

Cold & Wet: Cases from the Last Frontier

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ARMY MEDICINE
Serving To Heal...Honored To Serve



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UNITED STATES ARMY
INSTITUTE OF SURGICAL RESEARCH
Optimizing Combat Casualty Care

The banner features a gold and black color scheme. On the left is the U.S. Army star logo. In the center, there is an American flag and a caduceus. On the right, there is a military helicopter and a circular logo with the text "PROTECT PROJECT SUSTAIN".



185 SKYWAGON II

N6590E



DANGER →

JET
INTAKE

6024

SITKA

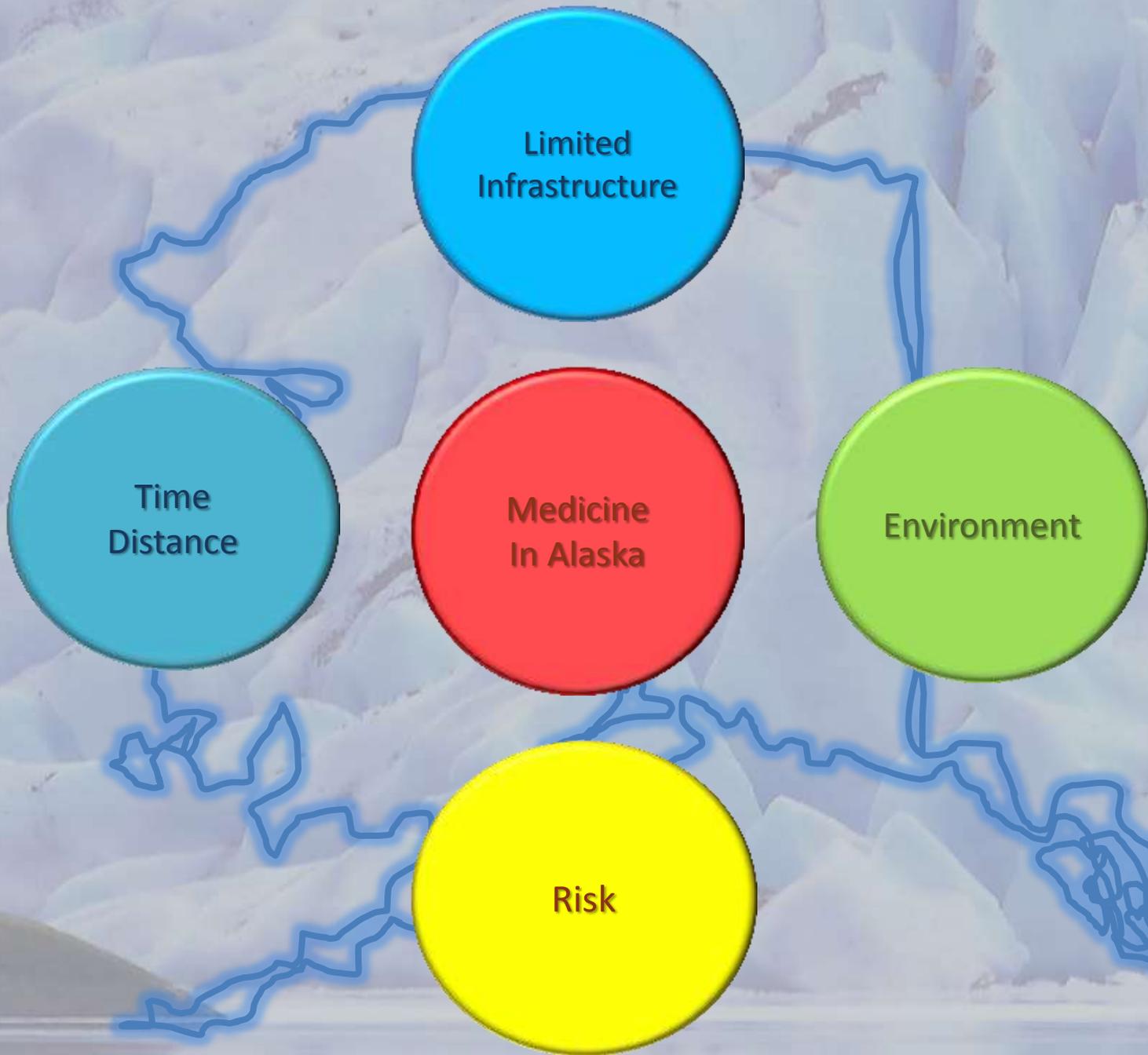
U.S.
COAST GUARD

At 591,000 square miles, Alaska is as wide as the lower 48 states and larger than Texas, California and Montana combined.



Cold & Wet: Cases from the Last Frontier

- Unique challenges medicine AK
- Cases
- Lessons
- Path forward



Limited
Infrastructure

Time
Distance

Medicine
In Alaska

Environment

Risk





Limited
Infrastructure





USCGC SPAR



**NORTON SOUND
REGIONAL HOSPITAL**



















ALASKA
ARMY NATIONAL
GUARD



HEALTH
CLINIC

CITY OF
LITTLE DIOMEDE
WASHETERIA / CLINIC
1988
COOPERATIVE PROJECT BETWEEN THE
CITY OF LITTLE DIOMEDE
THE STATE OF ALASKA
AND U.S. PUBLIC HEALTH



