



Drowning

Resuscitation

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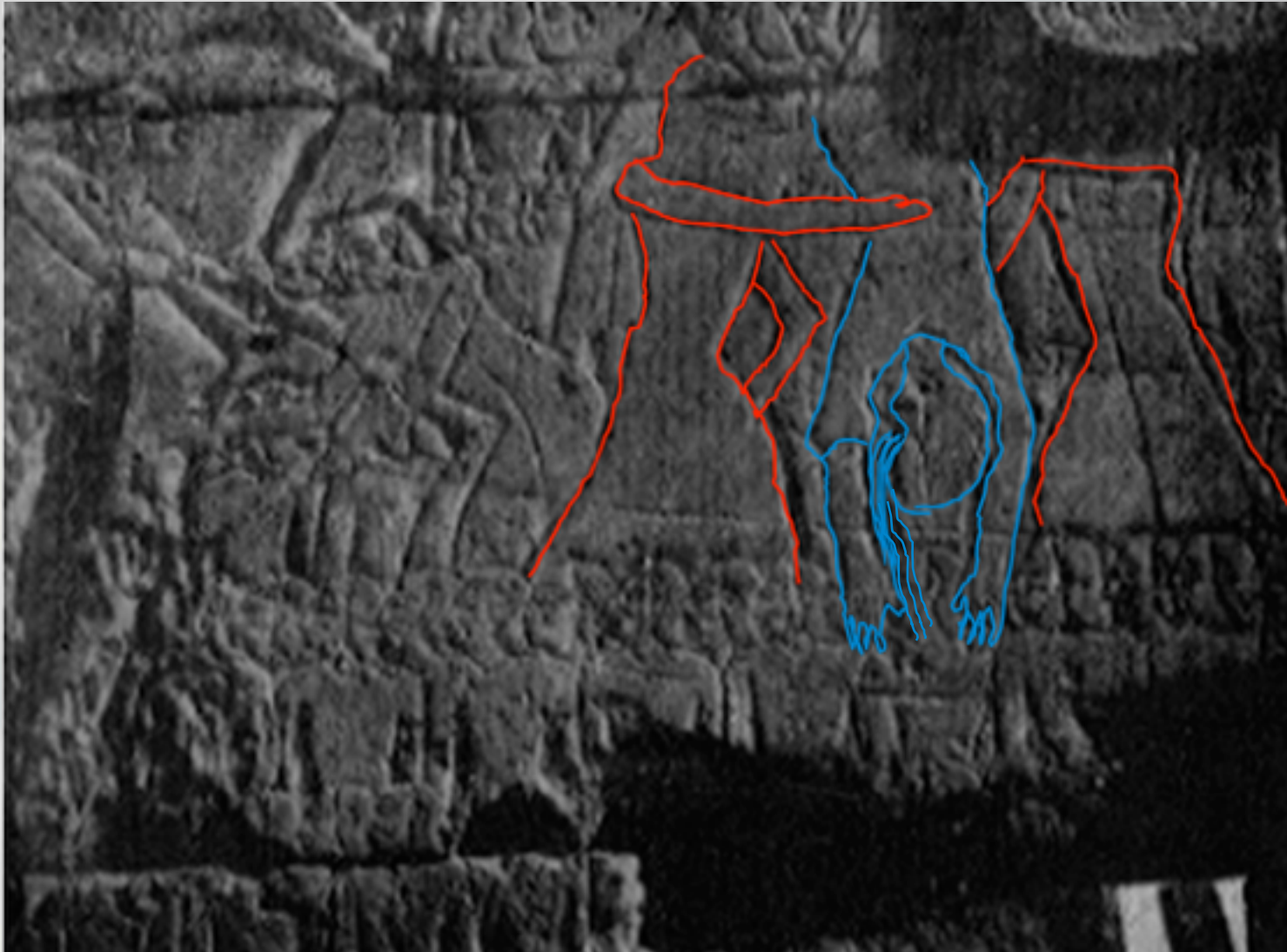
Disclosure

No financial conflicts

Images and videos of fatal and non-fatal drowning patients

Follow your protocols and medical direction





The "Great of Aleppo" held upside down after drowning. 1237 B.C.
From the Pylon of the Ramesseum, Thebes. Photographed by Mr. W. M. F. Petrie

Objectives

- Understand definition of drowning
- Emergent Management
- Disposition of drowning patients
- Don't blow smoke up pt's (or colleagues) asses



What we will not cover

- Epidemiology
- Rescue Techniques
- Post Resus Care
- Hypothermia
- Shallow Water Blackout
- ICU Management



DROWNING CHAIN OF SURVIVAL

A call to action



Who is Drowning?

