HYPOTHERMIA
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 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 (5X resting)
• Once shivering stops, the body has lost the capacity to actively rewarm itself
Hypothermia-Mild (Above 90°F)

- Sustained uncontrolled shivering
- Change in fine motor coordination
- Loss of strength
- Loss of balance-ataxia
- Impaired judgment, confusion
- FULLY CONSCIOUS
- UMBLES: fumble, bumble, stumble mumble, and grumble
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
THE COLD SHOCK RESPONSE:

ACCOUNTS FOR THE MAJORITY OF DROWNING DEATHS FOLLOWING ACCIDENTAL IMMERSION IN OPEN WATER BELOW 68°-77° F.

In cold water, under 59° the risk of drowning increases by 5X
There is Plenty of Cold Water
Nantucket Island 36.0 °F
Woods Hole 35.1 °F
Fall River 39.0 °F
Boston 35.1 °F
RESPONSES TO COLD WATER IMMERSION

1. INITIAL RESPONSE (0-3 minutes)
   “Cold Shock”

2. SHORT TERM RESPONSE ( 3-30 minutes)
   “cold incapacitation”

3. LONG TERM RESPONSE ( >30 minutes)
   “Circum-rescue Collapse”
   “Hypothermia”

Each response is initiated by cooling different parts of the body: skin, muscles & joints, then brain and heart.
• Sudden cooling of the skin initiates a series of reflexes involving heart, blood pressure, and breathing.

• Peaks in 30 sec., last just 3 min., and increases the risk of drowning.
Cold Shock Response-Reflexes

• Immediate “gasp” reflex → inhaled water → drowning

• ↑ HR, BP, CO, Adrenaline → risk heart attack → drowning

• ↑ ↑ ↑ ↑ Rate and volume of breathing increases 5X
Cold Shock - Respiratory disaster

• Hyperventilation → confusion & loss of consciousness

• Hyperventilation → asynchrony of swim stroke and breathing, and aspiration

• Breath holding time <10 sec. → entrapment: Unable to escape from capsized craft – try a “delayed escape”
How To Modify the Cold Shock Response -post immersion

MAKE A CONSCIOUS EFFORT TO BRING BREATHING UNDER CONTROL IN THE FIRST 1 - 2 MINUTES

“REMAIN CALM—DON’T PANIC”

STAY VERTICAL
Cold Incapacitation- Short Term Response

• Short Term Response- 3 to 30 minutes
• Muscles, nerves and joints cool: loss of strength, coordination, dexterity (muscle blood flow dramatically reduced)
• Loss of movement= paralysis
• Quickly lose ability to maintain airway freeboard; swimming is arduous and ineffective
## 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 crew member

#### Contributing Factors
- Heavy Weather \( 23\% \)
- Tacking* \( 17\% \)
- Jibing* \( 13\% \)
- Sail Change \( 12\% \)
- Repetitive Stress \( 7\% \)
- Fatigue/Crew Error \( 5\% \)
- Equipment Failure \( 4\% \)

* Crew coordinated sailing maneuvers

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Where Injuries Occur
On Keel Boat N = 1,080

Cockpit 46%
Below Deck 2%
Midships 19%
Foredeck 26%
Off Boat 4%
Aloft 1%
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
  - **R**est--splint as needed
  - **I**ce -- 15-20 minutes every 4 hours x 72hrs
  - **C**ompression
  - **E**levation 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.
Head Injury - Fisher’s data

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

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

Year of Race

Number

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.
Why are sailors making poor decisions?

- Seasickness **impairs memory and cognitive function**.
- Inability to integrate and analyze complex data ➔ impaired judgment and faulty decisions
OTHER FACTORS CAUSING IMPAIRED JUDGEMENT

- Medications for seasickness may impair cognitive function
- Dehydration ( fluids)
- Low blood sugar (food)
- Sleep deprivation (fatigue)
- Fear, panic, injury (fitness)
- Hypothermia (Fahrenheit)

THE FEARSOME FIVE
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
What is the visual cue to your body’s orientation?