Syringe-Syringe-Syringe-Syringe
80

OB
KIT

OB KIT
OB KIT
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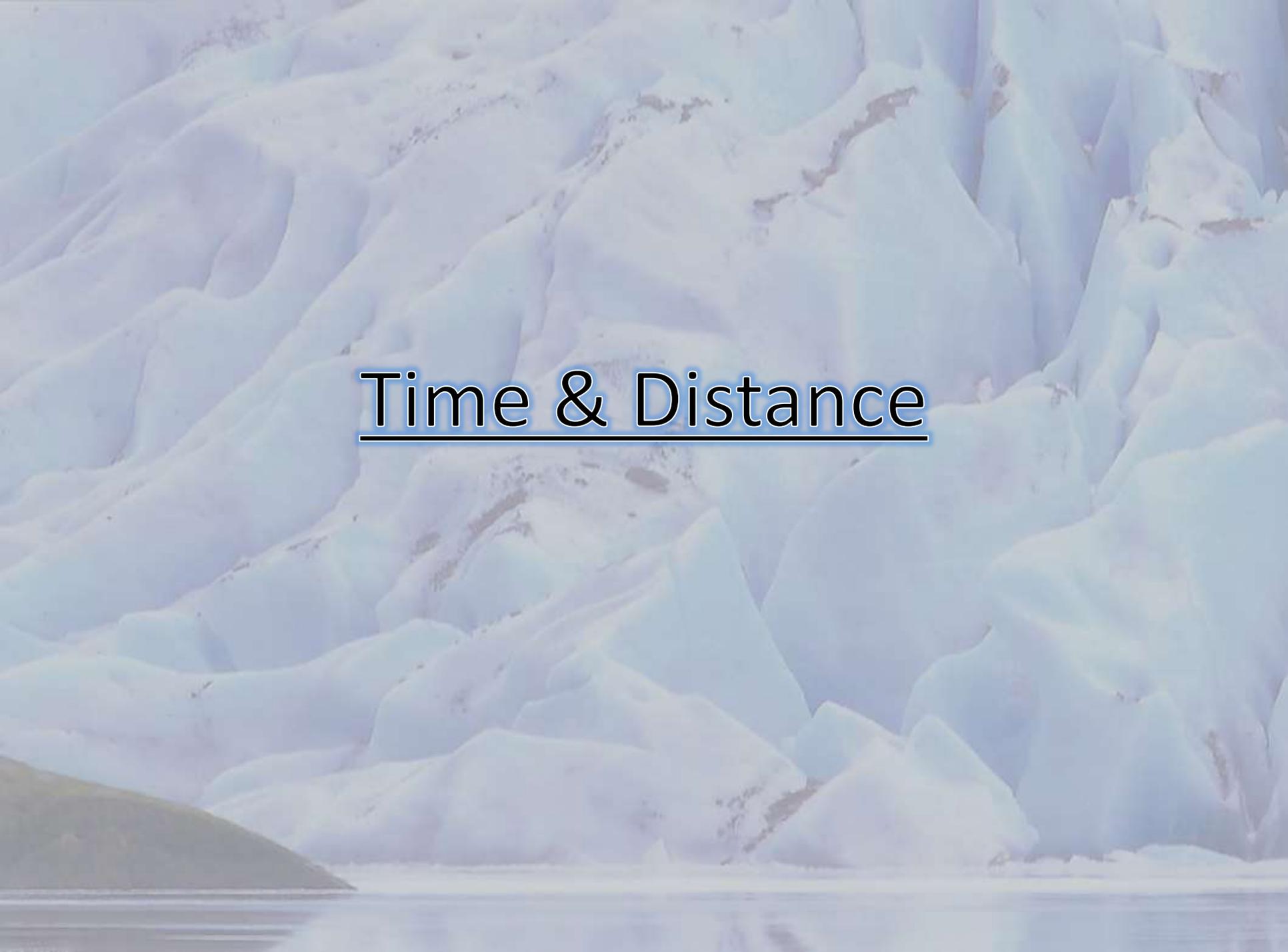
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DIOMEDE
NATIVE STORE
DIOMEDE ALASKA
99762



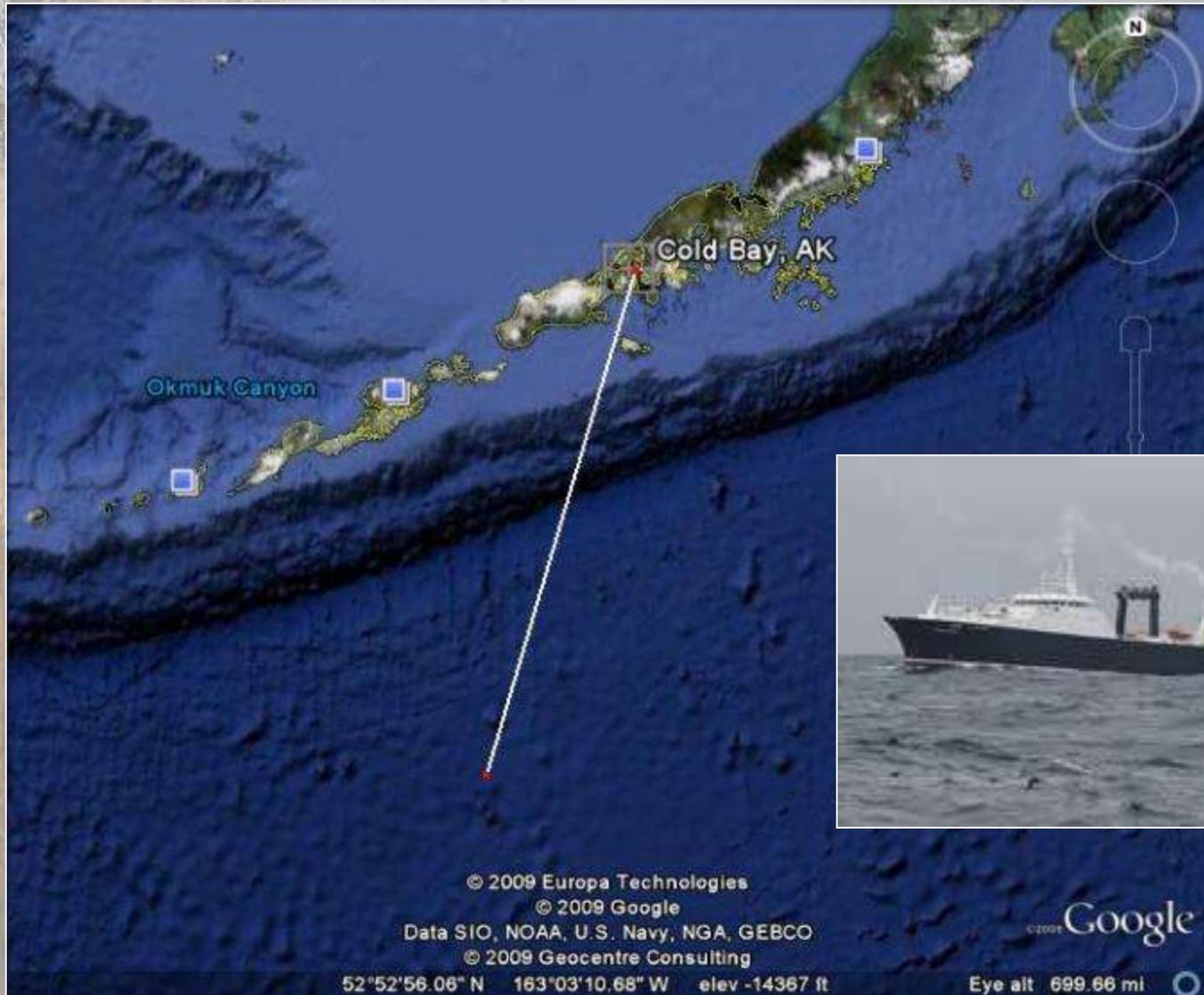
A large glacier with a blue tint, featuring a prominent crack and a small waterfall-like flow of water. The text "Time & Distance" is overlaid in the center, underlined.