- Excludes Floods/Boating/Natural Disasters
 - 2014 USCG Responded to 4,064 incidents
 - 2,678 injuries
 - 610 deaths
 - 77% Drowning
 - ❖ 84% without lifejackets
 - ❖ 80% vessel <21 ft



Definition

- “The process of experiencing respiratory impairment from submersion/immersion in liquid”
- Only 3 outcomes
 - Fatal
 - Non-Fatal
 - ± Morbidity



Bangladesh, Lifeguards Without Borders, Aug2009

Definition

- Old terms that should NOT be used
 - Dry
 - Wet
 - Active
 - Passive
 - Secondary
 - Near ← Especially



Lima, Peru, 2009

- No difference between salt, chlorine, freshwater

Drowning



COLIN'S HOPE
we



BMF

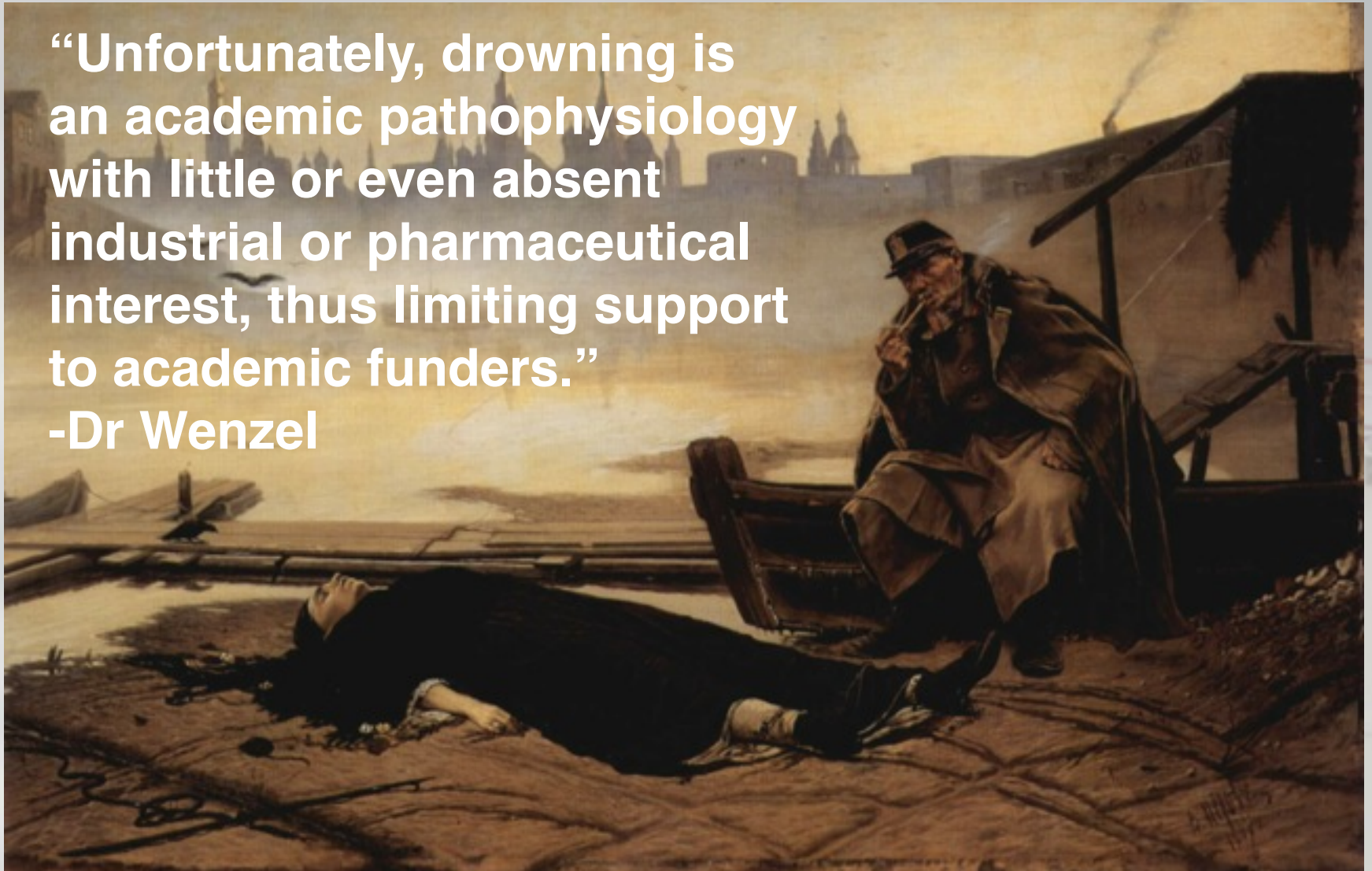


Building Resources & Awareness of Youth Drownings through Encouragement & Networking

