

## ORIGINAL ARTICLE

# Patterns of illness and injury encountered in amateur ocean yacht racing: an analysis of the British Telecom Round the World Yacht Race 1996–1997

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**Objectives:** To quantify the incidence and type of medical problem arising during an amateur circumnavigation yacht race, the BT Global Challenge.

**Methods:** All cases from 14 participating yachts in a confidential medical log completed by an appointed medic were reported.

**Results:** A total of 685 cases were reported, of which 299 (43.6%) were injuries and 386 (56.4%) illnesses. The subtype of injury, illness, and three evacuations at sea are described.

**Conclusion:** Injury and other forms of medical problem are relatively common in an amateur long distance ocean yacht race. Most can be adequately managed at sea, provided that optimal communication, training, and equipment are provided and maintained.

Ocean yacht racing is no longer the realm of experienced, professional, and predominantly male participants, but is increasingly accessible to amateur enthusiasts of both sexes, almost all ages, and to those of mixed ability. Safety remains an issue encompassing accident prevention, safety equipment, management of accidents and emergencies, and the role of the rescue services at sea. In this paper we document the medical aspects of an amateur trans-globe yacht race, The British Telecom (BT) Global Challenge. There is a lack of literature in this area, in particular information on medical complications encountered in offshore racing yachts. Although some articles give a broad overview of the role of crew medics,<sup>1</sup> few articles address the problem quantitatively. We hope to show that such a race can be undertaken by a predominantly amateur crew, while ensuring that safety is not unduly compromised.<sup>2</sup> Such principles are specifically directed towards improving the outcome of medical and surgical problems arising at sea. Such a race provided a source of data, as a medic aboard each yacht kept confidential medical records throughout the race; this is something that has not been achieved in other international yacht races. In addition, the race was an appropriate forum for such a study given its 10 month duration, its course, and the weather conditions encountered.

## METHODS

This report surveys incidence of injuries and illnesses on the BT Global Challenge September 1996 to July 1997. Over 300 amateur sailors on 14 identical (monotype with identical deck and cockpit layouts) yachts sailed in the race, and no participant was excluded from analysis. Each yacht had 14 crew, of whom one was a professional skipper alongside 13 amateurs including two additional crew for each leg of the race. Each amateur crew member paid a berth fee of £18 000 for completion of the entire race, and a pro rata rate was applied to individual leg participants. Minimum and maximum age was 21 and 60 years respectively. A total average circumnavigation time at sea was 170 days, representing 2380 crew days. From a total of 365 participants, 283 male and 82 female, 140 circumnavigated, with the remaining 225 completing between one and five legs of the race. Crew volunteers had undergone a core sail training of variable duration before the race. Subsequently, all crew trained with individual professional skippers

who remained solely responsible for training and safety throughout the race. A health questionnaire was sent to all participating crew volunteers before the race, and the race organisers reviewed the results. Each crew member had to provide a written report from their general practitioner or hospital consultant certifying that they were medically fit to participate. The fleet doctor and/or yacht medic followed up specific problems without reference to physical examination. A list of recommended vaccines was provided along with general guidelines for personal hygiene and wellbeing at sea. All crew were declared fit to sail before departure including the disabled crew of the yacht Time and Tide (T&T). Before the race, few volunteers were refused, although some withdrew after initiation sails. A medic was appointed on a voluntary basis to each yacht, coordinated by qualified offshore and onshore medical officers. Each medic had to be able to cannulate peripheral veins, suture, administer intravenous fluids/intramuscular drugs, insert chest drains, plaster limbs, strap joints, and have advanced life support skills. Medical representatives consisted of six doctors, seven nurses, and one dentist. Medics came from a wide variety of clinical training before the race. The medically qualified medics were exempted from specific training, with the remainder attending expedition orientated courses with an emphasis on management of trauma. Where appropriate, the doctors within the fleet gave training to non-medically qualified personnel. An offshore provision was made for any medic to discuss medical problems with another medic or fleet doctor or to gain advice via the Inmarsat satellite fax from a senior doctor at The Royal Naval Hospital, Gosport, Haslar, UK. (Subsequent races have used the Remote Health Centre, Accident & Emergency Department, Derriford Hospital, Plymouth, UK.) All medics had regular meetings to discuss progress on training, provision of care at sea, the contents of the medical kit, and, at the end of each leg, to debrief specific problems and coordinate appropriate speciality referrals. Each medic completed a confidential log to include all crew and themselves on all aspects of medical care. A case was defined as any one medical incident that the boat medic recorded. All data from all logs, including those of disabled crew members of T&T, and incomplete logs were included. Data were broken down into systems for each individual yacht as shown. The category denoted "Other" included rarer medical complications and specifically those applicable

