Safety at Sea – US Naval Academy 2012
Michael Jacobs, MD
HOW TO DIE UNDERWAY

◆ DROWNING/COLD SHOCK RESPONSE
◆ HEAD/BRAIN INJURY-
◆ SEASICKNESS
◆ MAJOR TRAUMATIC INJURY
◆ HYPOTHERMIA
◆ ANAPHALAXIS
◆ HEART ATTACK/STROKE/AAA
Hypothermia

- **CHRONIC:** Slow drop in core temp over hours to days
  - prolonged exposure to elements: wet clothing, cool breeze

- **ACUTE:** Rapid drop in core temp over hours
  - *Overboard:* Immersion in water < 25°C (77°F)
  - Water conducts heat away from the body up to 25X faster than air at the same temp
COOL AND WET: Risk Of Chronic hypothermia
Hypothermia Signs

- Mild
  - 35°C (95°F)
  - Shivering
  - Mental Impairment
  - Physical Impairment
• Shivering is the best dx sign
• Starts early, before a drop in core temp.
• Shivering powers metabolic (muscle) heat production
• Once shivering stops, the body has lost the capacity to actively rewarm itself
Hypothermia-Mild (Above 90ºF)

- Sustained uncontrolled shivering
- Change in fine motor coordination
- Loss of strength
- Loss of balance-ataxia
- Impaired judgment, confusion
- FULLY CONSCIOUS
Rx: Mild Hypothermia

- Get out of the cold
- Shelter, Dry skin
- Dress in layers, Wrap with insulation
- OK to give sweet fluids, snacks (fuel) if victim is alert
- External heat not necessary-NOT helpful
- Let victim shiver, limited exercise
Perils of Rewarming

• Active external heating warms skin
• Shivering heat production decreases
• Core temperature is unaffected
• Never substitute a hot shower
• Victim may suffer “circum-rescue collapse”
INJURY
Mechanisms of Injury  N = 1,480

Cause of Injury
• Trip/Fall 30%
• Hit by object★ 22%
• Lines /Halyards 22%
• Winch 8%

★Boom, spinnaker pole, sail clew, fellow crewmember

• Crew coordinated sailing maneuvers

Contributing Factors
• Heavy Weather 23%
• Tacking* 17%
• Jibing* 13%
• Sail Change 12%
• Repetitive Stress 7%
• Fatigue /Crew Error 5%
• Equipment Failure 4%
Where Injuries Occur

On Keel Boat \( N = 1,080 \)

- Cockpit 46%
- Foredock 26%
- Midships 19%
- Below Deck 2%
- Aloft 1%
- Off Boat 4%
INJURIES

• Soft tissue extremity injuries most common injury among sailors
• 30% caused by trips/falls
• Sailing maneuvers in heavy weather is major contributing factor
• Injuries include contusions, lacerations, sprains, and strains.
Sprains, Strains, & Soft Tissue Injury

• “Stable injuries”: No immediate loss of function; progress over first 24 hrs

• TREATMENT: RICE for 3-4 days
  - Rest—splint as needed
  - Ice -- 15-20 minutes every 4 hours x 72hrs
  - Compression
  - Elevation above the heart
HAND INJURIES

- Lacerations and contusions common
- Hand and upper extremity always exposed
- Risk to hands/fingers handling lines
- Winches and cleats are dangerous, especially in heavy weather
- **BOAT IS HIGH THREAT ENVIRONMENT**
Figure 10-3. Improper way to add wraps to a winch.
Avulsion/Amputation Rx

- Sterile Dressing
- Splint entire hand
- If finger completely amputated, place digit in sterile dressing, then sterile bag, then on ice (never directly on ice)
Head Injury—Fisher’s data

- 34 head injuries
- 24 caused by a “flying boom”
- > 50% fatal
Seasickness
Seasickness

- A common hazard to safety at sea
- Seasickness may be at least annoying or disabling, but may also lead to fatal consequences.
- Nearly everyone will develop seasickness with sufficient stimulus; however, individual susceptibility is enormously variable.
NEWPORT-BERMUDA RACE 1998-2006  863 yachts

Seasickness, Heavy Weather and Injuries

Number

Year of Race


- Boats reporting seasickness
- Injuries
- Heavy Weather Cited as Contributing to Injury
Seasickness

Every year, many seaworthy yachts are abandoned because their exhausted and despondent crews have lost their collective will to persevere.