Time & Distance

Case #1

- Location: 85 ft F/V 300 SW of Cold Bay
- 28 yo man, crewmember of a commercial fishing vessel with abdominal pain x 12 hours
 - Right lower abdominal pain, hurts worse going up/down ship ladder
 - Low grade fever
 - Nausea
 - Not hungry

Case # 1 Location



Case #1(continued)

- SAMPLE history
 - No allergies
 - No chronic medication, took Advil 200 mg x 4 tabs for discomfort 2 hours ago
 - Healthy without h/o surgery ever
 - Last meal 5 hours ago - soup

Case #1(continued)

- Vital Signs
 - T 100.1 ° F
 - HR 94
 - RR 18
 - BP 116/82

Case #1(continued)

- Physical Assessment
 - Alert, uncomfortable
 - No respiratory distress
 - Abdomen tender in right lower quadrant

Resources

- Master of vessel reports that another crewmember used to be an EMT-B
- MARSAT phone with intermittent connection and Satellite Internet
- First Aid Kit
 - BP cuff, stethoscope, pulse oximeter
 - Oral medications including narcotic pain medication, anti-inflammatories, and antibiotics



Case #1: Issues

- Patient is on a Fish Processing Ship >300 miles out to sea
- Weather
- USCG helicopter Kodiak cannot be on scene for 12-14 hours
- Soonest helicopter could possibly pick up patient and fly to Cold Bay (nearest runway where could hand off patient to commercial fixed wing medevac) is 18 hours

Case #1 Questions

- What is the diagnosis?
- What resources are there?
- What is the definitive treatment for this problem?
- How are you going to treat him?
- How long do you have to get him to definitive care?

Case #1: The Rest of the Story

- USCG helicopter able to meet ship in 16 hours (28 hours into patient symptoms)
- No IV capability on ship
- Patient allowed clear liquids to drink
- Ship's first aid kit – given Vicodin and Augmentin
- USCG helo took patient to Cold Bay. Commercial medevac took from Cold Bay to Anchorage.
- Appendix removed 36 hours into symptoms (unruptured).



Appendicitis

- Prehospital management
 - ? NPO
 - ? Pain meds
- How long to do you have?

How time affects the risk of rupture in appendicitis

- J Am Coll Surg. 2006 Mar;202(3):401-6. Epub 2006 Jan 18.
- 219 appendicitis patients operated on between 1996 and 1998 at 2 inner-city tertiary referral and municipal hospitals.
- Rupture risk was $<$ or $=$ 2% in patients with less than 36 hours of untreated symptoms.
- $>$ 36 hours, the risk of rupture rose to and remained steady at 5% for each ensuing 12-hour period.



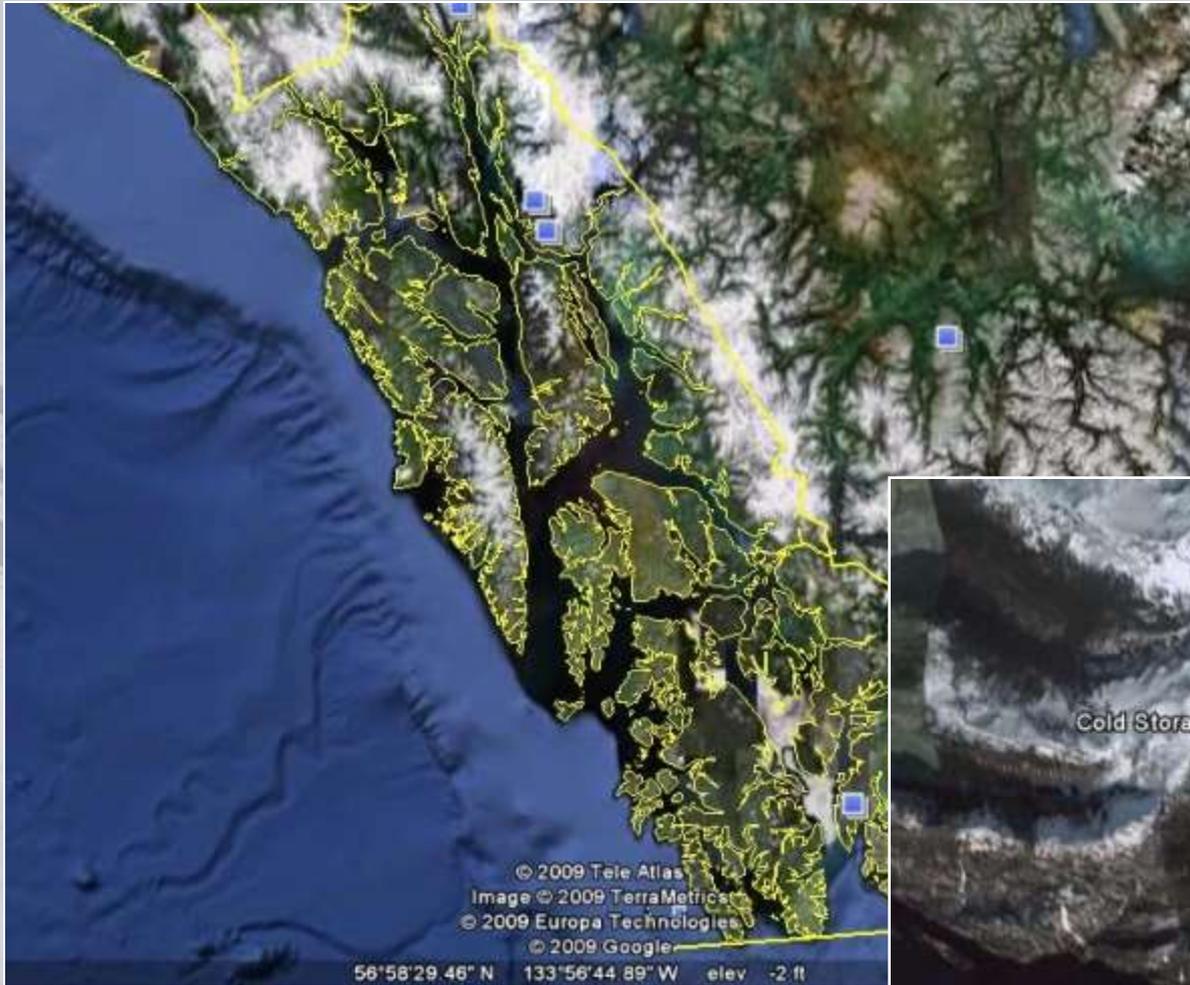
A background image of a glacier with the word "Cold" overlaid in a stylized font. The glacier is a massive, flowing body of ice with a textured, undulating surface. The color is a pale, milky blue, with some darker, brownish patches visible, likely due to sediment or rock fragments. The word "Cold" is centered in the middle of the image, rendered in a bold, black, serif font with a white outline and a blue glow. Below the word is a double horizontal line. The entire scene is set against a backdrop of a calm body of water in the foreground, reflecting the light from the sky.