What is the inner ear’s cue to your body’s orientation?
If your eyes are seeing what your ears are feeling, and what your brain expects, you have a better chance of having a great day.
“INFLATABLE VOMITORIUM” WHY?
It’s a sensory conflict chamber!!
Prevention

Prior to Departure:

• Start trip on medication ***
• Start trip well-hydrated, avoid alcohol
• Eat lightly 1-2 hrs before, especially carbohydrates.
• Prepare gear, navigation, ship’s stores
• Try powdered ginger root capsules (1gm every 6 hrs), Vitamin C 3-5gms
• Try acustimulation
***Medication is more effective in preventing symptoms than in treating reversing them—start trip on medication!! WHY?

DRUGS SIMPLY RAISE THE THRESHOLD FOR SEASICKNESS
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.
ReliefBand® Device for the Relief of Motion Sickness

Drug Free
Easy-to-Use
Non-Invasive

Arm Yourself Against Motion Sickness

Contains: ReliefBand® Device (1), Conductivity Gel (.34 fl. oz/10 ml), Alcohol Wipes (5), Carrying Case.

Disposible
Model No. RB-6 Plus
144 Hours Useful Life On Power Level 2

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So what’s wrong the “placebo effect”??

NOTHING! IF IT WORKS, WE’LL TAKE IT
Sea Sickness: Prevention

After Departure:
• Stay on deck, amidships, avoid fly bridge
• Avoid areas with fumes & odors
• Avoid close-focused visual tasks- e.g., reading, using binoculars
• Look at the horizon, take the helm
• Take medication at regular intervals (Use long-acting drugs while offshore)
• Snacks and fluids: granola, trail mix, fruit, crackers, pop corn, energy bars, gatorade
Seasickness:  *Signs*

Early (the window of opportunity for Rx)

- Yawning, Drowsiness/Lethargy/Apathy
- Salivation/Dry mouth/Belching/Passing gas
- Stomach awareness/ Mild nausea
- Dizziness
- Headache
- Hyperventilation
- “I don’t feel good”

*IT TAKES TIME FOR THE LINKAGE BETWEEN SENSORY CONFLICT AND NAUSEA TO DEVELOP*
Seasickness: Prevention and 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
Why Take the Helm?

- His brain can utilize the self-generated motor commands used to balance himself and control the boat to help anticipate and orient his body to the motion.
*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”
Late Treatment

• Lie down, **supine**, head still, “wedge” yourself in a secure well ventilated bunk
• Close your eyes, try to sleep (turns off “BB”)
• Small amounts of fluids, and candy
• Medication--suppositories or IM
• Pray
## Seasickness Medication:
### (best for prevention)

<table>
<thead>
<tr>
<th>Medication</th>
<th>Description</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 Phenergan</td>
<td>25mg tabs</td>
<td>12 hrs</td>
</tr>
<tr>
<td>with dexedrine</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, suppository, deep IM injection</td>
<td>12 hrs</td>
</tr>
</tbody>
</table>

*UK, Canada, Mexico, Europe & Bermuda*
• The protection conferred by drugs is a matter of degree
• No drug (or non drug therapy) has been found which can act as a magic bullet, totally preventing seasickness in everyone
• All drugs have side effects-
“BEST BET ”: Bonine (Meclizine) + Sudafed
Use Phenergan 25 mg when necessary

least sedation and cognitive side effects
COASTAL MEDICAL KIT: 12-24 hrs
SELECTION OF MEDICAL SUPPLIES

• Waterproof containers
• Rx Endemic diseases, crew’s health
• Rx Hazardous marine life, infections, seasickness, trauma, submersion, sun burn
• 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
• Avoid high risk medical evacuation for a low risk medical problem
• Promote health and safety of crew
Solar Injury—Sunscreens

- Apply early (½ hour before), liberally, & **frequently**: Q 2H
- Use “very water resistant”
- SPF (UVB) 25-30 with UVA
- Apply in recommended dose: Shot Glass
- Opaque barriers: ideal for nose, ears, lips: zinc oxide, Titanium dioxide
OPAQUE BARRIERS