

Emergency Medicine: On the Water Activities

Robert D. Welch, MD, MS, FACEP
Department of Emergency Medicine
Wayne State University School of Medicine
Detroit Receiving Hospital
Grosse Pointe Sail Club Member

Marc S Rosenthal, DO, PhD, FACEP, FAEMS
Department of Emergency Medicine
Wayne State University School of Medicine
Sinai-Grace Hospital
BYC and GPSA Member



1

Training

- CPR
 - Red Cross
 - American Heart Association
 - Or really anyone
- First Aid
 - Red Cross
 - Companies, multiple
 - Read books, ask questions
 - Lectures



4

Accident Reporting as Required by Federal Law

Under federal regulations (33 CFR Part 173, Subpart C – Casualty and Accident Reporting) the operator of any numbered vessel that was not required to be inspected or a vessel that was operated for recreational purposes is required to file a BAR when, as a result of an occurrence that involves the vessel or its equipment:

1. A person dies; or
2. A person disappears from the vessel under circumstances that indicate death or injury; or
3. A person is injured and requires medical treatment beyond first aid; or
4. Damage to vessels and other property totals \$2,000 or more; or
5. There is a complete loss of any vessel.



7

Objectives

- Describe the epidemiology of common injuries that may occur while sailing (cruising and racing)
- Review selected first-aid recommendations
- Discuss approach to selected medical symptoms and the approach while at sea
- Useful equipment and medications
- Possibility of telemedicine consults at sea
- Cases to stimulate discussion



2

2020 USCG Statistics

U.S. Department of Homeland Security
United States Coast Guard

- 5265 accidents up from 4268 (23% increase from 2019)
- 767 Deaths up from 613 deaths (25% increase) 6.5 deaths/100k vessels
 - 75% of fatal boating accident victims drowned
 - 86% of those drowned were not wearing a life jacket
 - 8/10 boaters who drowned were using vessels less than 21 feet in length
 - Alcohol use is the leading known contributing factor in fatal boating accidents
 - 77% of deaths occurred where operator no boating safety instruction



5

Most common vessels involved in accidents

- Open Motorboats 46%
- Personal Watercraft 22%
- Cabin Motorboats 13%

8

Sir William Osler

“Medicine is learned by the bedside and not in the classroom. Let not your conceptions of disease come from words heard in the lecture room or read from the book. See, and then reason and compare and control. But see first.”



3

2020 USCG Statistics

U.S. Department of Homeland Security
United States Coast Guard

- 3191 injuries up from 2,559 (Top five contributors)
 - Operator inattention
 - Improper lookout
 - Operator inexperience
 - Excessive speed
 - Alcohol use
- \$62.5 million dollars up from \$55 million dollars



6

Acute Sailing Injuries

- Performance of explosive and powerful moves
 - Physical actions on a sailboat are often awkward
 - Imbalances associated with changing forces on opposing muscle groups
 - Poor ergonomics
 - Unusual and unpredictable boat movements
 - Often not warmed-up
- Direct impact



9

Chronic Sailing Injuries

Chronic repetitive movements

- Leveraging body ("hiking")
- Grinding
- Steering
- Pulling

• Consider this possibility for each crew member prior to long cruise or race

10

RESULTS

- Average age of the study population was 40.1 (SD 13.2; range 18–80) years
- Males (83%)
- North Americans (97%)
- Sailed an estimated 65 days (SD 50) over the previous 12 months

13

Patterns of Severe Injuries

- Planned and unplanned jibes in high winds
- Collisions with other boats
- Catastrophic rig failure
- Falls through open hatches or companionways
- Prolonged hiking in dinghies and small keelboats Three eye injuries resulted in permanent loss of vision
 - Struck by the boom
 - Hydraulic ram handle
 - Spinnaker pole during a jibe

16

Sailing Injury Survey

- Survey done in 2006
- 1881 respondents completed the demographics
- 21 excluded (respondents < 18 years of age)
- 1 injury was reported by 1468 (79%) respondents
- 1353 (72%) provided complete data on 1 injury
- 362 provided complete data about a second injury
- Total 1715 injuries with data
- 559 illnesses

11

RESULTS (cont.)

