Medical Emergencies

- The most common injuries or illnesses that an EMTF/EMPF is most likely to encounter on the fireline are:
  - Traumatic Injuries
  - Bites & Stings
  - Allergic Reactions
  - Gastrointestinal Problems

Medical Emergencies

- Traumatic Injuries
  - Soft Tissue Injuries
  - Sprains, Strains & Fractures
  - Burns
  - Eye Injuries

Medical Emergencies

- Soft Tissue Injuries
  - Broadly categorized as either “closed” or “open”
  - Damage to the skin, cells and blood vessels
  - May result in extensive injuries to the internal organs and bones

Medical Emergencies

- Soft Tissue Injuries
  - Contusions
  - Hematomas
  - Abrasions
  - Lacerations
  - Avulsions
  - Amputations
  - Penetrations / Punctures
  - Blisters
  - Crush Injuries

Medical Emergencies

- Soft Tissue Injury - Treatments
  - The basic care for any soft tissue injury is the proper use of wound dressings and bandages
  - The functions of the dressings and bandages are to stop bleeding, to protect wounds from further damage, and to prevent further contamination

Medical Emergencies

- Fractures, Dislocations, Sprains & Strains
  - Injuries to the bones, muscles, and connective tissues result when excessive or abnormal force is applied to the musculoskeletal system
  - There are three basic mechanisms by which this force can be applied:
    - Direct Force
    - Indirect Force
    - Twisting Force

Medical Emergencies

- Fractures, Dislocations, Sprains & Strains
  - It will not be your responsibility to diagnose exactly what type of injury has occurred
  - The fact is that any painful, swollen and deformed extremity will receive the same emergency medical care

Medical Emergencies

- Fractures
  - When a bone is broken or is simply cracked
  - Can produce severe bleeding
  - Very painful
  - Potential for long-term disability
  - Classified as “Open” or “Closed”

Medical Emergencies

- Open Fracture
  - When the skin overlying a painful, swollen and deformed extremity is broken, then the condition is termed – an open fracture

- Closed Fracture
  - If there is no break in the continuity of the skin, then the condition is termed – a closed fracture

Medical Emergencies

- Fractures - Treatment
  - Control any bleeding from open wounds
  - Clean gross contamination
  - Dress bone ends loosely with moistened dressings (if needed)
  - Check for PMS (before & after splinting, including marking for distal pulses)
  - Splint with appropriate splint
  - Elevate and apply ice pack
  - Evacuate

Medical Emergencies

- Dislocations
  - Disruption of the normal structure of a joint where one bone connects with another
  - The extreme flexion or extension of a joint is what usually renders a joint “dislocated”

Medical Emergencies

- Sprains
  - A stretching or tearing of the ligaments that surround or support a joint
  - Commonly result from the application or twisting force to a body part

Medical Emergencies

- Strains
  - The injury that results from the abnormal stretching of the tendons that connect muscles to bones and the muscles themselves

Medical Emergencies

- Dislocations, Sprains & Strains - Treatment
  - Control any bleeding from open wounds
  - Check for PMS (before & after splinting, including marking for distal pulses)
  - Splint with appropriate splint
  - Elevate and apply ice pack
  - Evacuate the patient

Medical Emergencies

- Burns
  - Burns can cause the death of patient in various ways, some immediate and some delayed
  - Immediate causes of burn-related deaths include airway compromise and inadequate respirations
  - Delayed causes are largely related to the loss of normal skin coverage and include profound fluid loss resulting in hypoperfusion and overwhelming infections

Medical Emergencies

- Burns
  - Classification of burns is based on three major elements
    - Mechanism of burn injury
    - Depth of the burn
    - Percentage of body surface area burned (BSA)
  - When you describe a burn, your description should include each of these elements

Medical Emergencies

- Mechanism of Injury
  - Thermal
    - Most commonly encountered by the EMTF/ EMPF
  - Chemical
  - Electrical
  - Radiation

Medical Emergencies

- Depth of the Burn
  - Superficial or 1st Degree
    - Least serious of burns
    - Only involve the epidermis
    - Reddened skin at the burn site
    - Painful and irritating