Physiology of Drowning

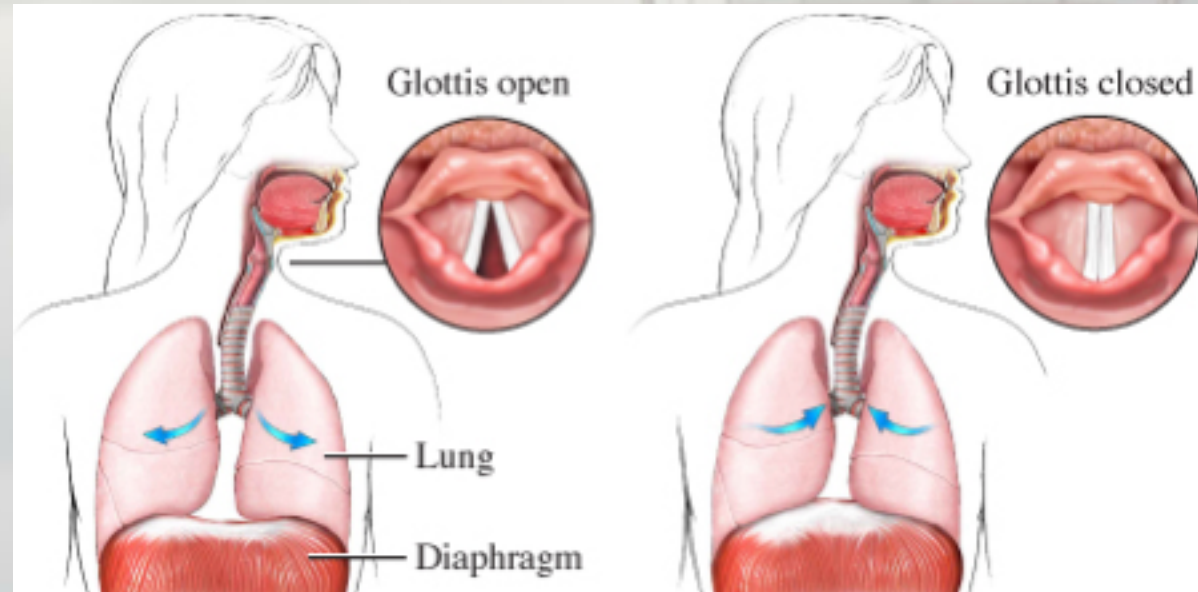
“Unfortunately, drowning is an academic pathophysiology with little or even absent industrial or pharmaceutical interest, thus limiting support to academic funders.”