- Injuries requiring medical care = 4.6 per 1000 days of sailing
- 47% were minor injuries requiring no treatment
- 26% received first-aid onboard
- 33% sought medical care after injury

14

Figure 1. Part of keelboat associated with injury, n = 1226.

Mast	2%
Sail	9%
Spinnaker Pole	5%
Lifelines/Stanchions	4%
Hatch/Companionway	8%
Winches	8%
Deck	18%
Boom	6%
Sheets/Lines	22%
Cleats	5%
Other/Not Applicable	19%

17

Table 1. Skill level and safety behaviors of respondents, N = 1880

Variable	Percent
Self-rated ability	
Beginner	2.3%
Intermediate/Experienced	73.9%
Professional/Pro Equivalent	23.8%
Life jacket use	
0–25% of time	48%
26%–50% of time	16%
51%–75% of time	6%
76%–100% of time	30%
Sunscreen use	
0–25% of time	19%
26%–50% of time	14%
51%–75% of time	14%
76%–100% of time	53%
Alcohol within 2 hours of injury*	7%

*n = 1715.

12

Severe Injuries

- Defined as "evacuation" from the vessel and/or "hospitalization."
- Rate of severe injury was 0.56 per 1000 days
- Of the 70 (4%) severe injuries:
 - Fractures 25%
 - Torn tendons or cartilage 6%
 - Concussion 14%
 - Dislocations 8%
 - 36% heavy weather was a contributing factor
 - Crew inexperience and lack of communication

15

Medical Problems

- 559 sailing-related illnesses
 - Sunburn (53%)
 - Sea sickness (31.8%)
 - Dehydration (7%)
 - Hypothermia (2%).
- 4 cases of medical illnesses classified as severe
 - 2 cases of hypothermia (dinghy sailors who capsized in cold water)
 - 2 cases of sea sickness (dehydration)

18

AHA/RED CROSS GUIDELINE FOCUSED UPDATE

2020 American Heart Association and American Red Cross Focused Update for First Aid



19

Myth – Wounds and Lacerations

- **Do you need sterile technique for simple wound closure?**
 - Sterile gloves
 - Sterile saline
- **How about just good local cleaning, irrigation, and debridement?**
 - Iodine???
 - Non-ionic detergents
- **Do not need all the "sterile" equipment recommended by many of the medical kit manufacturers**
 - Glues, strips, and sutures
 - STAPLES may be a good idea



22

Head Injuries

- Not in First Aid recommendations
- Any symptoms suggesting possible intracranial pathology should be taken seriously - Evacuate
 - Confusion must be carefully evaluated
 - LOC (lucid interval) or Amnesia
 - Age
 - Seizures
 - Severe headache
 - Vomiting



25

Wounds / Bleeding

- Direct Pressure
- Best controlled by applying pressure until bleeding stops
- The pressure must be firm and maintained for a long time
 - Manual pressure on gauze or other cloth placed over the bleeding source
 - If bleeding continues add more gauze on top and apply more pressure
 - If it is not possible to provide continuous manual pressure wrap an elastic bandage firmly over gauze to hold it in place with pressure



20

Fractures

- Assume that any injury to an extremity may include a fracture. Do not move or try to straighten an injured extremity
- No evidence that straightening a long bone fracture shortens healing time or reduces pain prior to permanent care. Expert opinion suggests that splinting may reduce pain and prevent further injury. If far from care, then stabilize the extremity with a splint in its current position



23

Hypothermia

- Begin re-warming a victim of hypothermia immediately
- Move the victim to a warm environment
- Removing wet clothing
- Wrapping all exposed body surfaces with anything at hand
- If the hypothermia victim is far from definitive health care, begin re-warming (heat source)
- I also recommend paying close attention to:
 - Mental status
 - Shivering

26

Tourniquets

- Battlefield use
- During surgery
- Paramedics
- Potential complications if used incorrectly or for prolonged periods of time



21

Dislocations

- This may be the exception to the rule of do not try to straightened (if you feel comfortable)
- Fingers
- Shoulder
- Examples



24

Sea Sickness

- Sea Sick Bands – any experience?
- Ginger
- Dramamine (dimenhydrinate)
- Scopolamine (levo-duboisine)
- Promethazine (Compazine) 10mg oral, 25mg rectal



