


## Slide 1

### Emergency Medicine: On the Water Activities


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## Slide 2

### 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



## Slide 3

### Training

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




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Background Statistics

- " There are three types of lies - - lies, damn lies, and statistics."  
— **Benjamin Disraeli, Mark Twain**
- " Facts are stubborn things, but statistics are pliable."  
— **Mark Twain**
- "I can prove anything by statistics except the truth."  
• --- **George Canning**


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2021 USCG Statistics 


- 4439 accidents down from 5265
- 658 Deaths down from 767 deaths 5.5 deaths/100k vessels
  - 81% of fatal boating accident victims drowned
  - 83% of those drowned were not wearing a life jacket
  - 75% boaters who drowned were using vessels less than 21 feet in length
  - Alcohol use is the leading known contributing factor in fatal boating accidents at 16%
  - 75% of deaths occurred where operator no boating safety instruction



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2021 USCG Statistics 


- Injuries (Top five contributors)
  - Operator inattention
  - Improper lookout
  - Operator inexperience
  - Excessive speed
  - Machinery Failure
- \$67.5 million dollars an all time high



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**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.



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**Most common vessels involved in accidents  
2021**


- Open Motorboats 47%
- Personal watercraft 19%
- Cabin Motorboats 13%
- Highest % deaths
  - Open motorboats 44%
  - Kayaks 15%
  - Pontoon 10%



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**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




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### 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



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### 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



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### 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



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### Recent Events


- Chicago Mackinac Race 2018
  - After the start an experienced sailor/racer/triathlon competitor went overboard in 6ft seas. Lifejacket not "closed", no tether attachment.
  - Crew felt he waved alright. Patient not recovered, found days later dead. Multiple attempts to recover the victim.
- Newport Bermuda Race 2022
  - During the race, daytime, owner/skipper in cockpit, boat hit by larger wave, rolled skipper fell overboard.
  - He was obese, no tether. No PFD.
  - Was initially alive in water, took over an hour to pull out of the water, was dead. They effectively used a lifelines but could not get the skipper out of the water.



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### Summary Recommendations

1. Preparedness much better than response
2. Properly fitted PFD, "closed", is essential as well as the crew member clipped to a jack line.
3. Rescue is much more difficult than one would expect.
4. Difficult seas increases the difficulty exponentially
5. Crews must practice MOB/POB in difficult conditions to have any reasonable chance of success.
6. While thinking outside the box is useful, crew must be alert to do this effectively.



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7. It was reported Newport/Bermuda crew used 4on/4off day and 3on/3off night shifts. Report indicated crew well rested, based on this rotation they could not be well rested, can affect decisions/planning.
8. N/B used halyard to pull POB in, it shredded due to angle.
9. Both recoveries, crew reports on POB status did not match reconstructed events.
10. Both crews did not identify early drowning, confused actions by POB for good condition.
11. Crews need to recognize drowning can occur within a couple of minutes. Time is critical.



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### Preparation/Planning


- "If you fail to plan, you are planning to fail" — Benjamin Franklin.
- "In preparing for battle I have always found that plans are useless, but planning is indispensable" — Dwight D Eisenhower
- "A good plan today is better than a perfect plan tomorrow" — George S Patton
- "A battle plan never survives contact with the enemy" — Multiple
- "Plans are worthless, but planning is everything". — Eisenhower
- "No battle plan survives contact with the enemy". Colin Powell
- "Plans are of little importance, but planning is essential." — Winston Churchill



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### Medical Problems


- 559 sailing-related illnesses
  - Sunburn (53%)
  - Sea sickness (31%)
  - 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)



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### 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



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### Tourniquets


- Battlefield use originally
- During surgery
- EMS/Police/Fire now use
  - With basic training appropriateness of use about 90%
- Potential complications if used incorrectly or for prolonged periods of time



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### 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



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### 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



## Slide 22

### Dislocations


- This may be the exception to the rule of do not try to straightened (if you feel comfortable) However, if you decide to do, do it immediately.
- Fingers
- Shoulder
- Examples



## Slide 23

### 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
  - On blood thinners (Aspirin and Plavix do not count)



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### Hypothermia

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






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### Sea Sickness


- Sea Sick Bands
- Ginger
- Dramamine (dimenhydrinate)
- Scopolamine (levo-duboisine)
- Promethazine (Compazine) 10mg oral, 25mg rectal
- Prevention
  - Avoid noxious fumes
  - See horizon/be busy
  - Make sure crew eat



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### 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
  - Topical Vitamin A, E may help
  - Aloe
  - Oral steroids for severe sunburns but be careful



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### Allergic Reactions


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



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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



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Shock


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



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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



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Potential for Telemedicine at Sea

- Practicality
- Best may be simple phone and text consultation
- Satellite connection, offshore, is needed.




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MARK TWAIN

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




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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




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### Urgent Problems

- Fractures (especially long bones)
- 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.




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### Serious Problems

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




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### 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
- Cannot urinate



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## Slide 37

### 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,



## Slide 38

### Preparation

- Know yourself, are you safe for the race/trip
- Have enough personal 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, now less of an issue. But no one with active Covid-19 should sail/race.



## Slide 39

### 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



## Slide 40

USCG

- Motor vessels
  - Basic 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




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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




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## Slide 42

Case 1

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




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## Slide 43

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.



## Slide 44

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



## Slide 45

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



## Slide 46

Case 2


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



## Slide 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



## Slide 48

Case 3

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






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Case 3

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




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Case 4

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




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Case 4

- You get over your squeamishness 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.




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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.



## Slide 53

Case 4


- However, if she cannot tolerate fluids at all, off the boat
- If she starts to develop lower abdominal pain, off the boat, presumed pregnant until proven otherwise.



## Slide 54

Case 5


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



## Slide 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, focal neuro problem.
- Are symptoms improving or getting worse



## Slide 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.



## Slide 57

Case 6


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



## Slide 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.



## Slide 59

Case 7


- 55 y/o woman passes out (Syncope)
  - Lasts 5-10 seconds or
  - Lasts for 10 or more minutes
- What do you want to know for each scenario?
- What to assess?
- What questions to ask?



## Slide 60

Case 7


- **Assessment:**
  - Pulse, skin, breathing, temperature
  - Did they fall, any injuries from fall
  - Any bleeding
  - Duration of syncope
  - Any seizure like activity
- **Questions**
  - What preceded event
  - History of same
  - Medical problems
  - Medications they use



## Slide 61

Case 7

- Questions
  - Any bleeding before event
  - Any chest pain, any pain
  - Any shortness of breath
  - Prior history of same
- Plan
  - If 5 -10 seconds no complaints probably ok
  - If 10 minutes or other symptoms, then evacuate




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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
- Get trained!!!!



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