Safety at Sea –Annapolis SAS 2016
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HOW TO DIE UNDERWAY

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

• 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

• CHRONIC: Slow drop in core temp over many hours to days
  • prolonged exposure to elements
COOL AND WET: Your biggest risk of Chronic hypothermia
# Hypothermia Signs

**STANDARD CLASSIFICATION BASED ON CORE TEMPERATURE**

<table>
<thead>
<tr>
<th>Category</th>
<th>Temperature</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mild</strong></td>
<td>95°F-90°F</td>
<td>Mental Impairment</td>
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<tr>
<td></td>
<td>(35°C-32°C)</td>
<td>Physical Impairment</td>
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<tr>
<td></td>
<td></td>
<td>Shivering</td>
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<tr>
<td><strong>Moderate</strong></td>
<td>90°F-82°F</td>
<td>Shivering max → less effective</td>
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<tr>
<td></td>
<td>(32°C-28°C)</td>
<td>↓ Level consciousness</td>
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<td></td>
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<td>86°F (30°C) Shivering stops</td>
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<td></td>
<td></td>
<td>Deep coma</td>
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<tr>
<td><strong>Severe</strong></td>
<td>&lt;82°F</td>
<td>Vital signs deteriorate</td>
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<tr>
<td></td>
<td>(28°C)</td>
<td>Cardiac arrest (VF, asystole)</td>
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</table>
• Shivering is the best dx sign; thermal skin sensors trigger this reflex
• Shivering powers (muscle) heat production (5X resting)-involuntary exercise
• Once shivering stops, the body has lost the capacity to actively rewarm itself
• Starts early, before a drop in core temp
A cold shivering person with a core temperature above 95°C is “cold stressed” but not hypothermic - you need to make a clinical decision:
The person is normal-functioning, alert, able to care for themselves, not incapacitated.
  e.g. sudden brief immersion in cold water, wind chill while wet, etc.
Hypothermia-Mild (Above 90ºF)

- Sustained uncontrolled shivering
- Change in fine motor coordination
- Loss of strength
- Loss of balance
- Impaired judgment, confusion
- FULLY CONSCIOUS
- UMBLES: fumble, bumble, stumble mumble, and grumble
Rx: Mild Hypothermia
• Protect from further cooling
• Shelter, remove wet clothing, dry skin
• Dress in layers, wrap with insulation, vapor barrier
• OK to give sweet high carb fluids, snacks if victim alert (calorie replacement)
• External heat not necessary-NOT always helpful-may be harmful
• **Let victim shiver**, limit exercise-”no standing or walking first 30 minutes”-
Moderate/Severe hypothermia – usually from cold water immersion

• Not shivering
• Depressed vital signs
• Altered level of consciousness: Low on AVPU scale
• Unable to walk/stand
• Bizarre behavior if conscious
Rx: Moderate/Severe Hypothermia

Same as for Mild with changes:

• No standing or walking - keep horizontal
• No fluids or food orally unless still awake and able to swallow
• Try some method of rewarming: apply heat to axilla, chest, and back
• Plan medical evacuation
• Handle gently
• No CPR if signs of life or perfusing rhythm
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
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.
Initial Response

• 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 of heart attack → drowning
- ↑↑↑ Rate and volume of breathing increases 5X
Cold Shock- A respiratory Disaster

• Hyperventilation → confusion & loss of consciousness
• Hyperventilation → asynchrony of swim stroke and breathing, → 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: The Short Term Response, lasts 3 to 30 minutes/gradual

- Muscles, nerves and joints cool: loss of strength, coordination, manual dexterity, grip strength

- Quickly lose ability to maintain airway freeboard; swimming is arduous and ineffective, survival tasks and assisting in rescue impaired

- “It will only get worse” If you feel weaker you are!
EXERCISE IN COLD WATER

The key is to move slowly to decrease heat loss (become a slow cooler)-don’t do any unnecessary swimming

• activity flushes cold water through protective garments

• activity flushes warm blood through the muscles of the extremities

• Exercise in cold water increases rate of core cooling 37%-50%

• NO effect on cooling rate if water warmer than 77°F
Protect the airway, skin, core to survive in cold water-expand window of opportunity for rescue

35 Lb. BUOYANCY
FLOAT HIGHER
⇧RIGHTING ABILITY
⇧HEAD SUPPORT
ACTIVATED BY IMMERSION IN WATER, NOT SPLASH
REQUIRES ANNUAL CHECK
Seasickness
NEWPORT-BERMUDA RACE 1998-2006  863 yachts

Seasickness, Heavy Weather and Injuries

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

Number

Year of Race

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• Too often, mariners consider seasickness a medical emergency and justification for medical evacuation.
• Waiting just 36 to 72 hours often allows symptoms to subside, and weather conditions to improve.
• “Getting your sea legs”
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: Early Signs

( the window of opportunity to prevent progression and offer early treatment)

• 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/VOMITING TO DEVELOP
Seasickness: Mechanism

• The brain’s balance center receives sensory data from the eyes and inner ear (vestibular apparatus) 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?
“INFLATABLE VOMITORIUM” WHY?
It’s a sensory conflict chamber!!
Seasickness Prevention

Eliminate the conflicts: vestibular cues cannot be manipulated, but you can provide visual information that contains equivalent motion information sensed by the vestibular system.