Medical Emergencies

- Depth of the Burn
  - Partial Thickness or 2nd Degree
    - Involves both the epidermis and the dermis
    - Red, white, or blotchy skin and blisters at the burn site
    - Burned skin is moist due to body fluids seeping out through the damaged area
    - Very painful

Medical Emergencies

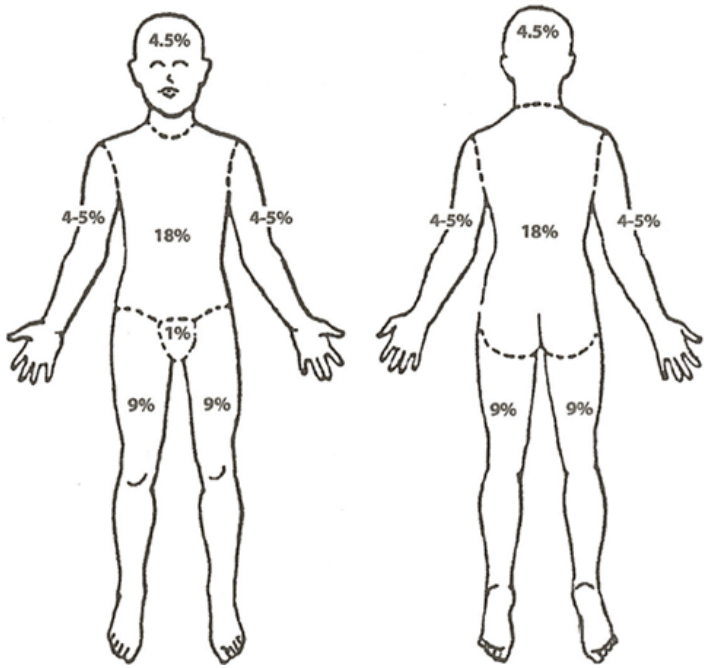
- Depth of the Burn
  - Full Thickness or 3rd Degree
    - Most extensive tissue damage
    - Involves all layers – epidermis, dermis and subcutaneous layers
    - Damage may extend deeper to the muscles, bones or internal organs
    - Dry leather-like appearance
    - White, brown, or charred color
    - Little or no pain
    - Surrounding areas will be painful

Medical Emergencies

- Body Surface Area
  - The amount of a patient's body surface area that is burned also affects how severe the burn
  - The most widely used system for estimating the extent of BSA burned in adults is called the "Rule of Nines"
  - You may also use the "Palm Method"

Medical Emergencies

- Rule of Nines
  - Each area of the body represents 9 percent of BSA
    - Head and Neck
    - Each upper arm
    - The Chest
    - The Abdomen
    - The upper back
    - The lower back
    - The front of each lower extremity
    - The back of each lower extremity



Medical Emergencies

- Palm Method
  - The surface area of the palm of the patients hand represents 1% of the patients BSA

Medical Emergencies

- Burn – Treatment
  - Stop the burning process
  - Continually monitor the airway
  - Remove any surrounding clothing
  - Evaluate the severity of the burn
  - Cover with a dry sterile dressing
    - Separate fingers & toes
  - Keep patient warm
  - Evacuate the patient

Medical Emergencies

- Eye Injuries
  - Most common injuries are corneal abrasions that result from foreign bodies
  - Most commonly caused by airborne particulates and wind
  - May encounter other injuries to eyes such as
    - Trauma
    - Impales Objects

Medical Emergencies

- Eye Injury - Treatments
  - Foreign Body
    - Lift the eyelid and let the action of tears help to flush it out
    - If unsuccessful, irrigate the eye with water
    - If eye pain or a feeling of a retained foreign body persists, evacuate the patient to the Medical Unit for further evaluation

Medical Emergencies

- Eye Injury - Treatment
  - Trauma and Impaled Objects
    - Control any bleeding from open wounds
    - Do not apply pressure to the eye
    - Stabilize impaled objects and cover both eyes
    - Evacuate the patient

