Clinical Topics

Medical equipment for expeditions

ROBIN ILLINGWORTH

Each year more than 200 expeditions leave Britain to travel to destinations around the world, to climb mountains, explore jungles, to study plants or beetles, and to seek excitement and adventure. Expeditions may differ greatly in size, duration, objectives, and activities, but none can avoid the possibility of accident or illness. Most expeditions have no major medical problem. Nevertheless, any injury or disease that does occur may be more serious and difficult to manage because of the remoteness that is an essential part of an expedition.

Expedition medicine entails far more than just taking a first-aid kit and hoping not to have to use it. It is most important to prevent illness and injury whenever possible by adequate immunisations and antimalarial prophylaxis, careful attention to the cleanliness of food and water, safety precautions during potentially dangerous activities, and general common sense. Dental and medical check-ups will be needed before departure, plans must be made for emergency evacuation if necessary, and full medical insurance arranged. These and other aspects of expedition medicine have been discussed elsewhere.[1-3]

Even with the best preventive medicine, however, a medical kit is essential. This paper is the result of experience gained from expeditions and mountaineering in four continents and of organising medical equipment for more than 60 expeditions. Most of these have been run by the Brathay Exploration Group for young men and women aged 16-22, with older leaders, to remote parts of Scotland, Norway, Iceland, Greenland, Canada, Kenya, Borneo, and elsewhere (figs 1-3). This experience may be useful to others planning similar ventures.

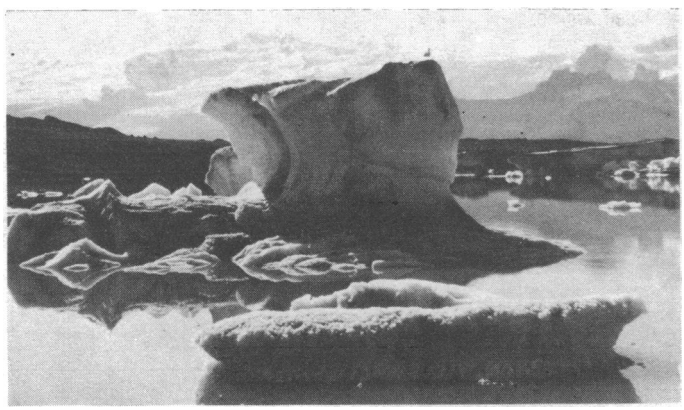

FIG 1—Jokulsa lake and Vatnajokull icecap, South-east Iceland. Highest point of icecap is Hvannadalshnjukur, 2119 m, which was climbed by the Brathay Iceland expedition, 1979.

FIG 2—Kiagtut Sermia glacier, South Greenland. (Brathay Greenland expedition, 1969.)

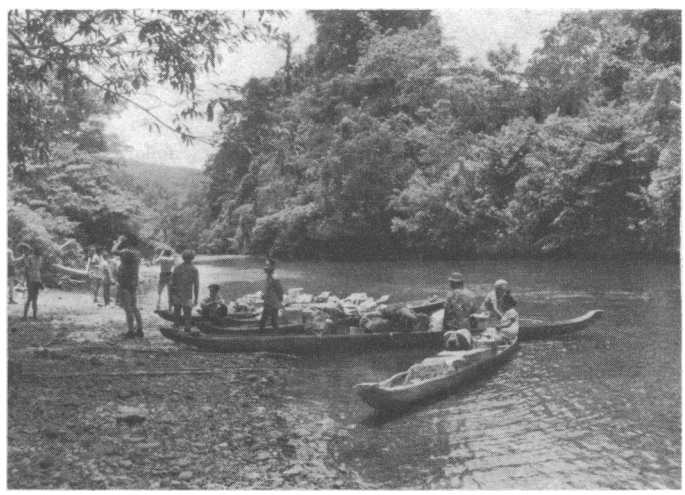

FIG 3—Expedition equipment in dug-out canoes on Karamuak River, Borneo. (Brathay expedition to Sabah, 1977.)

Accident and Emergency Department, General Infirmary, Leeds LS1 3EX

ROBIN ILLINGWORTH, BM, MRCP, senior registrar (also honorary medical adviser to Brathay Centre for Exploration and Field Studies, Old Brathay, Ambleside, Cumbria LA22 0HN; present address: Accident & Emergency Department, St James's University Hospital, Leeds LS9 7TF)

Planning the kits

Organising the medical kits for an expedition takes a lot of time and trouble if it is done properly. It is difficult to decide what to take, and what not to take, especially on a small expedition travelling in a remote area and carrying all its equipment. A larger expedition can carry

more medical equipment, but however much is taken one cannot possibly deal with every conceivable accident or illness that might occur. If a medical kit is too large and heavy it is likely to be left behind and so will not be available when needed. With careful planning, however, most common conditions may be treated without outside help, and first aid for more serious problems may be given if necessary.