**Table 1** Medical exclusions based on information gathered from the questionnaire completed before the race

|   |
|---|
| Ischaemic heart disease, bypass grafting or angioplasty |
| Symptomatic bronchial asthma                            |
| Long term medication such as warfarin                   |
| Single kidney and transplant recipients                 |
| Colostomy or ileostomy                                  |
| Active malignancy                                       |
| Progressive neurological disease                        |
| Psychiatric disease                                     |
| Insulin dependent diabetes                              |
| Pregnancy   |

to T&T. Statistical assessments were made for injury incidence for particular yachts or legs of the race;  $p < 0.05$  was deemed significant.

## RESULTS

Table 1 gives reasons for excluding potential volunteers on the basis of the questionnaires completed before the race.

The results of all logs were analysed. No deaths of crew members were recorded, and three medical evacuations occurred. Two involved the Royal Navy to evacuate to the nearby Falkland Islands and one to the island of St Helena.

Three of the 14 logs were incompletely filled out when there was a change of appointed medic between legs. A total of 685 cases were reported over a six month period at sea. The largest category, comprising 43.6% (299/685) of all cases, was attributable to injury. Tables 2 and 3 give type and incidence of cases. Legs 2 and 4 of the race were predominantly spent in the Southern Ocean where the roughest sea conditions were encountered. These two legs had significantly more injuries than the other legs of the race (Wilcoxon signed rank test, two sided  $p$  value = 0.018). Within each leg, each dated case recorded was allocated to a tertile (first, middle, or last third on a chronological basis for each individual yacht) to allow analysis of injuries occurring at different time points. Excluding the shortest leg (leg 3, Wellington to Sydney, five days), Friedmans non-parametric rank test showed a significant

trend towards higher injury rate at the beginning than the end of each leg ( $p = 0.03$ , 95% confidence interval 0.024 to 0.033).

## Injuries on board

Abrasions and contusions featured most prominently (108/299; 36.1%), and were treated with a combination of support, non-steroidal anti-inflammatory drugs, and basic support techniques. T&T did not have a significant excess of injuries ( $p = 0.14$ ; Kolmogorov-Smirnov test based on 13 totals excluding T&T and T&T's total number of injuries). Cases were minor and required no onshore medical follow up. Burns, including thermal, rope, and sun, made up 15.7% (47/299) of injuries (fig 1). Fractures comprised 11.0% (33/299) of injuries and were all closed. Types of fracture included ribs, clavicle, wrist, and tibial plateau. Suspected fractures, where there was persistent pain or disability, were confirmed radiologically ashore. After immobilisation, analgesia was achieved using tramadol and non-steroidal anti-inflammatory drugs. Some 11.0% (33/299) of injuries were lacerations, and a low threshold for suture as a means of primary closure was adopted, particularly in cold or wet conditions. One case of division of the finger extensor tendon was managed by primary suture and wound closure. Damage to cartilage, ligament, or tendon made up 9% (27/299) of injuries; these were dominated by ligament problems, which were immobilised when severe.

Head injuries were relatively common (20/299, 6.7%), but no loss of consciousness was documented. Some 8.4% (25/299) of injuries fell into the miscellaneous category consisting of foreign body (3/299), dislocation (3/299), blunt abdominal trauma (1/299), effusion/bursitis (11/299), and crush injuries (7/299). Three cases of olecranon bursitis were described, which were treated with early aspiration, compression, and early introduction of oral broad spectrum antibiotics. Figure 2 gives a breakdown of injuries according to anatomical location.

## Illnesses on board

Illnesses of various types accounted for 56.4% of all cases (386/685). Figure 3 illustrates the breakdown of illnesses by type. Eighty seven cases (22.5%) of disorders of the gastrointestinal or renal tract were documented, including three surgical emergencies which were all evacuated during the race. The three surgical emergencies evacuated were a case