Medical Emergencies

- Environmental Illnesses
  - Bites and Stings
  - Allergic Reactions
  - Gastrointestinal problems

Medical Emergencies

- Bites and Stings
  - A large number of creatures are capable of delivering a bite or a sting
  - Bites and Stings usually produce only minor irritation and discomfort
  - In some cases, bites or stings can lead to life-threatening complications from venom or anaphylaxis

Medical Emergencies

- Insect Stings
  - Common insects include
    - Bees
    - Yellow Jackets
    - Hornets
    - Wasps
  - Insects inject venom, a substance poisonous to humans, through their stingers
  - Frequently leaving the venom sac attached

Medical Emergencies

- Insect Stings
  - Reactions to a sting may include
    - Localized pain
    - Redness
    - Swelling at the sting site
    - Generalized illness as a result of multiple simultaneous stings or systemic, life-threatening allergic reaction like anaphylaxis

Medical Emergencies

- Insect Sting – Treatment
  - Remove Stinger if still present
  - Clean sting site
  - Remove restrictive clothing or jewelry before swelling begins
  - Place sting site below level of patient's heart
  - Monitor for signs of anaphylaxis
  - Evacuate if needed

Medical Emergencies

- Spider Bites
  - Venom delivered from most spiders causes local reactions
    - Swelling
    - Itching
  - Two species of spiders to remember
    - Black Widow
    - Brown Recluse

Medical Emergencies

- Black Widow
  - Found throughout the United States
  - Only one species of black widow has the classic red hourglass pattern
  - Venom causes systemic symptoms
    - Localized pain
    - Muscle cramps of the extremities and abdomen

Medical Emergencies

- Brown Recluse
  - Reported in over 20 states
  - Mostly in Southern and Central United States
  - Venom causes local tissue destruction
  - Systemic symptoms
    - Fever
    - Chills
    - Nausea & Vomiting

Medical Emergencies

- Spider Bites – Treatment
  - Clean sting site
  - Remove restrictive clothing or jewelry before swelling begins
  - Place sting site below level of patient's heart
  - Monitor for signs of systemic symptoms
  - Evacuate if needed

Medical Emergencies

- Scorpion Stings
  - Common in the Southwestern United States
  - Stings of most species cause only local reactions
    - Redness, pain and swelling at sting site
  - Black scorpion can cause serious systemic effects
    - Increased heart rate
    - Excessive salivation
    - Roving eye movements
    - Difficulty in swallowing

Medical Emergencies

- Scorpion Sting – Treatment
  - Clean sting site
  - Remove restrictive clothing or jewelry before swelling begins
  - Place sting site below level of the patient's heart
  - Monitor for signs of systemic symptoms
  - Evacuate if needed

Medical Emergencies

- Snake Bites
  - Approximately 45,000 reported snake bite victims annually in the US
  - Approximately 8,000 of those are from poisonous snakes
    - Pit Vipers
    - Rattlesnakes
    - Cottonmouth
    - Copperhead
    - Coral snake

Medical Emergencies

- Snake Bites
  - 25% of Pit Viper bites are “dry”
  - If only small amount of venom injected, the following may be present at the bite site
    - Swelling
    - Redness
    - Bruising

Medical Emergencies

- Snake Bites
  - If larger amounts of venom are injected, the following signs & symptoms are common
    - Swelling of an entire extremity
    - Nausea & Vomiting
    - Numbness in the mouth
    - Weakness & Dizziness
    - Increased heart & respiratory rate
    - Shock
    - Abnormal bleeding

Medical Emergencies

- Snake Bite – Treatment
  - Assure your own safety
  - Wash the area gently
  - Remove restrictive clothing or jewelry before swelling begins
  - Place sting site below level of patient's heart
  - Minimize patient movement
  - Monitor for signs of shock
  - Evacuate

Medical Emergencies

- Allergic Reactions
  - Exaggerated immune response to a substance
  - Results in release of chemicals from cells
  - Chemicals cause the physiologic events that make up an allergic reaction
  - Physiological events lead to hypoperfusion
    - Anaphylactic Shock
  - A severe allergic reaction can be life-threatening