-Dr Wenzel



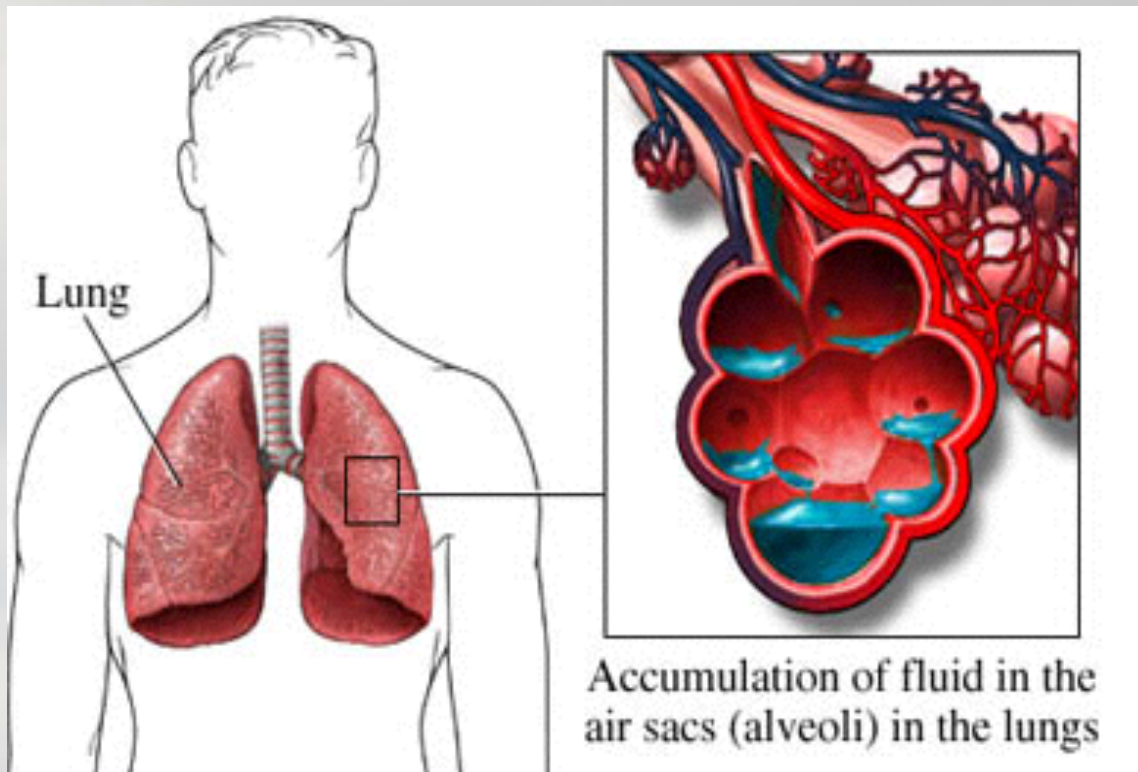
Physiology of Drowning

- Breath holding during struggle
- Attempt to inhale water results in ?laryngospasm
 - Usually little (<30mL) or NO fluid in lungs
 - Reflex Swallowing



Physiology

- Water may enter (1-2mL/kg)
 - Relaxation after unconsciousness



Physiology

Articles | 1 July 1967

The Effects of Fluid Volume in Seawater Drowning

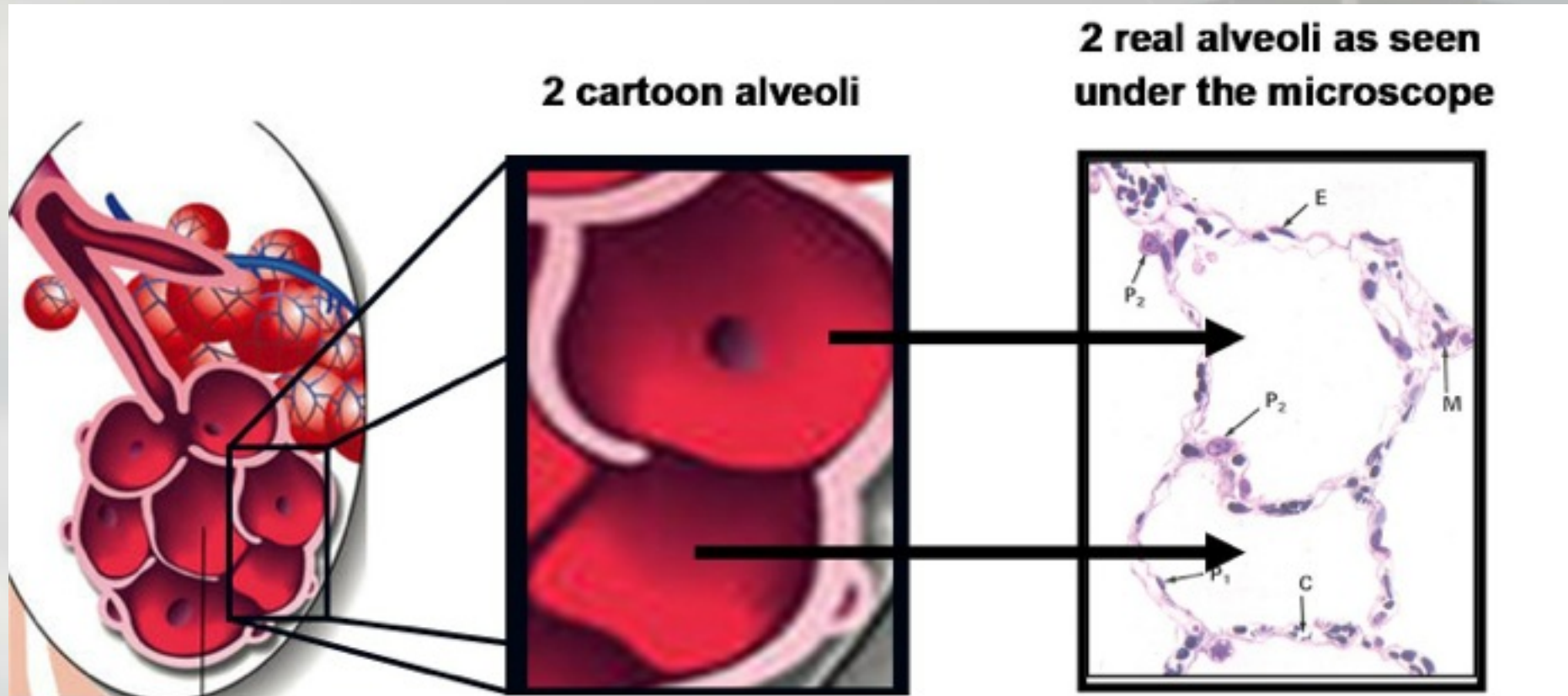
JEROME H. MODELL, M.D.; FRANK MOYA, M.D.; EARLENE J. NEWBY; BRUCE C. RUIZ; and APRIL V. SHOWERS, R.N.

Ann Intern Med. 1967;67(1):68-80.