**Table 2** Breakdown of all medical cases in BT Global Challenge Race 1996–1997

| Yacht name         | Neuro | Ophth | GI/renal | Flu/ENT/Resp | Derm./Absc | Seasick/Hypotherm | Trauma | Psych | Other | Dental | Total |
|--------------------|-------|-------|----------|--------------|------------|-------------------|--------|-------|-------|--------|-------|
| Motorola           | 0     | 0     | 19       | 0            | 16         | 11                | 34     | 0     | 0     | 4      | 84    |
| Group 4            | 0     | 0     | 4        | 4            | 6          | 0                 | 6      | 0     | 2     | 0      | 22    |
| PTR                | 5     | 2     | 1        | 5            | 5          | 7                 | 24     | 0     | 0     | 0      | 49    |
| Toshiba            | 6     | 2     | 12       | 8            | 10         | 15                | 21     | 0     | 2     | 0      | 76    |
| Concert            | 1     | 0     | 0        | 1            | 0          | 0                 | 9      | 0     | 1     | 0      | 12    |
| Courtaulds         | 1     | 0     | 3        | 2            | 0          | 3                 | 8      | 1     | 1     | 0      | 19    |
| Nuclear            | 1     | 0     | 0        | 1            | 1          | 0                 | 5      | 0     | 0     | 0      | 8     |
| Heath              | 1     | 1     | 4        | 5            | 3          | 0                 | 25     | 0     | 1     | 1      | 41    |
| Time + Tide        | 0     | 1     | 7        | 8            | 11         | 10                | 55     | 0     | 10    | 4      | 106   |
| STC                | 1     | 0     | 16       | 11           | 8          | 8                 | 38     | 0     | 9     | 1      | 92    |
| 3 COM              | 1     | 1     | 11       | 14           | 9          | 1                 | 26     | 0     | 6     | 4      | 73    |
| Comm Union         | 0     | 1     | 2        | 6            | 5          | 1                 | 17     | 0     | 2     | 2      | 36    |
| Rover              | 0     | 4     | 6        | 4            | 6          | 1                 | 18     | 0     | 2     | 0      | 41    |
| Global T           | 0     | 2     | 2        | 4            | 2          | 3                 | 13     | 0     | 0     | 0      | 26    |
| Total              | 17    | 14    | 87       | 73           | 82         | 60                | 299    | 1     | 36    | 16     | 685   |
| Mean               | 1.21  | 1.00  | 6.21     | 5.21         | 5.86       | 4.29              | 21.36  | 0.07  | 2.57  | 1.14   | 48.93 |
| Standard deviation | 1.89  | 1.18  | 6.05     | 3.96         | 4.62       | 4.98              | 13.99  | 0.28  | 3.37  | 1.50   | 31.78 |

Neuro, Neurological disorder; Ophth, ophthalmic disorder; GI, gastrointestinal; ENT, ear, nose and throat; Resp, respiratory disorder; Derm, skin disorder; absc, abscess; Hypotherm, hypothermia; Psychol, psychological disorder.  
Yachts: PTR, Pause to Remember; Courtaulds, Courtaulds International; Nuclear, Nuclear Electric; Heath, Heath Insured; STC, Save the Children; Comm Union, Commercial Union; Rover, Ocean Rover; Global T, Global Teamwork.

**Table 3** Injuries and illnesses in Whitbread Round the World Yacht Race 1997–1998

| Injuries              | Number of cases | %    | Illnesses           | Number of cases | %    |
|-----------------------|-----------------|------|---------------------|-----------------|------|
| Cervical pain         | 31              | 14.2 | Cracked skin        | 63              | 31.2 |
| Low back pain         | 51              | 23.4 | Gunwhale bum        | 50              | 24.8 |
| Shoulder pain         | 37              | 17.0 | Infected skin sores | 14              | 6.9  |
| Lateral epicondylitis | 14              | 6.4  | Fungal rash         | 35              | 17.3 |
| Medial epicondylitis  | 16              | 7.3  | Frost bite          | 14              | 6.9  |
| Wrist pain            | 37              | 17.0 | Burns               | 10              | 5.0  |
| Anterior knee pain    | 13              | 6.0  | Dental              | 10              | 5.0  |
| Ankle/foot pain       | 19              | 8.7  | Ear infections      | 6               | 3.0  |
| Total                 | 218             |      |                     | 202             |      |

Taken from Spalding T and Rodrigues R 2001.

of haematuria (no follow up information available), malaena stool with past history of peptic ulceration (active ulceration and bleeding not confirmed endoscopically), and acute appendicitis (subsequently confirmed and appendix removed). More than half (44; 51%) of the cases were gastroenteritis, which included one cluster. There were 21 (24%) cases of dyspepsia/gastritis, which were all managed with oral alkaline suspensions and/or ranitidine. In addition, there were nine (10%) cases of constipation, four (5%) of perianal pain/haemorrhoids, two urinary tract infections, two inguinal hernias, one complication of previous abdominal surgery, and one case of non-specific abdominal pain.