27

Skin

- Skin abrasions and wounds
 - Clean with water (don't need betadine – iodine)
 - Soap intact skin
 - Antibiotic ointments more for comfort
 - Oral antibiotics usually not needed
 - Consider underlying conditions (DM, immune)
 - Keflex, bactrim, clindamycin
- Sunburns
 - Prevent
 - Topic Vitamin A, E may help
 - Aloe
 - Oral steroids for severe sunburns but be careful



28

Shock

- Signs and Symptoms
 - Thirst
 - Altered Mental Status
 - High pulse rate
 - Low blood pressure
 - Loss of blood
 - Fast breathing
 - Pale, Weak
 - Sweaty skin

31

MARK TWAIN

“It is amazing what little harm doctors do when one considers all the opportunity they have”.



34

Allergic Reactions

- Epinephrine auto-injectors
- Prednisone (multi-uses)
- Antihistamines (diphenhydramine) may be useful
- Albuterol inhaler



29

Shock

- Treatment
 - Can be complicated
 - In setting of sailing, most of time, fluids will help
 - Do not give any medication that can lower blood pressure, e.g., Nitroglycerin or diuretics

32

Minor Problems

- Self limited motion sickness
- Rashes
- Minor lacerations, abrasions
- Vomiting minor
 - “gastritis pain”
- Minor bone fractures
- Minor allergic reactions
- “Feeling poor”
 - Usually can help, monitor, and finish the race



35

Shock

- Shock is a state where the patient is not able to perfuse end organs effectively.
- Causes
 - Sepsis
 - Cardiac
 - Heart Attack
 - Heart Failure
 - Neuro Injury (Stroke, trauma) cord injury
 - Dehydration
 - Trauma

30

Potential for Telemedicine at Sea

- Equipment needs
 - Some internet or high-speed data connection
 - Video or photographs
 - We use real-time video for stroke patients
- Practicality
 - Best may be simple phone and text consultation
 - Satellite connection



33

Urgent Problems

- Fracture
- Minor to moderate lacerations
- Somewhat Controlled vomiting (seasickness)
- Abdominal pain, but not associated with vomiting or getting worse
- Allergic Reactions
 - Determine when need to be seen, if can wait 2 days sail on, if not motor in to harbor for treatment and evaluation.

36

Serious Problems

- End of Race
- Crew must be evacuated
- Methods:
 - Sail/motor into harbor
 - Request assistance from USCG, Sheriff office for motorboat transport
 - Request Air Evacuation by USCG
- Method to be determined by risk to crew member medically and by rescue crews

37

Preparation

- Know yourself, are you safe for the race/trip
- Have enough medication for 2x time of the trip
- Do you feel well before the trip
- Medical form for each crew member
- As skipper, do you know who on your trip has significant medical issues, allergies, etc.
- What about Covid-19

40

USCG

- Motorvessels
 - No first aid training, they do have CPR training, they do have Narcan
- Rotor Aircraft
 - AST (Aviation Survival Technicians) EMT-Basic
 - They have airways, bleeding and splinting supplies, an AED,
 - Oral glucose
 - They can do CPR, manage an airway

43

Serious Problems

- Stroke
- Chest Pain, concerning, new
- Shortness of breath, concerning, new
- Constant vomiting causing dehydration
- High fever
- Altered Mental Status
- Cardiac Arrest
- Open Fracture
- Severe abdominal pain
- Severe lacerations
- Anaphylaxis

38

Situational Awareness

- Know who might be having problems, address immediately
 - Prevent worsening of problem
 - E.g., sea sickness, ensure early hydration of crew, problem crew, put on the helm
 - Consider medications early, etc.
 - For chest pain, shortness of breath, etc. Is it typical for the crew member or not?
- Do they have medication for the problem

41

Case 1

- 55 yo Male, chest pain of 1 hour duration. Described as burning. Food does not help nor water. Admits to a history of high blood pressure and alcohol use.
 - Anything more you need to know? i.e., what type of questions.
 - Your plan
 - Medications
 - Disposition