The medical kits will probably be needed most often for blisters, minor cuts and sprains, headaches, sunburn, insect bites, and diarrhoea. Whether visiting the arctic or the tropics, the sea, desert, or mountains the same injuries may occur and the same basic medical kits can be used. Nevertheless, extra drugs or equipment may be needed to deal with particular hazards of the expedition's area or activities. Advice from previous visitors to the area may be most useful.[4 5]

How much equipment to take will depend on many factors, such as the remoteness from medical aid, the size and organisation of the expedition (especially the number of camps and the travelling time between them), and the medical skills of the party. Accidents are most likely to happen in bad weather when travel is difficult. The time needed to get help is more important than the distance to a doctor or hospital, and in a remote area the nearest hospital may be small and poorly equipped. There is no point in taking drugs and equipment if no one knows how to use them, but sometimes advice may be obtained by telephone or radio and evacuation of a patient may not be necessary if the relevant medical supplies are available.

PERSONAL MEDICAL KIT

Each expedition member should take some personal medical equipment, including Elastoplast or similar dressings, a crepe bandage, and also sun cream, lip salve, insect repellant, and foot powder as required. Anyone taking a drug regularly should carry the main supply and someone else look after a reserve stock.

While travelling to the expedition area the main medical kits may be packed and inaccessible. It is useful to have available a small kit containing a few dressings, tablets for headaches, diarrhoea, and travel sickness, and water-purifying tablets.

EXPEDITION MEDICAL KITS

Recommendations for communal medical equipment are based on kits used on Brathay expeditions. A typical expedition of 20 people (without a doctor) for three weeks in South-east Iceland might have one "base-camp kit," one or two "mobile-camp kits," and four "field kits."

Field kit (table I)—Basic first-aid equipment for a small party away from camp for a day contained in a plastic box $11 \times 11 \times 7$ cm that weighs 260 g. The total cost in 1980 is about £4. When items are used the kit may be replenished from the base-camp kit.

Mobile-camp kit (table II)—Intended for a small group away from base camp for a few days and carrying all their equipment it is in a plastic box $23 \times 13 \times 8$ cm and weighs 680 g. The total cost in 1980 is about £9.

Base-camp kit (table III)—Designed as the main medical kit for an area such as Iceland where medical help is available within one or two days the kit is in a fibre-board box $40 \times 25 \times 13$ cm and weighs 3·9 kg. The total cost in 1980 is about £50. Part of the base-camp kit is the "accident kit," which contains equipment that might be useful at an accident away from camp. This should be kept intact at the top of the box where it may be found quickly in an emergency.

TABLE I—*Field kit contents*

Item	Amount
Plastic box and list of contents	1
Large plain wound dressing, No 15 *BPC*	1
Triangular bandage	1
Melolin non-adherent dressing 10× 10 cm	1
Elastoplast Airstrip dressings, assorted sizes	12
Zinc oxide plaster, 1·25 cm× 5 m	1 roll
Injection swabs (for cleaning small wounds)	6
Blood lancets (for blisters or splinters)	2
Safety pins	2
Scissors	1 pair
Paracetamol tablets	10
Mountain rescue message form	1
Pencil	1

TABLE II—*Mobile-camp kit contents*

Item	Amount
Plastic box and list of contents	1
Large plain wound dressing, No 15 *BPC*	1
Medium plain wound dressing, No 14 *BPC*	1
Triangular bandage	1
Elastic adhesive bandage, 7·5 cm	1
Melolin non-adherent dressing, 10× 10 cm	2
Elastoplast Airstrip dressings	12
Steristrip, 6·3 mm× 10·2 cm	1 packet of 10
Zinc oxide tape, 2·5 cm× 5 m	1 roll
Savlon antiseptic concentrate, 10 ml sachets	2
Plastic dressing forceps, sterile	1 pair
Gauze swabs, 7·5× 7·5 cm, packets of 5	3 packets
Injection swabs	10
Safety pins	4
Paper clip (for subungual haematoma)	1
Blood lancets	2
Scissors	1 pair
Thermometer	1
Cotton-wool-tipped sticks	4
Paracetamol tablets, 500 mg	20
Co-trimoxazole tablets	20
Chlorpheniramine tablets, 4 mg	20
Codeine phosphate tablets, 30 mg	50
Amethocaine eye drops, 1%, single dose	2
Fluorescein strip	1
Chloramphenicol eye ointment	1 tube
Buprenorphine (Temgesic) 0·3 mg ampoules	4
Syringe 2 ml	2
Needles 38× 0·8 mm	4
Emergency message form, pencil, notebook	1
Instructions on use of drugs and dressings	