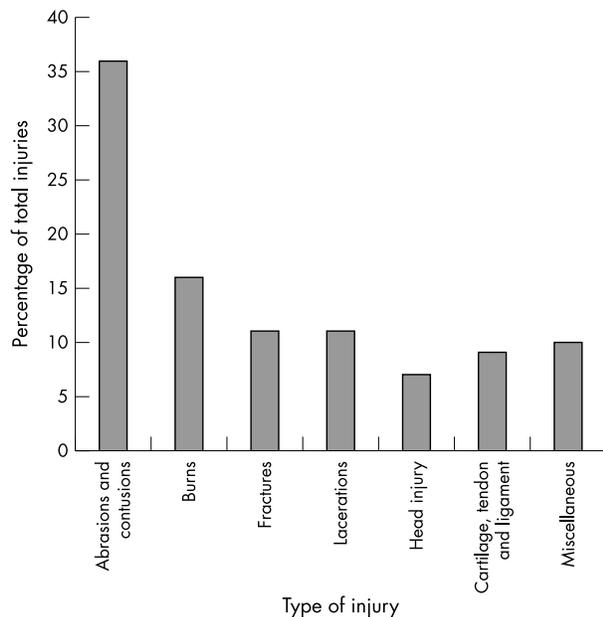
Dermatological conditions comprised 21.2% (82/386) of medical cases at sea. The case mix within this category included boils, “gunwale” bottom, and eczema; all were treated with basic hygiene methods (often lacking on boats), oral antibiotics, and/or topical steroid ointment.

Seventy three (18.9%) ENT/flu/respiratory cases were recorded, 51 of which were upper respiratory tract infections. Additional cases included middle ear infection and earwax. A case of suspected spontaneous pneumothorax was diagnosed by a doctor in a tall thin man aged 25 years with a past history of a small (<20%) pneumothorax; he was carefully observed and conservatively managed. Subsequent chest radiograph showed no residual collapse.

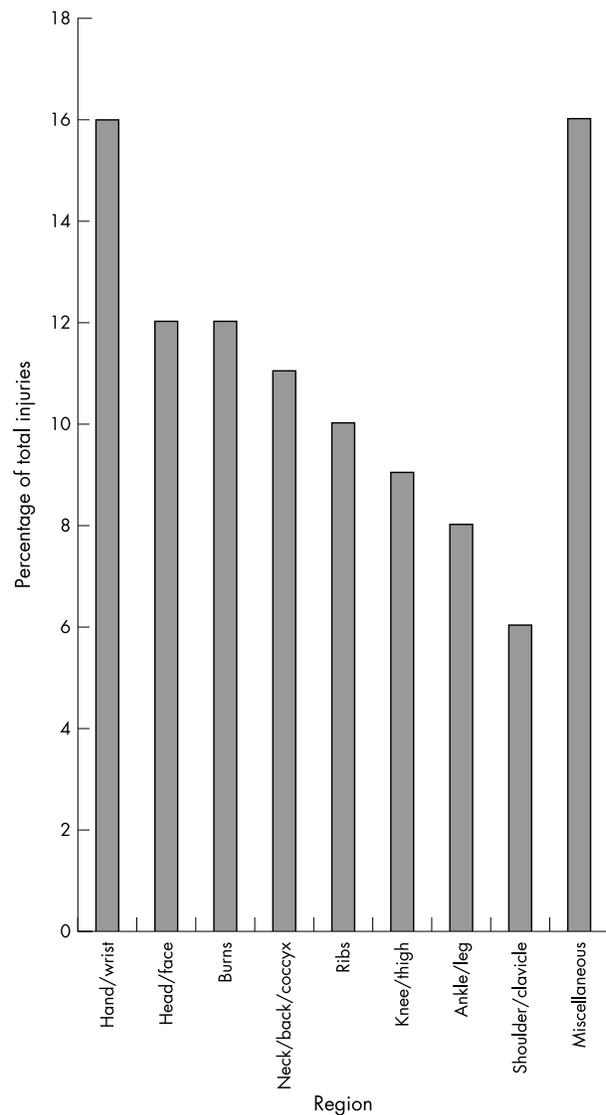
Seasickness accounted for 60 (15.5%) cases and was probably underestimated where mild symptoms were unre-

ported or where such an affliction was not deemed a medical case. Broad ranges of antiemetics were used in prophylaxis and treatment, and were minimally effective. No cases of significant hypothermia were recorded.