Medical Emergencies

- Allergic Reactions
  - Insect bites & Stings (5% of population)
    - Bees, wasps, hornets & yellow jackets
  - Plants
    - Poison oak & ivy, pollen from ragweed or grasses
  - Medication
  - Foods
  - Chemicals

Medical Emergencies

- Allergic Reactions Signs & Symptoms
  - Skin
    - Swelling of face, lips, tongue, neck or hands
    - Itching
    - Hives
    - Red flushed
  - Cardiovascular system
    - Increased heart rate
    - Signs of shock

Medical Emergencies

- Allergic Reactions Signs & Symptoms
  - Respiratory System
    - Cough
    - Rapid / Labored breathing
    - Hoarseness
    - Stridor
    - Wheezing
  - Decreased mental status

Medical Emergencies

- Allergic Reactions Signs & Symptoms
  - Generalized symptoms
    - Itchy, water eyes
    - Headache
    - Runny nose
    - Sense of impending doom

Medical Emergencies

- Allergic Reactions – Treatment
  - No signs of severe reaction
    - Remove restrictive clothing or jewelry before swelling begins
    - Do NOT administer an epinephrine auto-injector
    - Monitor for signs of severe allergic reaction
    - Evacuate as needed

Medical Emergencies

- Allergic Reactions – Treatment
  - Signs of severe reaction
    - Determine if patient has a prescribed epinephrine auto-injector
    - Monitor patient's airway
    - Remove restrictive clothing or jewelry
    - Evacuate immediately

Medical Emergencies

- Gastrointestinal Problems
  - Abdominal cramping
  - Nausea & Vomiting
  - Diarrhea
  - Many symptoms are linked to poor hygiene
    - Poor hand washing
    - Camp Crud
    - Coyote or Spike operations

Medical Emergencies

- Gastrointestinal Problems - Treatment
  - Encourage the drinking of fluids in large quantities
  - Treat with anti-diarrhea medication, if needed
  - If fever persists, isolate patient
  - Attempt to track back
    - When did the patient first develop symptoms?
    - Where was the “contact point?”
    - Are there more patients?

Medical Emergencies

- One of the EMTF/EMPF primary functions is to help decide what level of treatment the injured crewmember requires
  - Conventional vs. Unconventional

Medical Emergencies

- Identify the “Critical” vs “Minor patient
- Decisions that you may encounter
  - To treat an injury on the line and return the crewmember back to duty
  - Evacuate the crewmember to the Medical Unit for evaluation and treatment
  - Evacuate the crewmember to the hospital directly for evaluation and treatment

Medical Emergencies

- Decisions will be based on many factors
  - Severity of injury or illness
  - Environment
    - Time of day/night
    - Weather
    - Incident Activity
  - Transportation options
  - Operational Procedures

Medical Emergencies

- Major Medical Emergency
  - Life-threatening event
  - Patient may die if not treated immediately
  - Communications will clear the air for “Emergency” communications only
  - Resources may be redirected to emergency incident location

Medical Emergencies

- Request for Medical Aid
  - Non life-threatening event
  - Less serious injury or illness
  - Normal radio traffic may continue
  - Incident operations may continue

Medical Emergencies

- Severity of Illness or Injury
  - Does the patient have a true life-threatening injury or illness?
  - Are you able to stabilize the patient in the field?
  - Are medical supplies available to treat the patient?
  - Can the patient tolerate delayed treatment?

Medical Emergencies

- Environment
  - What type of terrain is the patient in?
    - Steep & Rugged
    - Isolated
    - Road access
  - What time of day or night?
    - Aircraft availability
    - Visibility
    - Available resources

Medical Emergencies

- Environment
  - Weather
    - Wind
    - Temperature
  - What is going on with the incident?
    - Burn Operations
    - Secondary Emergencies
    - Air Operations
    - Radio traffic

Medical Emergencies

- Transportation Options
  - Can the patient walk
  - Litter teams
  - Road access
  - Aircraft availability
  - Ground ambulance availability
  - ETA to the hospital – Ground vs. air
  - Ground support

Medical Emergencies

- In steep or rugged terrain, it will require at least 15 crewmembers to carry a stretcher
- Do you have enough resources?