TABLE III—*Base-camp kit contents*

Item	Amount
Accident kit (in a polythene bag with list of contents)	
Large plain wound dressing, No 15 *BPC*	2
Medium plain wound dressing, No 14 *BPC*	2
Small plain wound dressing, No 13 *BPC*	2
Triangular bandage	4
Melolin non-adherent dressing, 10× 10 cm	4
Crepe bandage, 10 cm× 5 m	2
Elastic adhesive plaster, 2·5 cm× 4·5 m	1 roll
Safety pins	6
Scissors	1 pair
Buprenorphine (Temgesic) 0·3 mg	10 ampoules
Syringe 2 ml and needle 38× 0·8 mm	10
Injection swabs	10
Instructions for using buprenorphine	
Luggage label	2
Emergency message form and pencil	1
Books and instructions (in a polythene bag)	
Medical Care for Mountain Climbers[16]	
Mountain Hypothermia leaflet[17]	
Instructions on use of drugs and dressings	
List of contents of medical kits	
Notebook and pencil	
Dressings and bandages (in a polythene bag with list of contents)	
Injection swabs	12
Savlon antiseptic concentrate, 10 ml sachets	10
Cotton-wool balls, sterile, packets of 5	10 packets
Gauze swabs, 10× 10 cm, packets of 5	10 packets
Melolin non-adherent dressing, 10× 10 cm	10
Melolin non-adherent dressing, 5× 5 cm	10
Bactigras dressing, 10× 10 cm	10
Elastoplast Airstrip dressings, assorted sizes	60
Elastoplast dressing strip, 6·3 cm × 1 m	1
Steristrip, 6·3 mm× 10·2 cm	3 packets
Elastic adhesive bandage 7·5 cm× 4·5 m	1 roll
Zinc oxide plaster, 2·5 cm× 5 m	1 roll
Tubigrip, size C	1 metre
Tubigrip, size D	1 metre
Conforming bandage (Krinx or Kling) 7·5 cm	3
Eye bath	1
Cotton-wool-tipped sticks (for removing objects from eyes)	10
Eye pad, sterile, No 16 *BPC*	2
Drugs and instruments (in a plastic box with list of contents)	
Scissors	1 pair
Splinter forceps	1 pair
Dressing forceps, plastic, sterile	2 pairs
Blood lancets	6
Disposable scalpel, No 15 blade	1
Paper clip	1
Safety pins	6
Thermometer, centigrade	1
Calamine cream	2 tubes
Paracetamol tablets, 500 mg	50
Throat lozenges	20
Antacid tablets	50
Codeine phosphate tablets, 30 mg	100
Senokot tablets	20
Chlorpheniramine tablets, 4 mg	50
Co-trimoxazole tablets	50
Dihydrocodeine tablets, 30 mg	50
Otrivine 0·1% nasal spray	1
Amethocaine 1% eye drops, single dose units	3
Homatropine 2% eye drops, single dose units	2
Fluorescein strips (Fluorets)	2
Chloramphenicol eye ointment 1%	1 tube
Vioform-hydrocortisone cream	1 tube
Emergency dental filling (Provipast)	1 tube

EXTRA DRUGS AND EQUIPMENT

Many expeditions will need extra drugs and equipment in addition to those in the standard kits. For example, the Brathay expedition to Borneo in 1977, with 18 expedition members plus local guides and porters, took two base-camp kits, one mobile-camp kit, five field kits, and four extra boxes of drugs, intravenous fluids, plaster of Paris, and other items: the total weight of medical kits was 28 kg and their value about £300 (fig 4). On a larger expedition much more equipment may be taken.[6] Even if there is a doctor or nurse on the expedition they may not be available immediately, so the best basic medical kit is one that anyone can use if necessary with a separate kit for the doctor's use only.

Suturing equipment and local anaesthetic may be necessary for closing wounds, and could be used by non-medical people with suitable training. Extra drugs may be needed if anyone is allergic to a drug in the standard kits, or has a pre-existing condition such as asthma. Injectable antibiotics and ampoules of hydrocortisone, glucose, diazepam, and an antiemetic may occasionally be useful.