“They are wet, seasick, scared, and want to go home,” observed a merchant marine captain.
FACTORS CAUSING IMPAIRED JUDGEMENT

Seasickness impairs memory and cognitive function

- MEDICATIONS FOR SEASICKNESS MAY IMPAIR CONGNITIVE FUNCTION
- DEHYDRATION
- SLEEP DEPRIVATION
- FEAR AND PANIC
Seasickness: Mechanism

- The brain’s balance center receives sensory data from the eyes, inner ear, and position sensors to estimate motion and spatial orientation of the head and body.

- A sensory conflict is generated when data from these structures arrives in the brain in conflicting combinations.

- Conflict activates the vomiting center in the brain.
If your eyes are seeing what your ears are feeling, you have a better chance of having a great day.
"INFLATABLE VOMITORIUM"
WHY?
Seasickness: Prevention

***Medication is more effective in preventing symptoms than in reversing them- start trip on medication!!
MUST BE WORN PROPERLY TO BE EFFECTIVE.
The bands must be worn on both wrists. Position the button as follows (see illustration): Starting at the first wrist crease (A), use your three middle fingers (B) to measure to a point on the underside of each wrist (C). Position the button downward over this point, between the two central (flexor) tendons (D).

(A) First wrist crease

(B) Three fingers

(C) Button placement, face down

(D) Central tendons

Davis Instruments
3465 Diablo Ave., Hayward, CA 94545, U.S.A.
Sailors' Secret

Premium Ginger
Zingiber officinale Root

For Motion Comfort*

Dietary Supplement

36 Capsules - 250 mg. Each
Sea Sickness: Prevention

After Departure:

• Stay on deck- amidships
• Avoid areas with fumes & odors
• Avoid close-focused visual tasks- e.g., reading, using binoculars, navigating
• Look at the horizon, take the helm
• Take medication at regular intervals (Use long-acting drugs while offshore)
Seasickness: Early Treatment

• “Fight back and act quickly” Take the helm
• Obtain good broad view of horizon:
  – Use “earth-fixed” reference frame
• Steer boat by reference to oncoming waves, clouds, horizon and distant marks
• Ride the waves with your whole body*
  Alter boat’s course for comfort & wear a safety harness
• Take additional medication
Posture yourself to anticipate the boat’s motion and “ride the waves.” Keep your head and shoulders balanced over your hips and gain postural control gracefully.

“GIMBLE YOURSELF”
# Seasickness Medication:

*(best for prevention)*

<table>
<thead>
<tr>
<th>Medication</th>
<th>Dosage</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>OTC Diphenhydramine</td>
<td>25-50mg liq/cap/chew</td>
<td>6-8 hrs</td>
</tr>
<tr>
<td>OTC Bonine</td>
<td>25 mg chew</td>
<td>6-8 hrs</td>
</tr>
<tr>
<td>OTC Meclizine</td>
<td>25/50 mg tab</td>
<td>6-8 hrs</td>
</tr>
<tr>
<td>OTC Stugeron *</td>
<td>15mg tabs</td>
<td>6-12 hrs</td>
</tr>
<tr>
<td>Rx Transderm-Scop</td>
<td>1.5mg patch</td>
<td>2-3 days</td>
</tr>
<tr>
<td>Rx Scopace</td>
<td>0.4mg (1-2tabs)</td>
<td>8 hrs</td>
</tr>
<tr>
<td>Rx Phenergan</td>
<td>25mg tabs</td>
<td>12 hrs</td>
</tr>
<tr>
<td></td>
<td>with dexedrine</td>
<td></td>
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<tr>
<td></td>
<td>5-10mg tabs, XR capsule</td>
<td>24 hrs</td>
</tr>
<tr>
<td>Rx Phenergan (alone)</td>
<td>12.5, 25, 50 mg tab,</td>
<td>12 hrs</td>
</tr>
<tr>
<td></td>
<td>suppository, deep IM injection</td>
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<tr>
<td>UK, Canada, Mexico, Europe &amp; Bermuda</td>
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</table>
Seasickness - Medication