Mechanism

- Surfactant wash-out (pulmonary edema)
- Direct cellular injury



↓ O2 Delivery to brain



Physiology

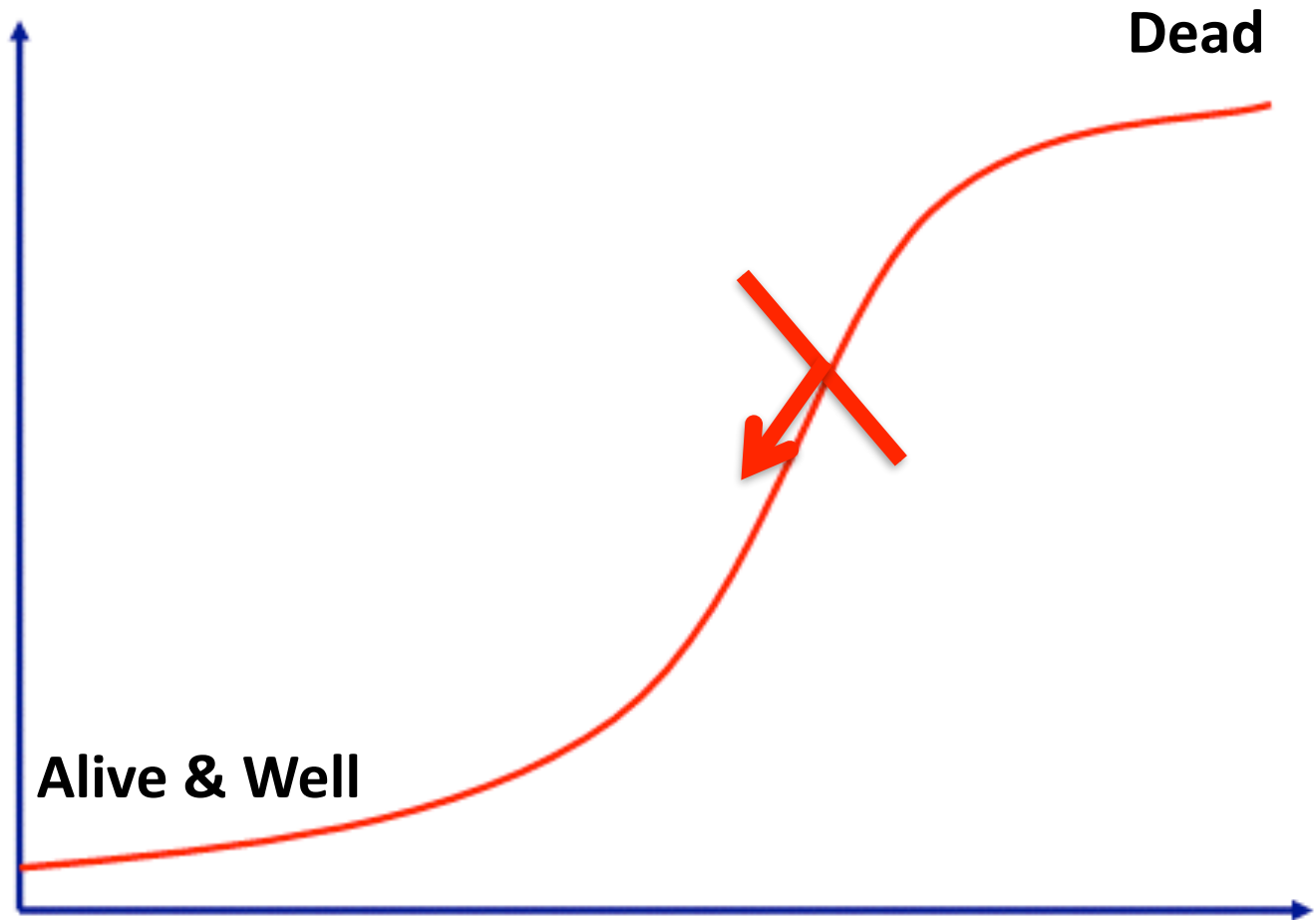
- Cause of death or morbidity
 - Anoxic Brain Injury
- Treatment → Oxygen to the Brain



Drowning is a **BRAIN** problem
with **LUNG** complications.