44

Kits – Practical and for Our Purposes

- Many things to consider, no one kit is right.
- Make your own
- Waterproof
- Consider purchase of AED
- Consider supplies for minor issues, e.g., band aids, ace wraps
- Consider Major Trauma supplies, Tourniquet, Israeli Bandage, clotting bandages
- Consider medications: Motrin, Tylenol, Aspirin, anti-emetic, Pepcid, anti-histamine,

39

- On Dec. 18, 2008, the French sailor Yann Eliès fell on deck fracturing his femur in Vendée Globe. He was alone in the southern Indian Ocean but managed to get below deck and into his berth where he spent the next three days awaiting rescue.
- Eliès was incapacitated and unable to reach the pain medication in his medical kit.
- "A comprehensive medical kit, like a life raft, is just expensive ballast if you and your crew can't find it".
- Eliès must have had a survivor's instinct and will
- These qualities are more useful than medical skill, equipment, or any amount of medical advice.
- Maybe his most important medical equipment he had was his satellite radio and GPS!

42

Case 1

- Patient complains of shortness of breath.
- Never has happened before.
- Heart rate 80
- Looks somewhat ok, is pale and weak.

45

Case 1

- Sailor needs to be off the boat.
 - Without equipment and expertise cannot
 - Know if a heart attack, blood clot in lung, or a minor issue.

46

Case 2

- You should get her off the boat ASAP.
- Concern if for a pulmonary embolism, blood clot in lung.
- Risk is high for a bad outcome.
- Evacuation is important.

49

Case 3

- if better continue racing.
- Get back to normal.

52

Case 2

- 40 yo female complains of shortness of breath. 2 hours duration, no medications tried, has none. Denies any problems.
 - What do you want to know? Questions?
 - Disposition

47

Case 3

- 24 yo Male has shortness of breath. Now for 1 hour, used his inhaler, minimal help but somewhat helping. Looks good, history of asthma. No other medications.
- Additional questions?
- Disposition

50

Case 4

- 25 yo female, vomiting 2-3 hours. No medical history. No pain.
- Questions?
- Disposition

53

Case 2

- Patient admits to drinking, smoking as well as on birth control.
- You notice her left leg is swollen.
- She looks very very unhappy.
- You manage to get a pulse, 120
- You should give Aspirin, fluids

48

Case 3

- Patient does not smoke. Vitals are good. Looks good. Has happened before, never hospitalized.
- Encourage more treatments

51

Case 4

- You get over your squeamish to ask when her last period was and if she is pregnant. She states not that she knows of.
- Her heart rate is 120
- Mouth is dry, she looks uncomfortable.

54

Case 4

- You can follow WHO's recommendations,
- Give her small sips/tablespoons of water, see how she responds, increase amount of water, Gatorade (1/2 strength), Vernors, etc. every 10 minutes, if after an hour or so can drink a few ounces at a time and feels better, probably can continue the race.

55

Case 5

- Questions:
- Are they on blood thinners (asa and Plavix do not count)
- Are they vomiting, weak anywhere, vision problems, neck pain, numbness
- Are symptoms improving or getting worse

58

Case 6

- Apply direct pressure to stop bleeding.
- Check for foreign bodies.
- If no functional problems,
- Clean it, dress it, use ace wrap or kerlix over it, keep it clean
- Go back to racing
- Update tetanus when land if needed.

61

Case 4

- However, if she cannot tolerate fluids at all, off the boat
- If she starts to develop lower abdominal pain, off the boat

56

Case 5

- Symptoms improve, no other complaints, they can function,
- They can continue, however, do not allow them to be in a position, that the injury can occur again. They have a closed head injury; we know that repeats injuries before symptom free for a month or 2 can cause permanent brain injury.
- If symptoms do not improve or they are worse, off the boat.

59

Final Thoughts

- Blind obedience to protocol is not always warranted, particularly in the unconventional setting.
- You are not practicing medicine in an ambulance or emergency department.
- Even if partially disabled, the patient will have a much better chance of survival with some freedom of movement.
- Know and plan for potential complications of pre-existing medical disorders!
- Radio, Phone and Motor are your best friends

62

Case 5

- 35 yo male, hit by the boom. Initially staggers, complain of pain that slowly improves.
- What questions
- Disposition

57

Case 6

- 42 yo female, cuts forearm, length 3 inches, some bleeding.
- What to do:

60