Cold

Case #2

- Location: Steep scree slope above Cold Storage Lake
- When: 8 PM in September
- Weather: Overcast, rain, 38°F
- 35 yo man took a 200 foot rolling fall down slope
- Screaming in pain with a deformed right shoulder. Shivering.
- Hunting buddy reports “he’s going into shock” (comms than lost)

Case # 2 Location



Case #2 (continued)

- SAMPLE history/Further assessment on hold
- Resources
 - Mountain Rescue Team
 - EMT III, paramedic
 - Technical rope rescue team
 - Boat/Hike (12 hours to ♂ contact)
 - CG helicopter (45 minutes to ♂ contact)



Case #2 Questions

- Patient problems?
- Anticipated problems?
- Plan?
- Priorities?

Case #2 (continued)

- Physical Assessment
 - V on AVPU scale, crying out in pain with movement
 - No respiratory distress
 - Right shoulder deformity, (+) pulse in wrist, screaming at any movement of right arm
 - Back pain, mid thoracic without deformity
 - Shivering uncontrollably with the “Umbles”

Case #2 (continued)

- Problems
 - Unsafe scene, at risk to fall down hillside
 - Shoulder injury, probable dislocation > 2 hours ago, cannot exclude fracture
 - Back pain with MOI for Spine
 - Possible hypothermia
 - “Shock?”

Case #2 (continued)

- Anticipated Problems
 - Prolonged litter transit down to a safe hoisting location (hours)
 - Shoulder injury, probable dislocation > 2 hours ago, cannot exclude fracture
 - Unable to reduce in the field
 - Back pain with MOI for Spine
 - Unable to clear spine in field
 - Hypothermia
 - “Shock?”

Case #2 Questions

- What are the problems?
- What is the most immediate concern?
- What is the definitive treatment for the problem?
- How are you going to treat him?

Case #2: The Rest of the Story

- Rescue captain made patient contact and then held patient in physical grip until technical rope team set up anchor system
- Litter, C collar, backboard, right arm splinted to side, warmed IV fluids, IV morphine, chemical heat blanket, Wiggy bag, oral calories

Case #2: The Rest of the Story

- Litter transit 1000 vf down hillside to stable location
- Patient transported to local hospital via USCG helicopter
- Core temp on arrival in ER = 98.2 °F
- Shoulder reduced in OR
- Spine films negative

Case #2: Learning Points

- Scene safety
- Hypothermia treatment in the field
- Shoulder dislocation field treatment
- Spine clearance in the field

Hypothermia: Packaging & Treatment



It is difficult or impossible to achieve pain-free immobilization during prolonged transport, especially during evacuation over rough terrain.

Joints that are left in the dislocated position for prolonged time are also generally more difficult to reduce later.

It may be reasonable to attempt early reduction in the field of selected simple dislocations.

DISLOCATION - SHOULDER

GENERAL PRINCIPLES

1. Simple anterior dislocations generally occur when the arm is in the position of 90 degrees abduction and full external rotation (i.e., "throwing a baseball"). Posterior force (from a fall, moving water, etc.) at the lower arm or elbow causes a levering action which dislocates the head of the humerus anteriorly out of the shoulder joint.
2. Recurrent anterior dislocations are common because the anterior joint capsule is weakened.
3. Associated injury to axillary nerve and brachial plexus is common. Although it does not change treatment, this injury should be documented.
4. Fractures that occur with simple anterior dislocations are generally minor and do not change treatment procedures.

ASSESSMENT

1. Mechanism of injury is consistent with simple dislocation.
2. Patients commonly describe the injury accurately as a "dislocated shoulder."
3. History of recurrent dislocation is common.
4. Patient is unable to reach hand across to touch the uninjured shoulder.
5. Injured shoulder generally shows a typical "hollow spot" deformity that is not present on the uninjured side.
6. Check and document status of peripheral nerves before and after treatment. Check the brachial plexus by testing motor/sensory function in both hands. Check the axillary nerve function by testing sensory function over the deltoid muscle.