Other items of equipment that might be taken if there is a doctor in the party are an oropharyngeal airway, stethoscope, auroscope and ophthalmoscope, urethral catheter, nasogastric tube, chest drainage catheter and Heimlich valve for pneumothorax, and dental equipment.[7] Intravenous fluids are heavy but indispensable in the event of major trauma or severe illness: the most useful are probably saline, dextrose, and Haemaccel (Hoechst).

Splints are fortunately needed rarely, and on most expeditions materials for making makeshift splints will be available. The most useful splint is a "long leg" splint for fractures of the tibia. Simple and cheap splints of padded cardboard made by Akla of Sweden are available from Marshall's Mountain Equipment, 306 George Street, Aberdeen AB1 1HL. Inflatable splints are effective for some fractures but may cause problems due to pressure on the skin; they are also liable to punctures and to changes in pressure due to temperature and altitude. Plaster of Paris is useful to make "backslabs" for fractured limbs. The most convenient form is the Gypsona "emergency splint pack" (Smith & Nephew Ltd).

Some expedition doctors take enough equipment for an emergency appendicectomy, but in fact non-operative treatment of appendicitis with fluids, analgesics, and antibiotics is safer than emergency surgery outside hospital.[8,9] Fluids could be given by rectum if intravenous fluids are not available. If injections of antibiotics can be given the combination of gentamicin and clindamycin is recommended, but if only oral drugs can be used co-trimoxazole with clindamycin or metronidazole should be effective.

If anaesthesia is contemplated Boulton's article[10] is essential reading. Local anaesthetic techniques could be useful for minor surgery. Ketamine is possibly the most suitable drug if general anaesthesia is unavoidable.

Special hazards of particular areas

In the tropics infectious diseases are common, especially malaria and gut infections. Even if antimalarial prophylaxis is taken regularly drugs for treating malaria must be available: in West Africa tablets and ampoules of chloroquine, and in East Africa, Asia, or South America quinine and pyrimethamine and sulphadoxine (Fansidar) as well as chloroquine. Metronidazole is useful for amoebiasis or giardiasis, chloramphenicol for typhoid, and piperazine for intestinal worms. Gastroenteritis is a major problem in hot countries: fluid may be replaced by oral glucose and electrolyte solution made from sodium chloride and dextrose compound powder, *BPC*, or by a solution of sugar and salt measured with a special plastic spoon.*

In hot areas, especially tropical rain forests,[11] wound infections are common. Mercurochrome solution painted on minor abrasions should help to reduce infection, but many people may need treatment with oral antibiotics, such as flucloxacillin or erythromycin. Fungal skin infections may need Whitfield's ointment or clotrimazole cream, and clotrimazole vaginal tablets are useful for women suffering from candidiasis. Snake bite is rare if sensible precautions are observed: few expeditions need to carry antivenom, but expert advice about this should be obtained in high-risk areas.[12]

Mountaineering expeditions are likely to suffer from sun, cold, and high altitude.[13,14] Many throat lozenges may be needed, and codeine phosphate helps the dry cough of altitude. Mountain sickness is treated by descent, but frusemide may help pulmonary oedema and dexamethasone cerebral oedema. Piles can be incapacitating at high altitude, but ointment and suppositories provide some relief. Sleeping tablets may be needed: a short-acting drug such as triazolam (Halcion) is the most suitable.

Sailing parties may suffer from chapped hands, salt-water boils, and excessive sun.[15] Lanolin hand cream may be needed in large quantities. Hyoscine or cinnarizine tablets often prevent sea-sickness but occasionally injections of an antiemetic are required. Salt and water depletion is common in the tropics: "slow sodium" tablets (Ciba) are the most palatable form of salt. Fractures or scalds may occur while sailing in bad weather. Falling overboard is likely to be fatal, so safety harnesses must be worn.

Diving expeditions share the same problems of exposure to sun and water, and otitis externa is common, especially if swimming near coral. Olive oil drops and antibiotic ear drops should be available.

*Available from TALC, Institute of Child Health, 30 Guilford Street, London WC1N 1EH.

FIG 4—Expedition medical kits in Borneo. (Brathay expedition to Sabah, 1977.)

Treating the local people

In a remote area the local people are likely to ask an expedition for medical help, especially if there is a doctor in the party. The drugs most often needed are analgesics, antibiotics, antimalarials, and in some areas vitamins. Many of the patients will be children, and suitable doses of important drugs must be available. Small polythene bags are useful for dispensing tablets.

Packing the kits

All the medical kits must be carefully packed before departure so that the contents are protected from trauma, dirt, and water but items can be found when needed. Tablets should be taken in plastic screw-topped containers labelled with the official and trade names of the drug and with the labels covered by waterproof tape. Full instructions must be available for all drugs.