If your eyes are seeing what your ears are feeling, and what your brain is expecting, you have a good chance of having a great day at sea.
Seasickness Prevention (early Rx)  
“Stay on Deck”

• “Fight back and act quickly-” Take the helm
• Steer boat by reference to oncoming waves, clouds, horizon and distant marks-
• Obtain good broad view of horizon:
  – Use “earth-fixed” ("outside") reference frame
• Ride the waves with your whole body
  Alter boat’s course for comfort & wear a safety harness
Why Take the Helm?

• Our brain can utilize the self-generated motor commands used to balance ourselves and control the boat’s motion to help anticipate and orient our body to the motion.
“Local frame of reference”
Wave Riding:
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”
Prevention

Prior to Departure:

- **Consider medication** - 6 hrs. before departure
- **Start trip well rested**, well hydrated, avoid alcohol
- **Eat lightly**, no special diet suggested
- **Prepare personal gear, navigation, ship’s stores**
- **Try powdered ginger root capsules** (1gm QID) *(Sailors Secret)*, or Vitamin C 3-5gms
- **Have a positive attitude**
- **Try acupressure band**
So what’s wrong the “placebo effect”??

NOTHING! IF IT WORKS, WE’LL TAKE IT (even kids “queasy pops”!!)
Prevention

Other measures after Departure

• Avoid areas with fumes & odors, stay on deck
• Avoid close-focused visual tasks-
• Take medication at regular intervals
• Sleep/nap- REDUCE sleep deprivation
• Snacks and fluids: trail mix, PBJ on crackers, string cheese, HBEs, fruit, pop corn, energy bars, Gatorade
Seasickness- Late Signs

*stomach emptying inhibited*

- Hands and face sweat, feel cold and clammy
- Pallor
- Waves of nausea become stronger → vomiting
- Cycles of nausea and vomiting Q 15-30 min.
- Anxiety/Depression
Late Treatment

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

**ANTI HISTAMINES**
- OTC Diphenhydramine: 25-50mg liq./cap/chew, 6-8 hrs.
- OTC Bonine: 25 mg chew, 6-8 hrs.
- OTC Meclizine: 25/50 mg tab, 6-8 hrs.
- OTC Stugeron *: 15mg tabs, 6-12 hrs.

**ANTI CHOLINERGIC**
- Rx Transderm-Scop: 1.5mg patch, 2-3 days

**ANTI DOPAMINERGIC**
- Rx Phenergan: 12.5, 25, 50 mg tab, suppository, deep IM injection, 12 hrs.

* 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-
least sedation and cognitive side effects “non-sedating” antihistamines are not effective

“BEST BET ”: Bonine (Meclizine), use caffeine 200mg., or pseudoephedrine for drowsiness
The favorite for crews at Safety at Sea Seminars
Least sedating
Medication Side Effects

• Antihistamines: drowsiness, dry mouth, dizziness, blurred vision, irritability, confusion, headache, urinary retention, impaired reactions time

• Phenergan: as above; rare but significant: arrhythmias, hypotension, extrapyramidal symptoms, neuroleptic malignant syndrome (NMS)

Therefore: DO EXPERIMENT WITH DRUGS ONSHORE
Transderm-Scop Side Effects

- urinary retention, dry mouth, drowsiness, blurred vision and mental status changes.
- “hot as hell, dry as a bone, blind as a bat, mad as a hatter”
- Rare side effects: hallucinations, disorientation, confusion, eye pain
- Withdrawal Symptoms (rare): dizziness, N&V, headache, equilibrium disturbances
- Avoid use: angle closure glaucoma, BPH
Samuel Johnson’s 18th century advice:

Finally, if all else fails

“To cure seasickness, find a good big oak tree and wrap your arms around it.”
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
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
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: **PRICE** for 3-4 days

- **P**rotect- splint as needed
- **R**est-reduce inflammation and pain
- **I**ce - 15-20 minutes every 4 hours x 24-48hrs, or 10 min intervals day 1
- **C**ompression-elastic bandage
- **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.