Physiology



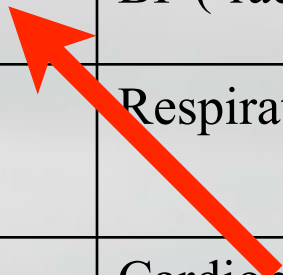
The Spectrum of Drowning

- 41,729 oceanfront lifeguard rescues in Rio de Janeiro from 1972 – 1991
 - 93% Released at scene without further treatment
 - 2,304 required additional medical care
 - 89% lived
 - 11% died



The Spectrum of Drowning

Grade	Signs/Symptoms (s/sx)	Mortality	Treatment
1	Cough, no foam at mouth/nose -Lungs Clear	0%	Thorough history – Release home with education
2	Small amt foam in mouth or nose, +Rales	0.6%	N/C O
3	Large amt foam, normal BP (+radial pulse)	5.2%	ETT/NRB O
4	Large amt foam, LOW BP (-radial pulse)	19.4%	ETT/NRB O Hospital
5	Respiratory Arrest	44%	ETT/NRB O Hospital
6	Cardiopulmonary Arrest	93%	ETT/NRB O Hospital Do not resuscitate if down >1 hour



The Spectrum of Drowning

Grade	Signs/Symptoms (s/ sx)	Mortality	Treatment
1	Cough, no foam at mouth/nose -LCTAB	0%	Thorough history – Release home with education
2	Small amt foam in mouth or nose, +Rales	0.6%	N/C O
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Lifeguards Without Borders

Published by Justin Sem Srott [?] · August 26 at 11:48am · 🌐

There's some incorrect terminology, but a good article to educate on NON-Fatal Drowning. Includes quotes and discussion from Dr Justin.

<https://www.yahoo.com/.../mom-shares-photo-of-3-year-old-son-...>



Mom Shares Photo of 3-Year-Old Son After Dry Drowning Scare

"People think that something like this won't happen to you but it can," Darcy McQueeney tells Yahoo Parenting about nearly losing her son, Ezra, 3, to...



The Reality

- **2010**

- 12,900 ED visits
- 2,600 admitted to same hospital (20.3%)
- 4,521 (1,106*) Deaths

- **2008**

- 0.3/100,000 Fatal*
- 2.1/100,000 Non Fatal*



Uganda, Lifeguards Without Borders, Nov 2014

*Pediatric Only



Lifeguards Without Borders

Published by Justin Sem Srott [?] · August 27 at 5:34pm · 🌐

Great story and great to see the correct terminology on non-fatal drowning!!!



2 Olympic Swimmers Who Drowned As Kids Share Their Scary Stories

They learned to swim the hard way, after nearly fatally drowning as kids, and now Olympic medal winning swimming champions Cullen Jones and Jessica Hardy...

YAHOO.COM



Position Statement 15-1

Use of the Terms Near, Dry, Delayed and Secondary Drowning

Position

1. Any person - adult or child - who has been in or under the water and has symptoms of difficulty breathing, excessive cough, foam or froth in the mouth, or aren't acting right that occur immediately or within a few hours of being in the water had a non-fatal drowning and should seek care from a doctor. Symptoms usually appear immediately, but may be delayed by a few hours or get progressively worse. Onset or worsening of symptoms usually occurs within the first 8 hours of submersion.
2. There is no such thing as "dry" or "wet", "delayed", or "secondary" drowning. Anyone with respiratory impairment, not acting right, excessive cough, foam, or lethargy after being underwater, even briefly, should be taken to a hospital for further evaluation. Drowning is a spectrum ranging from mild to moderate to severe.

Patient pulled from ocean

A- Patent, lots of foam



B- Tachypneic, tiring out

C- Tachycardic, thready pulse

Critical Actions?



Airway

- Ventilate / Oxygenate
 - Pediatric
 - Airway obstruction?
 - Foam, Sand, Mud, Del Taco
 - Dec Compliance
 - Vomitus
 - 86% of Drowning resuscitations



Hypoxic Arrest

- Cardiac BLS/ACLS
 - Heart stops, oxygen in blood needs circulating
 - C,A,B or C,C,C
- Drowning, Peds, Traumatic BLS/ACLS
 - Heart stops because no oxygen in blood
 - A,B,C



Part 12: Cardiac Arrest in Special Situations: 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care

Terry L. Vanden Hoek, Laurie J. Morrison, Michael Shuster, Michael Donnino, Elizabeth Sinz, Eric J. Lavonas, Farida M. Jeejeebhoy and Andrea Gabrielli

BLS Modifications

The most important and detrimental consequence of submersion is hypoxia; therefore, oxygenation, ventilation, and perfusion should be restored as rapidly as possible. This will require immediate bystander CPR plus activation of the EMS system. With the *2010 AHA Guidelines for CPR and ECC*, CPR now begins with chest compressions in a C-A-B sequence. However, the guidelines recommend that health-care providers tailor the sequence based upon the presumed etiology of the arrest. **Healthcare provider CPR for drowning victims should use the traditional A-B-C approach** in view of the hypoxic nature of the arrest. Victims with only respiratory arrest usually respond after a few artificial breaths are given.