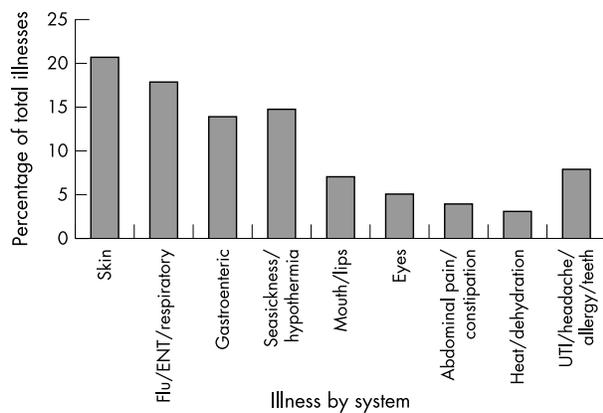
Neurological problems (17; 4.4%) were predominated by headaches, including migraine, one posterior interosseus nerve lesion following a contusion from a flogging sheet while



**Figure 1** Subtype of injuries as a proportion of total injuries sustained throughout the British Telecom Global Challenge 1996–1997.



**Figure 2** Breakdown of injuries according to anatomical region as a proportion of total injuries sustained throughout the British Telecom Global Challenge 1996–1997.



**Figure 3** Illness breakdown by system as proportion of total illnesses. UTI, Urinary tract infection; ENT, ear, nose and throat.

tacking (this patient was unable to complete the race), and one case of benign positional vertigo following head injury. One collapse of unknown cause was documented and subsequently diagnosed several months later as intracerebral pathology. One psychiatric case of “deck fright” following a heavy storm in the Southern Ocean, characterised by fear of being on deck especially at night, was treated with a short course of diazepam 5 mg three times a day and gradual reintroduction of general boat duties; the crew member left the yacht at the next port.

Dental problems accounted for 16 (4.1%) illnesses, of which 12 were related to gingivitis or decay, treated with analgesia and broad spectrum oral antibiotics. Four dental injuries were temporarily repaired using filler.

Fourteen (3.6%) ophthalmic complications were described, of which nine were infectious conjunctivitis, three related directly to contact lenses, two were dry eyes, and one sty. No corneal abrasions were described despite conditions in the Southern Ocean that would predispose to this. Anecdotal reports of sore eyes caused by high velocity salt spray, particularly while helming, were, however, common. No foreign bodies were observed. Chloramphenicol was the drug most often used for infectious conjunctivitis.

The remaining 36 (9.3%) miscellaneous cases reported included malignant melanoma, idiopathic oedema, drug reaction, phlebitis, and four amputation stump/sinus infections on T&T.

## DISCUSSION

The results set out the incidence of both injuries and illnesses encountered at sea on an amateur yacht race in which about six months were spent at sea. No deaths were recorded, which, in the context of duration and weather conditions encountered, indicated a level of commitment to safety from both organisers and crew. Despite three evacuations, most cases arising at sea were treated and managed at sea. Two of the three evacuations were necessary because of undisclosed information requested in the medical questionnaires completed before the race, and the third evacuation was for a newly developed diagnosis of appendicitis. We do not support the empirical need for prophylactic appendicectomy and question the value of obtaining confidential medical reports from volunteer’s general practitioners because the majority are fit and well and steps may be taken by highly motivated crew volunteers to obscure or not relate medical information. Table 1 gives proposals for medical exclusions for such races, but it is recognised that this list is not exhaustive and each case should be professionally and individually evaluated. The figures represent incidence and hence give an assessment of the number of new cases observed at sea. We recognise the

level of reporting bias on behalf of each crew medic but have included all available information. At present, no international regulation requires a vessel to provide medical or paramedical personnel on board; this study cannot confirm the absolute necessity of such provision, but goes some way to establishing the relation between them and the appropriate provision of medical care at sea. Furthermore, this study confirms that non-medical personnel can provide such care when appropriate support and training is given. A lack of similar studies prevents comparison of medical cases in this race, but subjects for future comparison would include professional yacht races and amateur yacht rallies.