Medical Emergencies

- What if???
  - You respond to a crewmember who has an 8” long 1” deep laceration to his lower leg from a chainsaw accident
  - Minimal blood loss after bleeding control
  - Good neuro and motor to the injured leg
  - No other injuries
  - Found sitting in crew buggy
  - 30 minute drive to local clinic approved by ICS 206

Medical Emergencies

- What if???
  - You respond to a crewmember with obvious fracture of lower leg from a boulder striking him
  - Obvious deformity with significant swelling to extremities
  - No other injury
  - 1945 hours
  - Remote location approximately 2 hour hike by foot

Medical Emergencies

- What if???
  - You respond to a crewmember who is complaining of chest pain and shortness of breath
  - Pale, cool and clammy skin signs
  - Slow pulse rate
  - Found sitting in the Div. Sup's vehicle
  - Hospital is 2 hours by ground
  - No ALS air ambulance on ICS 206

Medical Emergencies

- What if???
  - You respond to an ill crewmember who is c/o nausea, vomiting and hallucinations with episodes of shortness of breath
  - Skin sign are pale, dry with slight tenting
  - Patient states that he ate a live snake but he washed it in a small stream before eating it (unknown what type of snake)
  - ETA of ambulance is one hour with a 3 hour transport to the closest hospital
  - Patient works for a private contractor

Exertional Heat Injuries

- Firefighters face unique factors as a result of several inherent job stressors
  - These include sudden surges in the sympathetic nervous system caused by:
    - Unexpected calls for response
    - Rapid shifts from low to high levels of exertion
    - Carrying, lifting and wearing heavy gear and equipment
    - Prolonged exposure to high temperatures
    - Excessive fluid loss

Exertional Heat Injuries

- These factors have been shown to contribute to dehydration and a rapid rise in core body temperature

- May lead to heat stress and insufficient blood flow to the heart – this combination can cause cardiovascular strain

Exertional Heat Injuries

- Unlike athletes or industrial workers, the critical nature of firefighting does not allow curtailment of environmental exposure during climatic extremes

Exertional Heat Injuries

- Heat Illness Research:
  - One episode of heat injury can WEAKEN you and make you vulnerable at the next event
  - Passive cooling does NOT decrease body core temperature
  - Hydration alone does NOT prevent heat illness
  - Minor signs of heat illness can rapidly progress to heat stroke (less than 30 min)
  - You can have an exertional heat stroke on cool days

Exertional Heat Stroke

- Definition: State of extreme hyperthermia >40 degrees C (104 degrees F) associated with Central Nervous System (CNS) disturbances

Exertional Heat Stroke

- EHS is an emerging study of heat illnesses as a result of activity-related conditions (National Athletic Trainers' Association, 2002).
    - Exercise-associated muscle (heat) cramps
    - Heat syncope
    - Exercise induced (heat) exhaustion
    - Exertional heat stroke
    - Exertional Rhabdomyolysis

Exertional Heat Stroke

- 70% of the thermal burden experienced by wildland firefighters is due to metabolic heat production while wearing PPE.

- Losing as little as 1% of body weight could affect performance and hinder body's ability to cool itself.

Heat Exhaustion

- Signs
  - Pounding headache
  - Suddenly fatigued
  - Dizzy
  - Nausea
  - Vomiting
  - Chills and goose bumps
  - Feeling overwhelmed
  - Talking nonsense
  - Agitated
  - Blank stare
  - Wobbling or stumbling

Heat Exhaustion

- Treatment Priorities
  - Stop work immediately
  - Remove PPE
  - Cooling
    - Wet towel
    - Cold water over-the-head
    - Ice towel
    - Fans
    - Ice pack – armpits, groin, neck, feet
    - Ice pool/tub immersion – trunk & extremities
  - Hydration
  - Nutrition

Heat Stress Control Measures

- Aerobic fitness
- Acclimate
- Pre-hydrate
- Hydrate
  - Minimum six bottles of water per day, plus drinks at meals.
  - During work – minimum 1L water per hour.
  - As exertion and sweating increase – add electrolyte replacement.