Starting CPR with 30 compressions followed by 2 ventilations should theoretically delay ventilations by only about 18 seconds for the lone rescuer and by an even a shorter interval for 2 rescuers. The CAB sequence for infants and children is recommended in order to simplify training with the hope that more victims of sudden cardiac arrest will receive bystander CPR. It offers the advantage of consistency in teaching rescuers, whether their patients are infants, children, or adults.

In Water Resuscitation

3X Increased Survival



C-Spine

- Less than 1% of Drowning patients, all with significant mechanism of injury



AED's in Drowning

- V-Fib/V-Tach?
- Do not delay
Oxygenation / Ventilation

Author	Year	Included	% VF
Suominen	2002	48	6.2
Eich	2007	12	0
Grmec	2009	29	9.7
Ballesteros	2009	20	5.0
Nitta	2013	1737	1.7
Claesson	2014	499	4.8

“Do it by the book, but be the author.”



**BALTIMORE CITY HOSPITAL
DEPARTMENT OF ANESTHESIOLOGY
RESUSCITATION EXPERIMENT, JULY 13, 1957
VOLUNTEER: FELIX STEICHEN, M.D.
RESIDENT IN SURGERY**

Dr. Peter Safar (12 April 1924 – 2 August 2003)



Drowning



History

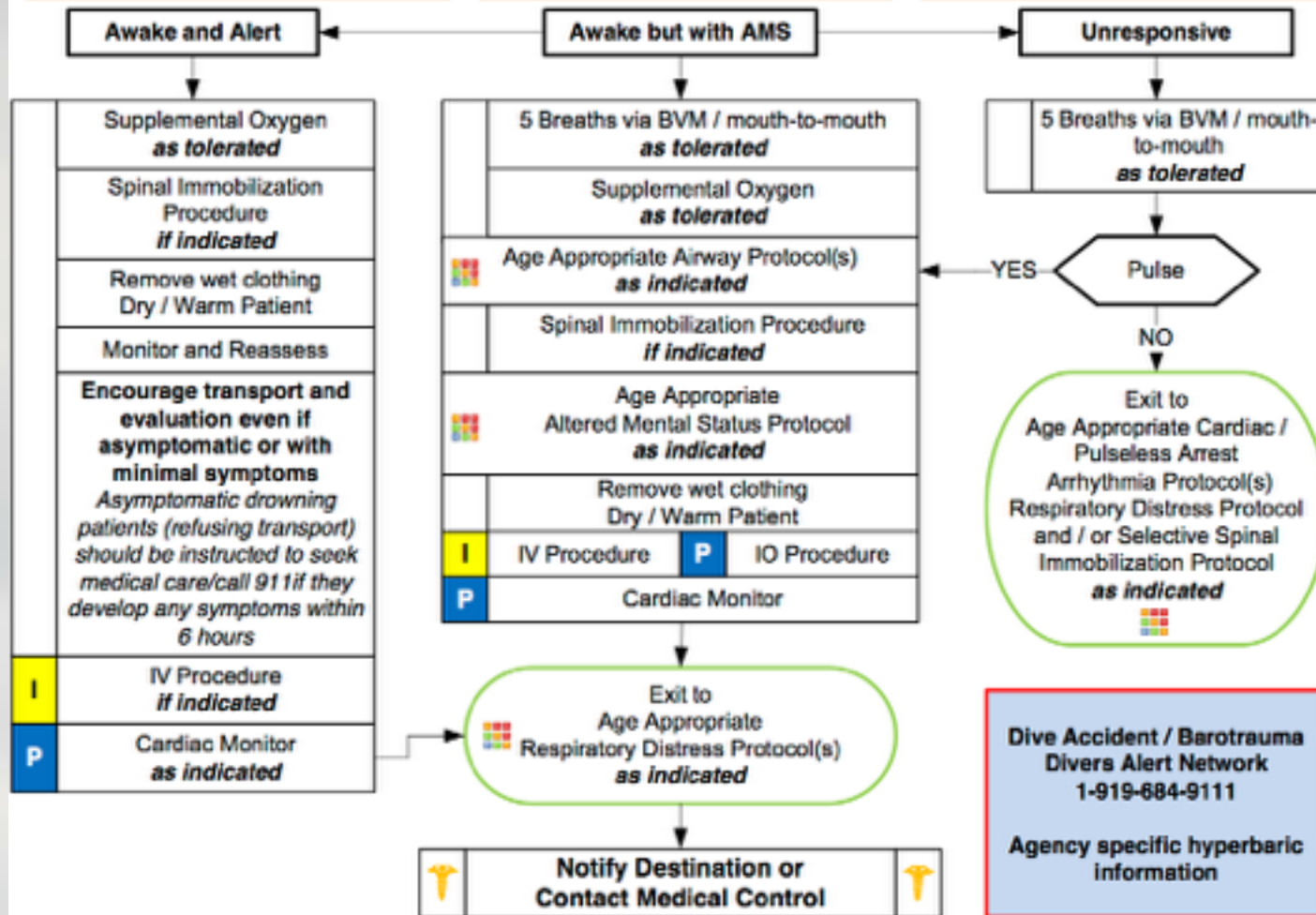
- Submersion in water regardless of depth
- Possible history of trauma
- Slammed into shore wave break
- Duration of submersion / immersion
- Temperature of water or possibility of hypothermia