• Consider: Sudafed (30-120mg pseudoephedrine) to counter drowsiness of medications or caffeine 200mg

• “BEST BET”: Bonine (Meclizine)* + Sudafed

• Use Phenergan 25 mg when necessary

*least sedation and cognitive side effects
SELECTION OF MEDICAL SUPPLIES

- Waterproof containers
- Rx Endemic diseases, crew’s health
- Rx Hazardous marine life, infections, seasickness, trauma, submersion, sunburn
- Medical expertise aboard
- Drugs not causing photosensitivity
- Access to reliable and comprehensive medical care; HOW FAR, HOW GOOD?
GOALS OF MEDICAL OFFICER

• Increase self-reliance at sea - do the “right thing at the right time”.
• Prevent minor problems major
• Avoid high risk medical evacuation for a low risk medical problem
• Promote health and safety of crew
MASH FOLDER FOR CREW

- Medication
- Allergies
- Sat phone medical contact
- History

EMAIL IN ADVANCE TO MEDICAL OFFICER TO FILE
HOW TO BE MISERABLE UNDERWAY

• Pass a kidney stone (or don’t pass it)
• Experience alcohol withdrawal
• Inadequate pain medication for a fracture
• Share the head with the crew—all with diarrhea
• Have a severe rash
• Be unable to void (Urinary retention)
• Suffer from a dental infection
• Recurrent chest/abdominal pain
COASTAL MEDICAL KIT: 12-24 hrs
Category 1 races, using the US Sailing prescription definition are "of long distance, well offshore,... where yachts must be completely self-sufficient for extended periods of time, ....prepared to meet serious emergencies without the expectation of outside assistance."
TELEMEDICINE

- www.worldclinic.com
- www.gwemed.edu/maritime.htm
- www.medaire.com

24 / 7 ACCESS VIA FAX, VHF AND SSB RADIO, E-MAIL, SATELLITE PHONE, & TELEX FOR SIMPLE AND COMPLICATED PROBLEMS
Maritime Medical Access (MMA)  
George Washington University