Heat Stress Control Measures

- Post Hydrate
- Nutrition: on-the-go carb replacements
- Adequate Work-Rest Ratios
- Buddy System/Personal Monitoring
- Rehab (40/20 Rule)
  - 40 min work
  - 20 min rest
- Personal Protective Clothing

Heat Stress Control Measures

- Some meds increase your risk of heat stress
  - Antihistamines; Decongestants
  - Ephedrine/Ephedra; Creatine
  - Amphetamines
  - Certain antibiotics, Diuretics, Beta-blockers
  - High sugar content beverages, Caffeine, Energy Drinks

Exertional Rhabdomyolysis

- Typically occurs in response to abrupt, excessive, prolonged, repetitive, or unaccustomed exercise.

- Degeneration of skeletal muscle or muscle necrosis.

Exertional Rhabdomyolysis

- Damage occurs to muscle membranes, allowing cellular components (such as creatine kinase, myoglobin, and potassium) to leak out into the blood system.
- Can lead to renal failure, heart arrhythmias, compartmental syndrome, ketoacidosis, death.

Exertional Rhabdomyolysis

- Symptoms
  - Persistent muscle pain/or weakness
  - Muscle swelling
  - Abdominal pain
  - Nausea or vomiting
  - Fever, rapid heart rate

Exertional Rhabdomyolysis

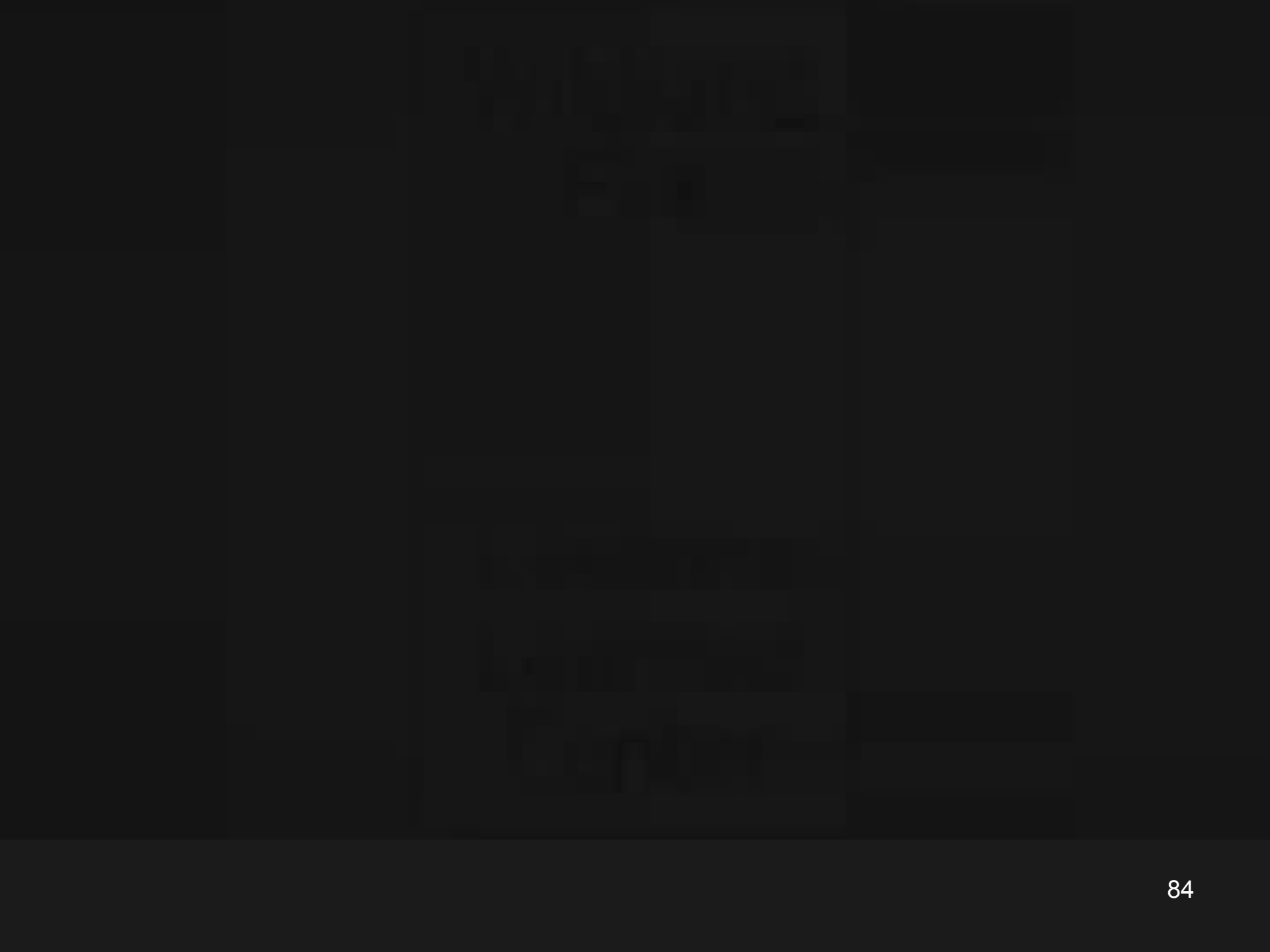
- Symptoms Cont.
  - Mental confusion
  - Dark urine (tea or cola colored)
  - May be accompanied with symptoms of heat illness
  - May include: fatigue, joint pain, seizures