Experience gleaned from the British Steel Challenge 1992–1993 race suggested that the type and site of injuries were predictable where danger areas are identified—that is, foredeck, galley, winches, and helm—and that such injuries increased with wind strength and sea state.<sup>3</sup> The figures presented are broadly in line with findings in *Merchant Seaman*<sup>4</sup> with respect to incidence and type of injury, although direct comparison is not possible. It is speculated that a number of factors may contribute to the relatively high incidence of injuries observed. These may include the amateur nature of the race—that is, relative inexperience, relatively high incidence of disability aboard T&T, night and rough sea conditions. Surprisingly, given the number and severity of disabilities, T&T did not have an appreciably greater proportion of injuries, and this may indicate a high level of safety commitment. A reduction of injury incidence towards the end of each leg also suggests a learning effect, even accounting for variations in weather. In particular, the use of waterproof clothing during heavy weather in the galley was emphasised, in addition to the use of gloves in cold/wet weather and when handling rope under high tension—for example, when trimming spinnaker sails. Sailing gloves do afford protection, but those designed to give maximum dexterity provide inadequate protection against cold. Lacerations and abrasions, particularly on the hand or finger, commonly became infected, and, as suturing can be difficult under rough conditions, stapling devices will be added in future. Cases of olecranon bursitis were treated by needle aspiration, immobilisation, padding, strapping, and antibiotics. Two such cases in single hands have been reported, which resulted in delayed drainage, haemorrhage, and ulnar nerve damage.<sup>5,6</sup> Bursitis also occurred in the lower limb and may have been prevented by additional padding within foul weather salopettes. The main problems in the lower limb were knee injuries comprised of ligament, cartilage, or cruciate damage; we suspect that some of these injuries in participants with pre-existing joint problems may have been prevented with knee supports. Fractures of the shaft of femur remain a real prospect<sup>7</sup> and may become more common with increasing boat speeds; the Donway splint was included in the most recent race. Rib fractures were also commonly experienced in the Sydney Hobart race 1996–1997, during which very heavy weather claimed lives.<sup>3,8</sup> Both these types of injury raise the issue of administering prompt and adequate analgesia and the optimal route by which to do this.<sup>9,10</sup> Head injuries, which are most commonly caused by moving spars, the boom, and by spinnaker or jockey poles, are also an area of concern.<sup>11</sup> Twenty deaths from head injury have been recorded since 1947, and an analysis of 86 casualties from sailing disclosed that 14% were non-fatal head injuries caused by the boom, including facial and accompanying spinal fracture.<sup>12</sup> Such head injuries require expert management<sup>13</sup> and are deemed preventable with the use of protective headgear. Appropriate clothing on deck, in addition to minimising times exposed to cold or wet weather, accounted for the absence of reported cases of hypothermia. We speculate that mild hypothermia was underreported on the basis of unofficial verbal reports from crew members. Each crew member was provided with a set of Gore-tex offshore foul weather gear consisting of jacket and salopettes; informal

reports from the crew suggested that, although such equipment may have provided considerable protection from prevailing elements, it was not sufficient to maintain dryness in heavy weather, in particular on the foredeck. Unconfirmed observations suggest that a roughly equal numbers of injuries were reported in the cockpit and on the foredeck. In particular, helmsmen are exposed to high speed volumes of spray in the Southern Ocean, which may have accounted for a large proportion of injuries. Those on the foredeck were prone to injury, particularly when large waves broke over this area, although overall injury incidence was increased in the rougher weather legs. With the available data, clear relations between injury and type of activity or skipper personality cannot be established.

On comparison with the professional Whitbread Round the World Yacht Race 1997–1998 (table 3), some clear differences may be observed. Fewer serious injuries were reported, but a high proportion of minor injuries were observed. In particular, a high incidence of shoulder and cervical pain was common in helmsmen, which could have been remedied, in part, by retraining. Such differences in figures between professional and amateur yacht races may be accounted for by enhanced balance, optimal physical fitness, and sharper instinctive type reflexes.

Gastrointestinal ailments formed the largest group of illnesses, although in this study seasickness was considered separately. A quarter (24.5%) of cases were gastrointestinal, and this was one of the most common reasons for landing patients.<sup>4</sup> In our study, non-steroidal anti-inflammatory drugs may have contributed to this, prompting the suggested use of more selective cyclo-oxygenase type (COX2) inhibitors. An outbreak of gastroenteritis simultaneously affecting multiple crew members occurred in one yacht, and may have been caused by the water supply. Skin conditions were also common, probably the result of a combination of heat, damp, salt encrustation (in particular relating to wrist and neck seals on dry suits), and oilskin chaffing. Lack of fresh water facilities (one shower a week), crowding, and lack of personal hygiene were contributory factors. Gynaecological problems were on the whole unreported, for which there may be a number of reasons. A proportion of the female crew opted for continuous use of the combined oral contraceptive pill, effectively rendering them amenorrhoeic for each leg of the race. In addition, female crew members may have been reluctant to seek advice from non-medically qualified or male medics, particularly within the context of male crew predominance on most yachts. Respiratory conditions, particularly upper respiratory viral type infections, were the third most common and may have spread as result of close quarter living conditions. Care of the eyes is important in these conditions, and crew members should wear effective sunglasses in the sun, and helmsmen require visors or goggles for protection from high velocity spray. Seasickness has been studied previously,<sup>14</sup> and the pattern observed in this race appeared consistent with this. We observed that acclimatisation to motion appears to occur in most crew members within 72 hours, and anecdotally that acutely sick crew may be at increased risk of dehydration, hypothermia, and possibly injury. Female crew, and those who had migraine at sea, were more susceptible to seasickness.<sup>15</sup> Drugs administered orally had minimal effect, particularly on established sickness, when only parenteral treatment was at all efficacious. A formal relation between seasickness and injury remains unestablished.