1. Positive (or uncertain) mechanism + positive signs or symptoms = **positive spine injury**
2. Positive (or uncertain) mechanism + negative exam and unreliable exam = **positive spine injury**
3. Positive (or uncertain) mechanism + negative exam and reliable exam = **negative spine injury and the patient does not need spinal immobilization**

SPINE INJURY

Conventional EMS guidelines recommend that essentially every victim of any significant trauma be treated in the field as having an unstable spine injury. For example, any victim of any motor vehicle crash is generally assumed to have an unstable spine injury and is transported to the hospital with full spinal immobilization. This approach is generally reasonable and appropriate for the conventional EMS context of rapid transport because patient symptoms and physical exam are often unreliable for the time period immediately following trauma.

The specialized context of delayed/prolonged transport, however, requires a closer look at assessment criteria and treatment procedures for spine injury. Full spine immobilization, if it is not required, can be unnecessarily difficult, impractical, impossible and even dangerous during prolonged evacuation, especially in severe environments or when using improvised equipment. Prolonged transport also provides an opportunity to repeat patient surveys and to observe changes in the patient's condition over time.

1. Because "positive mechanism" for spine injury is by necessity a vague term, emphasis in field assessment has been placed on clinical criteria. The evidence available in the current medical literature concludes that specific clinical criteria provide safe, accurate, and dependable assessment of possible unstable spine injury when the trauma victim is calm, cooperative, sober and alert. These clinical criteria can also be applied to trauma patients with uncertain or non-specific mechanisms of injury.
2. Pain response is often abnormal in victims of significant trauma during the time period immediately following injury. Fear, confusion, and multiple or distracting injuries often result in an acute, autonomic type of stress reaction (Acute Stress Reaction or ASR) and a variable period of "pain-masking." For this reason, all victims of severe trauma who have a "positive mechanism" for spine injury generally should be treated with full spine immobilization during the initial phase of patient management. In the conventional EMS context of rapid transport, these patients can be transported quickly and safely to a hospital facility for further assessment.
3. Extended patient management during delayed/prolonged transport provides the opportunity for repeated examination of the injured patient over a period of time. With the progression of time, the patient exam can become reliable as the patient becomes more alert and response to pain becomes dependable. Treatment then then be modified according to changes in the patient's condition.
4. If spine injury cannot be localized or if the exam is unreliable, the entire spine should be immobilized. If spine injury can be accurately and reliably localized, the injured part can be immobilized, applying the concept of the spine as a long bone with a joint at either end. The injured part is splinted according to the usual splinting principles of



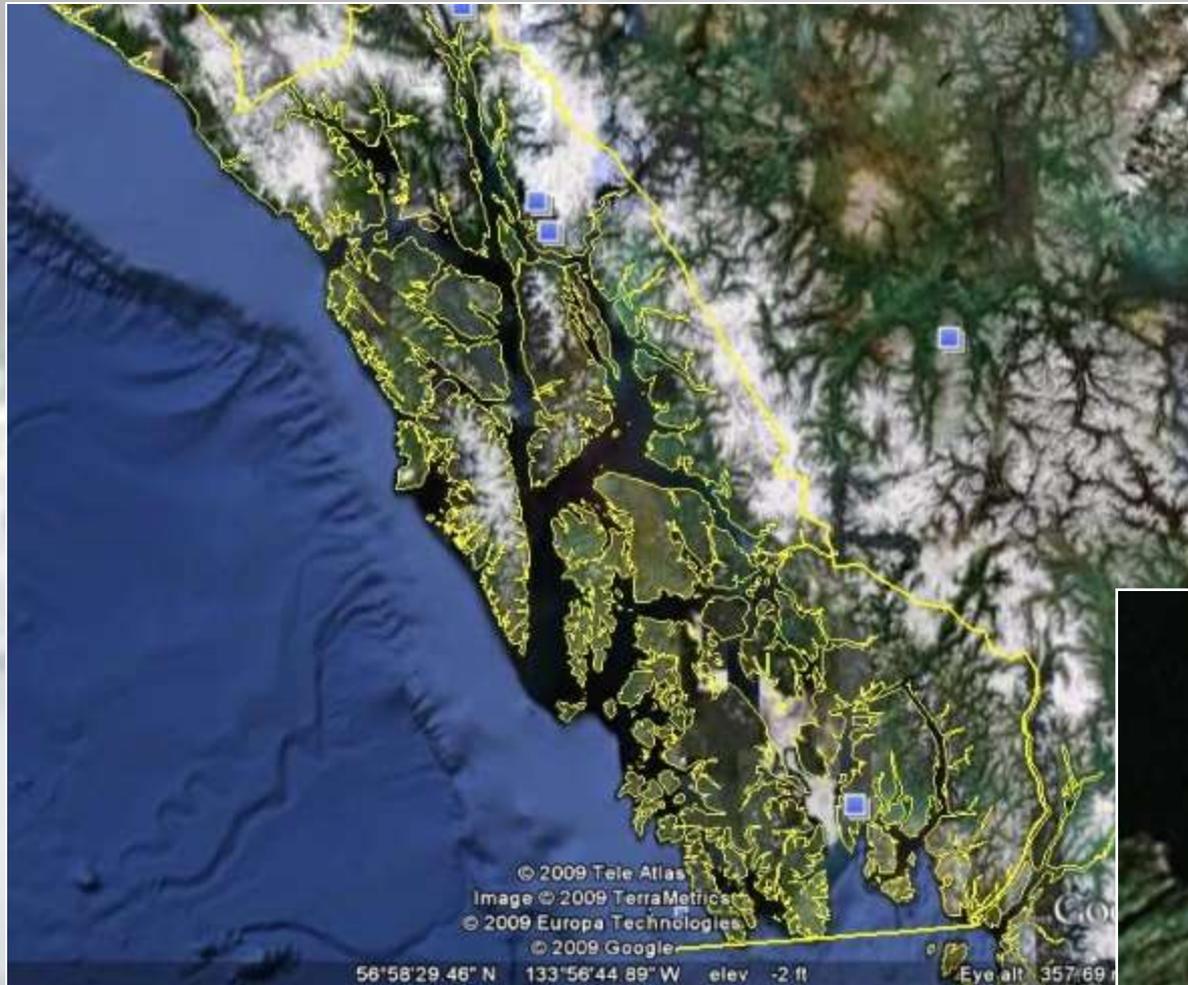


Operational Risk

Case #3

- Location: Small fishing village <50 inhabitants
- When: Midnight in November
- Weather: Overcast, rain, 35°F. Winds 35-45 kph
- 58 yo man with chest pain