After Action Review (AAR)

Green Sheet Summaries –
Wildland Fire Lessons Learned Center

Dutch Creek Incident

- Shasta Trinity National Forrest – July 25, 2008
  - Traumatic Fatal Injury
    - Seriousness of the Injury
    - Treatment Decisions
    - Transportation Decisions
    - Who is In Charge?



Border #14 Incident
12-CA-MVU-007686

- July 20, 2012 – Heat Related Injuries – Heat Exhaustion
  - Awareness of Individual Limitations
  - Work Rest Cycles
  - Hydrations during firefighting operations
  - Delaying treatment can lead to further medical complications

Chihuahua3 Fire
11-CA-MVU-011073

- October 2, 2011 – Firefighter Collapsed with Altered Level of Consciousness
  - Pre-existing condition – poison oak treatment
  - OTC medications – Benadryl
  - Physical preparedness
  - Adequate nutrition
  - Pre-response hydration

IHC Heat Related Illness
Angeles National Forest USFS

- June 8, 2014
  - Heat related illness
    - Leg cramps
    - Ice chest submersion – arms
    - Hyponatremia – imbalance of water to salt
    - Electrolytes intake with water – monitor adequate replacement
    - Consider Rhabdomyolysis

Rapid Evacuation Module (REM)

- This is a fairly new concept that is starting to get momentum.

- REM is a six-person module intended to provide a safer and more efficient method of moving an injured patient off the fireline to a pick up point for transport to a medical facility.

Rapid Evacuation Module

- A REM is outfitted with specialized equipped:
  - Wheeled Stokes basket
  - Backboard
  - Lashing
  - Low angle rope rescue equipment

Rapid Evacuation Module

- REM is managed and ordered through the Medical Unit Leader.
  - Based upon the complexity of the incident.
  - Remoteness of crews working on the fireline.
  - Terrain.
  - History of injuries – risk assessment.
  - Availability of trained personnel

Rapid Evacuation Module

- Upon arrival on-scene, the REM reports to the Division/Group Supervisor and assesses the situation.
  - Assesses the scene safety and condition of the patient.
  - Assesses the environment.
  - Assesses available resources.

Rapid Evacuation Module

- Develops and implements an effective plan of egress.
- Packages the patient for extrication.
- Transfers to the EMTF/EMPF for continued patient care and transport.