Although “down time” is usually a term used for sails, it also applies to crew and some were “off watch” for as long as 21 days. This places added strain on the fit members which may lead to fatigue and ultimately exhaustion. This may be particularly relevant in heavy weather. Information with respect to watch systems run by individual skippers was closely guarded, although it is clear that watches at night and in heavier weather legs were generally shorter. Stampi<sup>16</sup> has

### Take home message

Medical problems aboard yachts in amateur ocean races are relatively common. Most can be dealt with on board, provided that crew medics are adequately trained and that optimal communication, training, and equipment are provided and maintained. Further research is required to establish optimal medical requirements for ocean based yachting.

recently studied sleep patterns observing the time honoured technique of “cat napping”. Given its potential to cause accident and loss at sea, it is appropriate that the International Maritime Organisation should include fatigue as a topic for further investigation, and this is increasingly recognised.<sup>17</sup> Psychological cases were rare, hence it is not possible to draw conclusions about how such illnesses correlate with factors such as weather, personality, or the presence of a sympathetic medic. However, we do acknowledge that certain symptoms such as fatigue may be a manifestation of psychosomatic illness, and that, in contrast with professional sailors, amateur crew members may have had differing attitudes and responses to certain situations at sea.

The medical equipment provided by the race organisers was adequate but continues to undergo constant development and updating for subsequent races. These kits were based on the statutory requirements of the Maritime and Coastguard Agency from the Merchant Shipping Notice (MSN 1726). Each yacht was supplied with category A kit (appendix A) with certain modifications, although cylinder oxygen was not carried. In future races, consideration will be given to molecular sieve converters. In view of the sophisticated on board communications systems available, the role of telemedicine should also be considered. We support the use of this technology and acknowledge its advantages,<sup>18</sup> but accept that it cannot replace a well trained medic with a comprehensive medical kit.

In summary, although a lot of cases have been reported in this race, a large proportion of which involved injury, such an event can take place with relative safety provided that training and commitment on behalf of organisers, skippers, and individual crew volunteers remain a priority. Important components of this include appropriate medical equipment and training and a need for continual development and discussion. We note in particular the relative lack of attention to such areas as nutrition and appropriate medical screening before the race. Furthermore, there is a need for all medics, medically qualified or otherwise, to be trained in basic life support<sup>19</sup> and the management of trauma to Advanced Trauma Life Support (ATLS) standard.<sup>20</sup> The scope of such training should be a subject for future research and debate.

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### APPENDIX A

#### Medical kit provided for each yacht on the British Telecom Global Challenge 1996/7

Oral antibiotics: augmentin, clarithromycin, amoxycillin, ciproxin, flucloxacillin, and trimethoprim. Injectable antibiotics: ceftriaxone. Antifungals: fluconazole.

#### Skin preparations

Calamine lotion, E45 cream, Flamazine, hydrocortisone 0.5%, daktarin, KY jelly, magnesium sulphate, stercac powder, iodine.

## Bandages

Triangular, crepe 10 m, gauze swabs, dressing packs, plasters, tubigauze, cotton wool, eye dressing, micropore, tupperware boxes.

## Anaesthesia and fluids

Lignocaine 1%, bupivacaine 0.25%, lignocaine gel, ketamine. Fluids: saline (4 × 500 ml), Haemaccel.

## Cardiac

Oral: aspirin, glyceryl trinitrate (sublingual), frusemide tablets, sotalol; injectable: atropine, adrenaline.

## Stomach and gut

Tablets: gaviscon, loperamide, prochlorperazine, dioralyte sachets, bisacodyl, ranitidine. Suppositories: prochlorperazine, glycerin, anu-sol.