Case # 3 Location



Case #3(continued)

- SAMPLE history
 - SSCP with SOB after moving equipment up a beach
 - No allergies
 - List of chronic medication, (Lisinopril, Toprol XL, HCTZ, ASA, Zocor). Has SL NTG tabs.
 - MI x 3, stent, HTN, hyperlipidemia, tobacco use
 - Last meal 5 hours ago – soup
 - Events – as above. CP x 2 hours, relieved with 2 SL NTG and Oxygen

Case #3 (continued)

- VS: HR 94 RR 22 BP 154/110
- Physical Assessment
 - A on AVPU scale
 - No respiratory distress
 - No JVD
 - Lungs with scattered coarse rhonchi
 - Cardiac sounds regular without extra sounds
 - No edema
 - Tobacco stains on fingers right hand

Resources

- ETT with Oxygen 2 D cylinders
- Marine VHF radio
- First Aid Kit
 - BP cuff, stethoscope, pulse oximeter
 - Miscellaneous first aid supplies

Problems

- Remote island community
 - Air – USCG only option due to weather (ETA 2 hours)
 - Boat - only small boats on scene. >12 hours for boat from KTN or SIT
- Known CAD with usual cardiac symptoms relieved with meds/oxygen
 - Limited meds and oxygen
 - No defibrillator

Case #3 Questions

- Patient problems?
- Anticipated problems?
- Plan?
- Priorities?

Case #3 (continued)

- Anticipated Problems
 - Cardiac ischemia
 - VF
 - Pulmonary edema
 - Respiratory distress
 - Shock
 - Limited oxygen
 - Symptoms will get worse with effort
 - Nonambulatory patient

Case #3: The Rest of the Story

- ETT titrated oxygen to keep sat>95%
- Patient got up and walked to dock at approach of helicopter
 - Recurrent CP/SOB
 - Presyncopal episode
- CG crew hoisted to dock
 - IV, monitor, MONA
- Litter hoist to helo
- Unremarkable transit to a regional hospital



Case #3: Learning Points

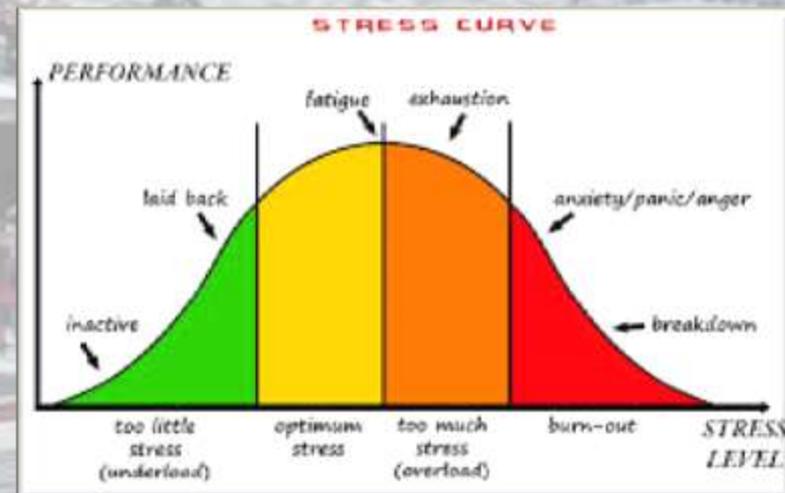
- ACS
- Dynamic risk assessment
- Anticipate potential problems
- Scene safety
- Scene safety
- Scene safety





Human Factor Pitfalls

- Stereotypical behavior “comfort zone”
- Denial
- Lack of situational awareness
- Truncated thinking under stress