Signs and Symptoms

- Unresponsive
- Mental status changes
- Decreased or absent vital signs
- Foaming / Vomiting
- Coughing, Wheezing, Rales, Rhonchi, Stridor
- Apnea

Differential

- Trauma
- Pre-existing medical problem
 - Hypoglycemia
 - Cardiac Dysrhythmia
- Pressure injury (SCUBA diving)
 - Barotrauma
 - Decompression sickness
- Post-immersion syndrome



Adult / Pediatric Environmental Section Protocols

Dive Accident / Barotrauma Divers Alert Network
 1-919-684-9111

Agency specific hyperbaric information



Pearls

- **Recommended Exam: Respiratory, Mental status, Trauma Survey, Skin, Neuro**
- **Drowning is the process of experiencing respiratory impairment (any respiratory symptom) from submersion / immersion in a liquid.**
- **Begin with BVM ventilations, if patient does not tolerate then apply appropriate mode of supplemental oxygen.**
- **Ensure scene safety. Drowning is a leading cause of death among would-be rescuers.**
- **When feasible, only appropriately trained and certified rescuers should remove patients from areas of danger.**
- **Regardless of water temperature – resuscitate all patients with known submersion time of ≤ 25 minutes.**
- **Regardless of water temperature – If submersion time ≥ 1 hour consider moving to recovery phase instead of rescue.**
- **Foam is usually present in airway and may be copious, DO NOT waste time attempting to suction. Ventilate with BVM through foam (suction water and vomit only when present.)**
- **Cardiac arrest in drowning is caused by hypoxia, airway and ventilation are equally important to high-quality CPR.**
- **Encourage transport of all symptomatic patients (cough, foam, dyspnea, abnormal lung sounds, hypoxia) due to potential worsening over the next 6 hours.**
- Predicting prognosis in prehospital setting is difficult and does not correlate with mental status. Unless obvious death, transport.
- Hypothermia is often associated with drowning and submersion injuries even with warm ambient conditions.
- Drowning patient typically has $<1 - 3$ mL/kg of water in lungs (does not require suction.) Primary treatment is reversal of hypoxia.
- Spinal immobilization is usually unnecessary. When indicated it should not interrupt ventilation, oxygenation and / or CPR.

Protocol 80

Any local EMS System changes to this document must follow the NC OEMS Protocol Change Policy and be approved by OEMS

Summary

- Understand definition of drowning
 - Process, not an outcome
 - No “Dry”, “Secondary”, “Wet”, “Delayed” Drowning
 - Only Fatal or Non-Fatal
- Management
 - Rapid O₂ O₂ O₂, anticipate vomitus, ignore foam
 - Hypoxic vs Cardiac cause of arrest
- Disposition of drowning patients
 - ALL Symptomatic patients require evaluation
- Don't blow smoke up pt's (or colleagues) asses
 - Engage your medical director or educators, embrace change



twitter



LifeguardsLoveYouTube.com

ISLASurf.org

Profile summary



LifeguardsWO Borders
@LifeguardsWB

Lifeguards Without Border is group of medical professionals and ocean lifeguards with a vision to decrease the number of drownings around the world.
lifeguardswithoutborders.org

190 TWEETS 369 FOLLOWING 104 FOLLOWERS [Follow](#)

LifeguardsWO Borders @LifeguardsWB 3h
@JabariWater @the_ISLASurf #SMS ability is one of the most exciting features, since 95% of #Drowning deaths occur in low income countries.
[Details](#)

LifeguardsWO Borders @LifeguardsWB 3h
@SNCDPC Thanks. I'll be doing a presentation on the #History of #Drowning #Resuscitation
[Details](#)

LifeguardsWO Borders @LifeguardsWB 4h
@podmedic @HCDFRS We have taken the same approach to #Drowning. Community level prevention, train the #ED, #EMS, & #ICU.
[Details](#)

LifeguardsWO Borders @LifeguardsWB 6h
Tagging backboards to take to Macedonia for our upcoming collaboration with @the_ISLASurf team pic.twitter.com/1ye3ihE4M1
[Details](#)

LifeguardsWO Borders @LifeguardsWB 16 May
Back from Zion and now doing #Drowning #Education for @CNLV North Las Vegas Fire. @SNCDPC @LasVegasEM pic.twitter.com/jA1MePkmFQ
[Details](#)



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