During the expedition it is best if one person looks after the kits, but everyone must know what is available if an emergency occurs. In many accidents the first-aid kit is less important than shelter, food, and water.

Conclusion

Expedition medicine entails far more than just taking a medical kit, but this is important and may take much planning. Fortunately most expeditions have no serious medical problem, and, unless the doctor or his companions are ill or injured, travelling as an expedition doctor may be a most enjoyable holiday.

I am grateful to many people for information and advice about expedition medicine and for supplying items for medical kits. Suggestions for improvements in the medical kits will be welcome.

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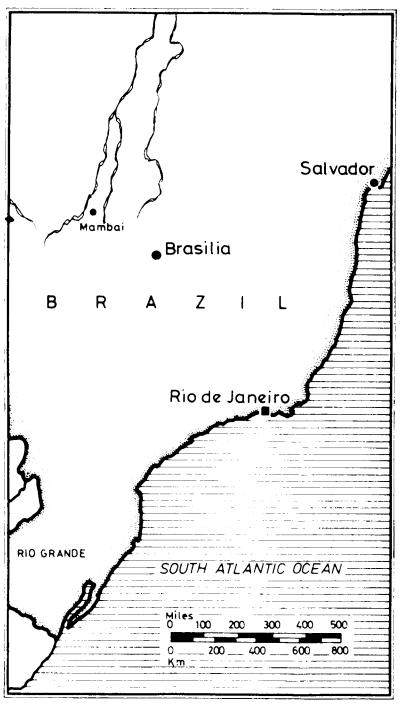
My Student Elective

Chasing bugs in Brazil

SIMON WESTON SMITH

Our little house in Brazil saw the first signs of life at the unfortunate hour of five in the morning. Three bodies stumbled out to eat a breakfast of coffee and cakes before the crashing of gears and clouds of dust announced the arrival of Domingos in a vehicle which had once passed as a jeep. Armed with torches, forceps, and little wooden boxes with clip-on lids, these three bodies then clambered into this mechanical miracle and with more roaring, crashing, and dust we would hurtle down the road out of the village of Mambai into the surrounding countryside. Five or six hours later Mambai would once again tremble as Domingos hurled the blue jeep up the hill and around the corner into "High Street," stopping to disgorge the three bodies which had embarked earlier that morning, now covered from head to toe in dust and bruises, but still carrying torches, forceps, and little wooden boxes with clip-on lids.



This troubled village of Mambai lies not far from the centre of Brazil, about 400 km north-west of the city of Brasilia, and these three bodies, which plagued this village for two-and-a-half months during the summer of 1979, belonged to two fellow students and myself. We were driving around Mambai not with the intention of terrifying the local inhabitants, but rather with the aim of studying the epidemiology of Chagas's disease, otherwise known less colourfully as South American trypanosomiasis.

St Thomas's Hospital Medical School, London SE1
SIMON WESTON SMITH, medical student

No rain but plenty of water

Mambai is the central village of a municipality of about 1000 houses and 5000 people spread over about 2000 km². The area is largely uncultivated yet bears no similarity to the landscape most people associate with wild Brazil. There are no Amazonian rain forests and no daily tropical rain storms; instead, Mambai is an area of sparsely spread trees and shrubs without rainfall for most of the year. Surprisingly, however, the land is crossed by ever-flowing palm-lined streams which receive their water from vast underground lakes.

These plentiful supplies of water throughout the year make irrigation feasible; however, it is used to only a limited extent, and the landowners of Mambai are generally content with their non-intensive farming. Indeed, there is no market for the goods they might be able to grow, as transport to any centres of industrialisation is exceedingly difficult. But things are changing and the German owner of a ranch covering some 400 km² of Mambai looked forward to rearing large numbers of cattle on a well-irrigated stretch of land and driving the produce for sale in Brasilia.

The people of Mambai are enormously varied in origin. The majority are of Portuguese extraction, but there are negroes who have moved west from the sugar plantations on which their fathers worked as slaves. The picture is further complicated by Northern European missionaries, whose enthusiastic proselytism seems to have produced some fair blue-eyed children among the dark-skinned Portuguese families. All the families, however, live a similar way of life in their mud-brick or wood-and-palm houses. A few cattle are raised; rice, maize, coffee, and cotton are grown; and sugar cane is crushed, fermented, and distilled to make a potent brand of rum known as *pinga*. In Britain house-to-house surveys might be met by offers of cups of tea, but in Mambai we were given liberal quantities of this lethal spirit.