Developing an Adaptive Response

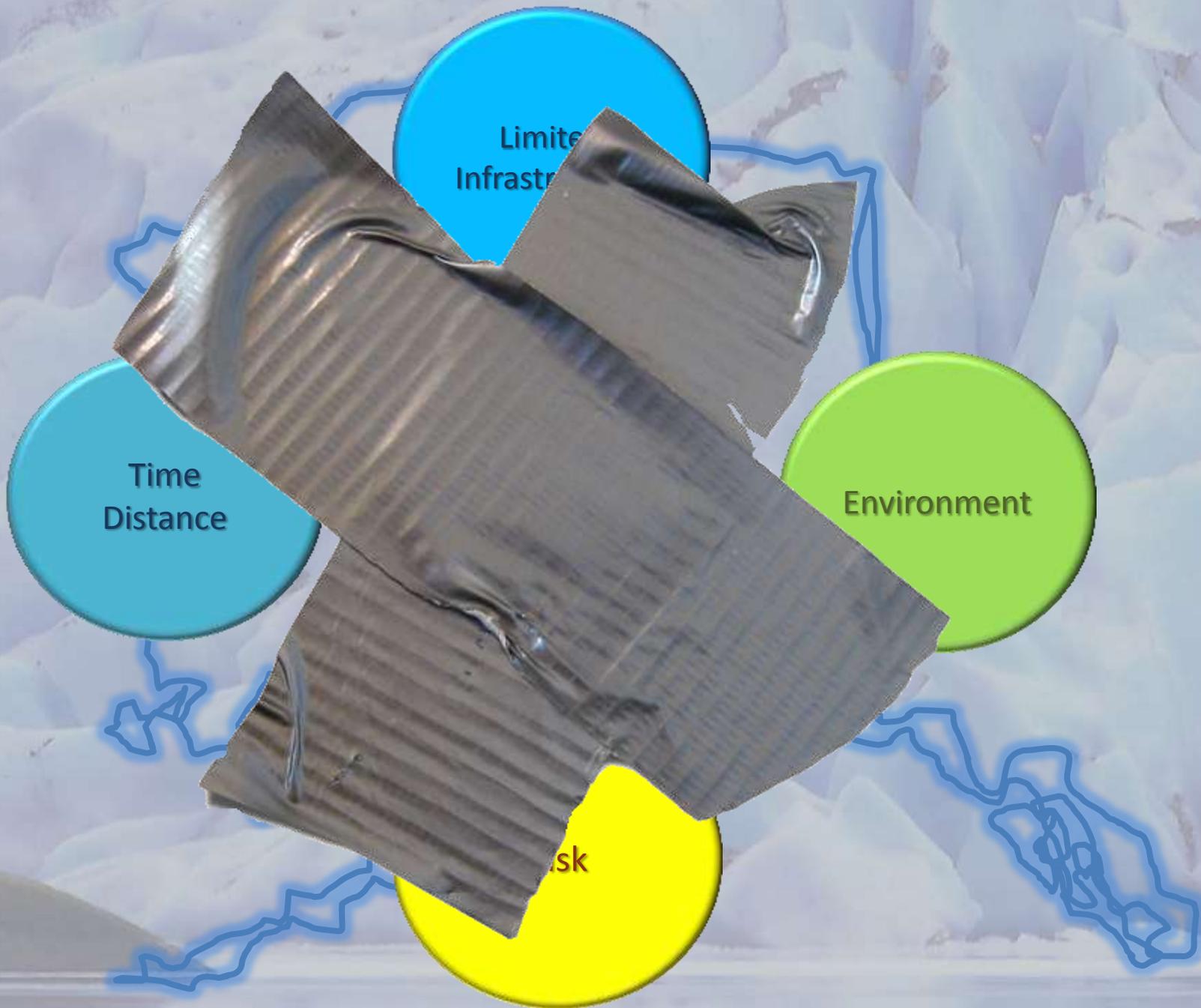


Risk Analysis

- Hazard assessment
- Preplan
- Practice/Train
- Dynamic reassessment



“Hope for the best. Prepare for the worst. Assume nothing. Trust no one.”





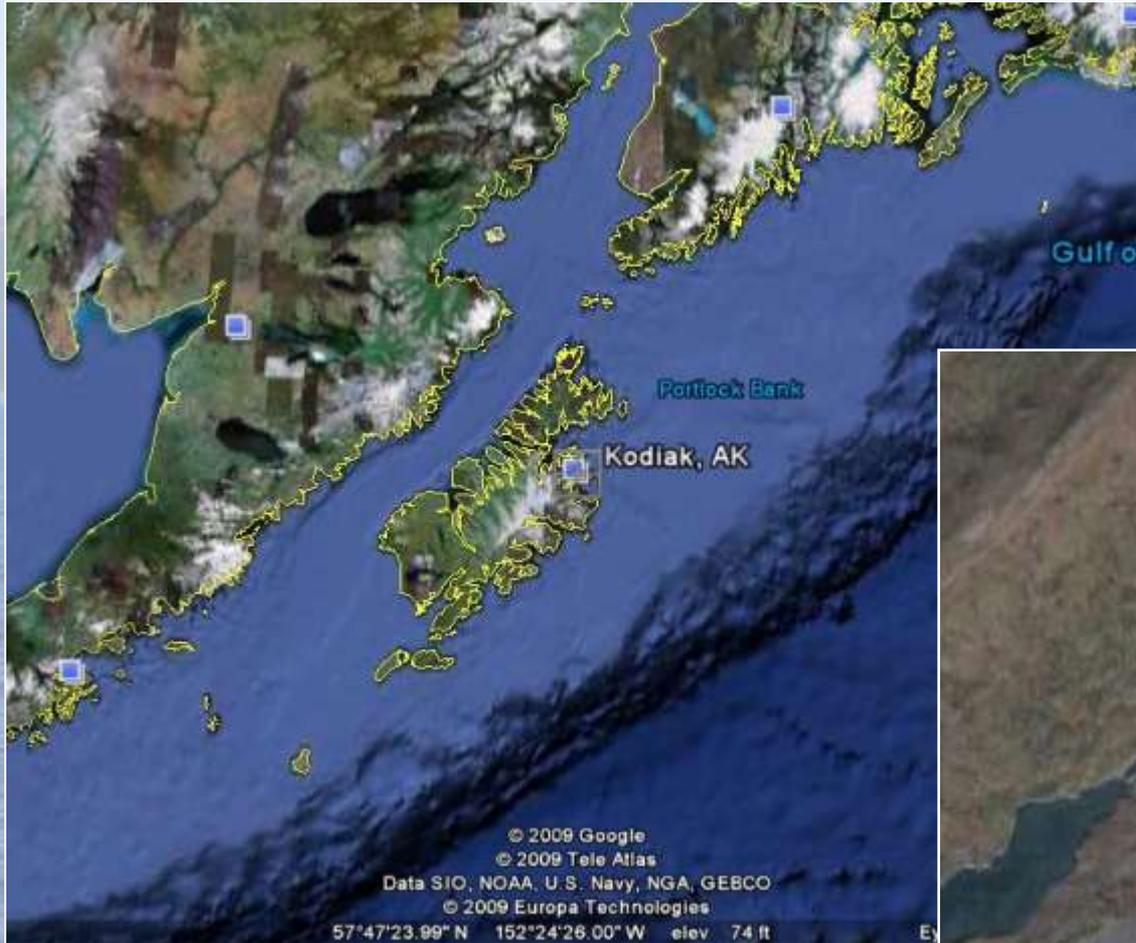
Duct Tape
Case #4

Case #4

- Location: Small fishing village < 50 inhabitants
- When: 5 PM in August
- Weather: Fair with light winds
- 28 yo man passed out with empty bottles of pills



Case # 4 Location



Case #4(continued)

- SAMPLE history
 - List of medication – empty bottle of Xanax #30 (dispensed 2 days ago), empty bottle of Elavil #30
 - Events – 28 year old man had been drinking heavily after fight with significant other (SO). Found down by SO with empty bottle of JD and beer bottles. Won't wake up.