- 120 transoceanic commercial and recreational vessels over 4 years (Occupational Medicine 2007)
- 84% of consultations were for medical problems, 14% were for injuries, and 2% were for psychiatric illness.
<table>
<thead>
<tr>
<th><strong>RCC</strong></th>
<th><strong>Location</strong></th>
<th><strong>Area of SAR Coordination Responsibility</strong></th>
<th><strong>Phone Number</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic SAR Coordinator</td>
<td>Commander U.S. Coast Guard Atlantic Area</td>
<td>Overall responsibility for areas covered by RCC Boston, RCC Norfolk, RCC Miami, RSC San Juan, RCC New Orleans and RCC Cleveland plus a portion of the North Atlantic Ocean out to 40 degrees west longitude.</td>
<td>(757)398-6231</td>
</tr>
<tr>
<td>RCC COMLANTAREA</td>
<td>Commander Portsmouth, Virginia</td>
<td>New England down to and including a portion of Northern New Jersey plus U.S. waters of Lake Champlain.</td>
<td>(617)223-8555</td>
</tr>
<tr>
<td>RCC Boston</td>
<td>Commander 1st Coast Guard District Boston, Massachusetts</td>
<td>Mid-Atlantic states including the majority of New Jersey down to the North Carolina / South Carolina Border.</td>
<td>(757)398-6231</td>
</tr>
<tr>
<td>RCC Norfolk</td>
<td>Commander 5th Coast Guard District Portsmouth, Virginia</td>
<td>Southeast states from the South Carolina / North Carolina border around to the eastern end of the Florida panhandle plus a large portion of the Caribbean Sea.</td>
<td>(305)415-6800</td>
</tr>
<tr>
<td>RCC Miami</td>
<td>Commander 7th Coast Guard District Miami, Florida</td>
<td>Southeast portion of the Caribbean Sea.</td>
<td>(787)289-2042</td>
</tr>
<tr>
<td>RSC San Juan (Sub-Center of RCC Miami)</td>
<td>Commander Sector San Juan</td>
<td>Southern states including the Florida panhandle to the U.S. / Mexico border in Texas plus the inland rivers including the Mississippi, Missouri, Ohio and tributaries.</td>
<td>(504)589-6225</td>
</tr>
<tr>
<td>RCC New Orleans</td>
<td>Commander 8th Coast Guard District New Orleans, Louisiana</td>
<td>U.S. waters of the Great Lakes, their connecting rivers and tributaries.</td>
<td>(216)902-6117</td>
</tr>
<tr>
<td>RCC Cleveland</td>
<td>Commander 9th Coast Guard District Cleveland, Ohio</td>
<td>California and Eastern Pacific Ocean waters assigned by international convention off the Coast of Mexico.</td>
<td>(510)437-3700</td>
</tr>
<tr>
<td>Pacific SAR Coordinator</td>
<td>Commander U.S. Coast Guard Pacific Area</td>
<td>Overall responsibility for areas covered by RCC Alameda, RCC Seattle, RCC Honolulu and RCC Juneau.</td>
<td>(510)437-3700</td>
</tr>
<tr>
<td>RCC Alameda</td>
<td>Commander 11th Coast Guard District Alameda, California</td>
<td>Hawaii, U.S. Pacific Islands and waters of Central Pacific Ocean assigned by international convention (extending from as far as 6 degrees south to 40 degrees north latitude and as far as 110 west to 130 east longitude).</td>
<td>(808) 535-3333</td>
</tr>
<tr>
<td>RCC Seattle</td>
<td>Commander 13th Coast Guard District Seattle, Washington</td>
<td>Hawaii and other U.S. territories and possessions in the far western Pacific Ocean.</td>
<td>(206)220-7001</td>
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<tr>
<td>RCC Honolulu</td>
<td>Commander 14th Coast Guard District Honolulu, Hawaii</td>
<td>Guam and other U.S. territories and possessions in the far western Pacific Ocean.</td>
<td>(671)355-4824</td>
</tr>
<tr>
<td>(operated as JRCC with DOD)</td>
<td>Commander Sector Guam</td>
<td>Alaska, U.S. waters in North Pacific Ocean, Bering Sea, and Arctic Ocean.</td>
<td>(907)463</td>
</tr>
</tbody>
</table>
Training Resource: The Man

Jeffrey Isaac, PA-C Ltd.
Phone: 1-970-275-4999
www.medicalofficer.net

Wilderness Medical Associates
WFR,WEMT

SOLO

Jeffrey Isaac, PA-C is the curriculum director and a lead instructor for Wilderness Medical Associates, Inc. He is a co-author with Dr. David Johnson of *Wilderness and Rescue Medicine, A Practical Guide for the Basic and Advanced Practitioner*, used as a textbook in WMA courses worldwide. His teaching reflects the experience of 25 years in emergency medicine, outdoor education, and wilderness rescue.
THE CREW KIT

• This is the “clinic” kit - supplies to treat common problems - avoid disrupting ship’s primary kit.

• PREVENTION BEGINS HERE

• Review contents with crew
Bonine
Raspberry Flavored Chewable Tablets
Causes Less Drowsiness
Value Size
The Once-A-Day Travel Tablet
Bonine
Meclizine Hydrochloride • Antiemetic
Prevents Motion Sickness
All Day Protection
16 Chewable Tablets
Solar Injury: Prevention-Sunscreens

- Apply early (½ hour before), liberally, & frequently: Q 2H
- Use “very water resistant”
- SPF (UVB) 25-30 with UVA
- Apply in recommended doses: shot glass
- Opaque barriers: ideal for nose, ears, lips: zinc oxide, Titanium dioxide
IF IT MAKES YOU FEEL BETTER
Twinject™ 0.3 mg auto-injector
(epinephrine injection, USP 1:1000)
each dose delivers 0.3 mg of epinephrine
1 UNIT OF USE PACK

MethylPREDNISolone TABLETS, USP
4 mg

EACH TABLET CONTAINS: Methylprednisolone USP, 4 mg
USUAL DOSAGE: See package insert.
Keep patient under close observation of a physician.
STORE at 20° - 25°C (68° - 77°F) [see USP Controlled Room Temp.]

Rx only
21 TABLETS

Qualitest®