities

a. Diving

Diving necessitates the availability of a ready supply of oxygen until a decompression chamber can be reached

b. Skiing

Skiing injuries can be managed by the kit in the medical professional module or the guide kit

c. Kayaking

Kayaking injuries can be managed by the kit in the medical professionals module or the guide kit

d. Climbing

Climbing injuries can be managed by the kit in the medical professionals module or the guide kit

e. Altitude

The combination of cold temperatures, low barometric pressures and altitude can result in altitude related illness at a lower than anticipated altitude. The medication below is recommended for any trips above 2000m

Medications			
Dexamethasone (IM)	4mg/2ml	2	8mg IM then 4mg 4 times/day - HACE unconscious
Salbutamol inhaler	200 doses	1	2 puffs inhaled for relief of asthma/wheeze/shortness of breath
Azetazolamide (= Diamox))	250mg	10	1 tab twice a day for altitude sickness
Dexamethasone	2mg	10	4 tabs then 2 tabs four times a day for HACE
Nifedipine retard	20mg	7	1 tab twice a day for HAPE