Case #4 (continued)

- VS: HR 118 RR 10 BP 130/76
- Physical Assessment
 - U on AVPU scale
 - No eye opening
 - Moan with sternal rub
 - Withdraws from pain
 - Sonorous respirations
 - Lungs with scattered coarse rhonchi
 - Rest of exam unremarkable

Glasgow Coma Scale for Head Injury

Glasgow Coma Scale,

Eye opening

Spontaneous	4
To loud voice	3
To pain	2
None	1

Verbal response

Oriented	5
Confused, disoriented	4
Inappropriate words	3
Incomprehensible sounds	2
None	1

Best motor response

Obeys	6
Localizes	5
Withdraws (flexion)	4
Abnormal flexion posturing	3
Extension posturing	2
None	1

Resources

- EMT II with Oxygen 3 D cylinders and jump kit including equipment appropriate for level of training
- Marine VHF radio and landline phone
- No commercial medevac option
- Possible USCG helo from Kodiak

Problems

- Obtunded patient
 - GCS 7
- Polysubstance OD
 - TCA
 - Benzodiazepine
 - ETOH

Case #4 Questions

- Patient problems?
- Anticipated problems?
- Plan?
- Priorities?

Case #4 (continued)

- Anticipated Problems
 - Airway compromise/respiratory arrest
 - Cardiac dysrhythmia
 - Shock
 - Limited oxygen

Case #4: The Rest of the Story

- ER MD on a fishing trip found
- MD intubated/bagged victim
- EMT started IV
- CG helo landed
 - Patient packaged in litter
 - MD attended patient on cardiac monitor/IV/ BTV enroute Kodiak
- Admitted Kodiak Hospital/Transferred Anchorage

Case #4: Learning Points

- Airway protection
 - “GCS 8, intubate”
 - Gag vs. handling secretions
- TCA overdose
 - Cardiac dysrhythmias
 - Shock
 - CNS depression/Seizures





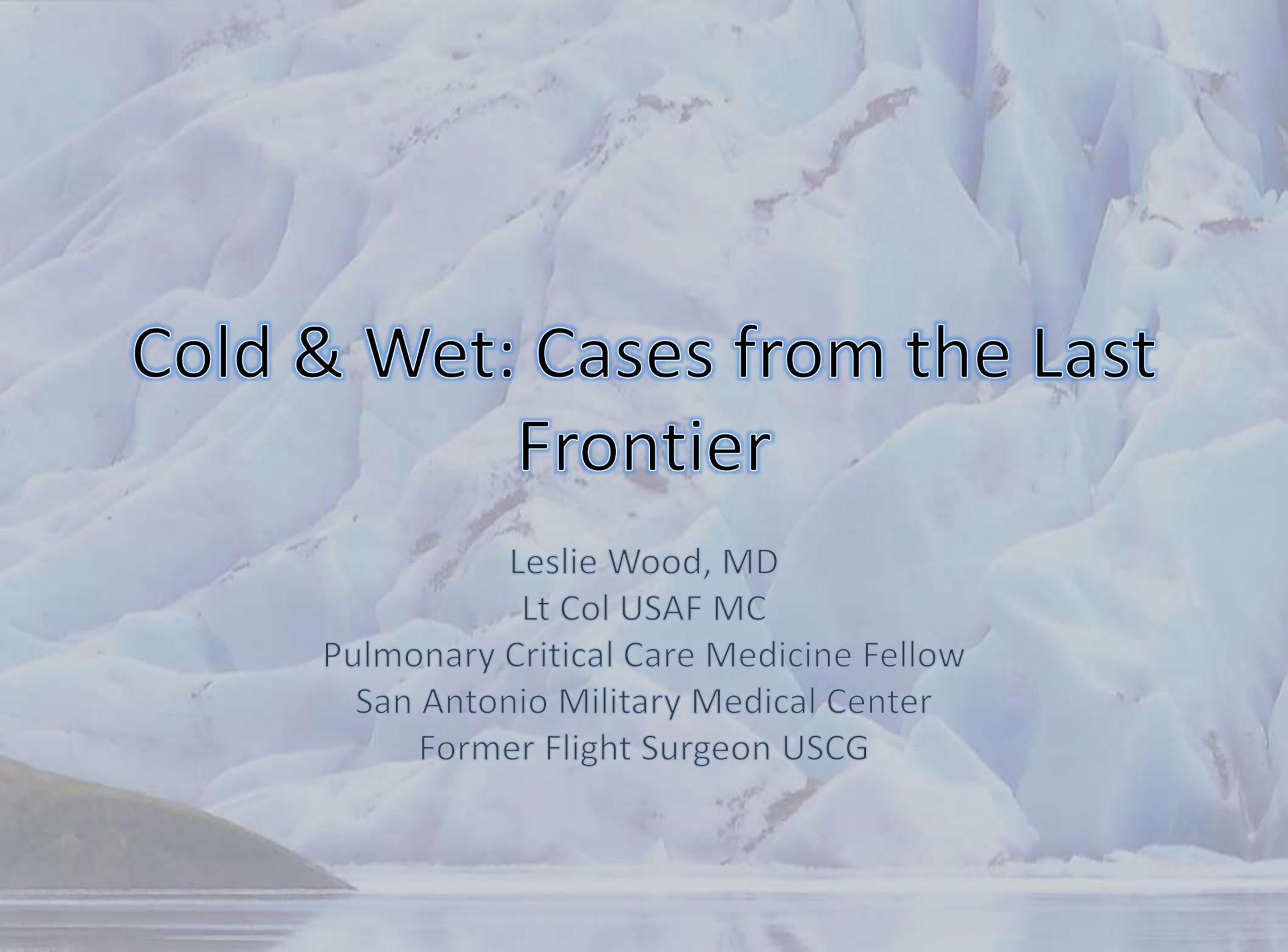
Charting the Path Forward

- Diagnostic tools in the field
- Community planning
- Medical education
- Coordination of resources

Diagnostic
Resources
Tele - ICU







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