## Hardware

Stethoscope, sphygmomanometer, pocket diagnostic set, syringes, needles, canulae, "wis loc" collar, sterile gloves, scissors, sutures (Vicryl), foil blanket, eye bath, dental first aid kit, thermometer, chest drain set, foley catheter and bag, Spencer Wells forceps, Sam splints, plaster of paris bandage, Ryles tube, pen torch, batteries, Multistix urine test, cotton buds, laryngoscope and endotracheal tube, mini tracheostomy set, Vitalograph emergency aspirator, Sussex universal airway/resuscitator.

## Ears, nose, mouth, and eyes

Drops: betnosol, hypromellose, zovirax, optrex, cyclopentolate, chloramphenicol, amethocaine, fluorescein, ciproxin, karvol, ephedrine, strepsils, bonjela, simple linctus.

## Allergy/anaphylaxis/asthma

Tablets: aminophylline, piriton, prednisolone. Injectable: hydrocortisone, adrenaline, piriton. Inhaler: salbutamol.

## Anxiety/fits

Diazepam (injectable), nitrazepam tablets.

## Analgesia

Tablets: coproxamol, tramadol (100 mg), ibuprofen, ketoprofen gel, aspirin; diclofenac suppositories; tramadol injectable.

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## REFERENCES

- 1 **MacKenzie JC.** The ocean yacht racing medic: an overview. *J R Nav Med Serv* 1998;**84**:71–8.

- 2 **Eriksen K.** Round the World Yachting. *Daily Telegraph* 30th November, 1996.
- 3 **Green A.** Sydney-Hobart report. *RYA Magazine* 1999:11–14.
- 4 **Goethe WHG,** Watson EN, Jones DT. *Handbook of nautical medicine.* Berlin, Heidelberg, New York: Springer Verlag 1984:chapter 3.2.
- 5 **Goss P.** *Close to the wind.* London: Headline 1998.
- 6 **Yazyhov V.** *Seahorse International Sailing* 1999;**228**:42.
- 7 **Editor.** BT crew injured in Bass Strait. *Yachting World* 2001.
- 8 **Mundle B.** *Fatal storm.* 1999.
- 9 **Kendall JM,** Reeves BC, Latter VS. Multicentre randomised controlled trial of nasal diamorphine for analgesia in children and teenagers with clinical fractures. *BMJ* 2001;**322**:261–5.
- 10 **Jelinek GA.** Ketorolac versus morphine for severe pain. Ketorolac is more effective, cheaper, and has fewer side effects. *BMJ* 2000;**321**:1236–7.
- 11 **Schonle C.** Medical aspects of selecting a new high performance olympic sail boat. *Sportverletz Sportschaden* 1998;**12**:44–6.
- 12 **Fisher G.** Fatal head injuries in sailing. *Seahorse International Sailing* 2001;**251**:50.
- 13 **White RJ,** Likavec MJ. The diagnosis and initial management of head injury. *N Engl J Med* 1992;**327**:1507–11.
- 14 **Turner M,** Griffin MJ. Motion sickness incidence during a round-the-world yacht race. *Aviat Space Environ Med* 1995;**66**:849–56.
- 15 **Grunfeld EA,** Price C, Goadsby PJ, et al. Motion sickness, migraine, and menstruation in mariners [letter]. *Lancet* 1998;**351**:1106.
- 16 **Stampi C.** Around the world—in 891 naps. *Seahorse International Sailing* 2001;**254**:32.
- 17 **Feyer AM.** Fatigue: time to recognise and deal with an old problem. *BMJ* 2001;**322**:808–9.
- 18 **Anogianakis G,** Maglavera S. Utilising multimedia for training merchant mariners as paramedics. *Stud Health Technol Inform* 2000;**72**:66–72.
- 19 **Lavis M,** Rose J, Jenkinson T. Sports doctors' resuscitation skills under examination: do they take it seriously? *Br J Sports Med* 2001;**35**:128–30.
- 20 **Cahill CJ.** ATLS: essential training for Royal Naval medical officers? *Advanced Trauma Life Support. J R Nav Med Serv* 1995;**80**:122–3.

## COMMENTARY

The authors are to be commended for a prospective study of the medical problems arising on a very long, albeit in stages, ocean race. They rightly make the point that such racing is no longer the preserve of the young fit professional (the oldest subject in the study was aged 60), and thus the conditions they report have moved towards those seen among merchant seamen, rather than young athletes. This paper should be consulted by all planning or participating as a medic in ocean racing at whatever level, to inform decisions on equipment and medical stores, and is thus a useful contribution to the literature.

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