ΚΑΡΠΑ ΣΕ ΕΜΠΟΛΕΜΗ ΖΩΝΗ
(πόλεμο, στρατιωτική θητεία, ασκήσεις)
ΚΑΡΠΑ ΣΕ ΕΜΠΟΛΕΜΗ ΖΩΝΗ (πόλεμο , στρατιωτική θητεία , ασκήσεις)

ΠΑΤΙΛΙΑΚΑΣ ΑΘΑΝΑΣΙΟΣ  Επιμελητής Καρδιολογικής κλινικής Ναυτικού Νοσοκομείου Κρήτης Διευθυντής αιμοδυναμικού εργαστηρίου κλινικής IASIS Χανιά.
Conflicts of interest: none.
The Top 5 Causes of Death in the United States Military

<table>
<thead>
<tr>
<th>Cause of Death</th>
<th>Percentage of U.S. Military Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  Suicide</td>
<td>28.1%</td>
</tr>
<tr>
<td>2  Transport accidents</td>
<td>18.3%</td>
</tr>
<tr>
<td>3  Other accidents</td>
<td>9.3%</td>
</tr>
<tr>
<td>4  Combat</td>
<td>9.0%</td>
</tr>
<tr>
<td>5  Cancer</td>
<td>8%</td>
</tr>
</tbody>
</table>

From 1990 through 2011, there were 29,213 deaths of U.S. military members while on active duty. From 2000 to 2011, two-thirds of all deaths unrelated to war were caused by transportation accidents (n=4,761; 37%), other accidents (n=1,358; 10%) and suicides (n=2,634; 20%)
Αίτια αιφνίδιου καρδιακού θανάτου σε νέους δραστήριους ανθρώπους

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Cause-Specific Findings in 902 Cases of Adjudicated Unanticipated Sudden Cardiac Death Stratified by Age &lt;35 Years and ≥35 Years in a Cohort Undergoing Active Surveillance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Findings</td>
<td>&lt;35 Yrs of Age (n = 296)</td>
</tr>
<tr>
<td>----------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Sudden unexplained death</td>
<td>123 (41.3%)</td>
</tr>
<tr>
<td>Atherosclerotic disease</td>
<td>69 (23.2%)</td>
</tr>
<tr>
<td>Hypertrophic cardiomyopathy</td>
<td>38 (12.8%)</td>
</tr>
<tr>
<td>Myocarditis</td>
<td>17 (5.7%)</td>
</tr>
<tr>
<td>Idiopathic dilated cardiomyopathy</td>
<td>14 (4.7%)</td>
</tr>
<tr>
<td>Anomalous coronary artery</td>
<td>12 (4.0%)</td>
</tr>
<tr>
<td>Hypertensive cardiomyopathy</td>
<td>11 (3.7%)</td>
</tr>
<tr>
<td>Arrhythmogenic RV dysplasia</td>
<td>4 (1.3%)</td>
</tr>
<tr>
<td>Ischemic cardiomyopathy</td>
<td>2 (0.7%)</td>
</tr>
<tr>
<td>Other*</td>
<td>8 (2.7%)</td>
</tr>
</tbody>
</table>

Data presented as raw (columnar percent incidence). *Other cases (n = cases <35 years of age, cases ≥35 years of age, respectively): additional causes of death associated with coronary artery disease included coronary artery bridge (n = 6, 1), spontaneous coronary thrombosis (n = 1, 2%) and spontaneous coronary dissection (n = 0, 1); causes of death associated with valvular heart disease included aortic valve disease (n = 0, 3), mitral valve disease (n = 1, 1), and endocarditis (n = 0, 1).

RV = right ventricle.
Διαφορές στην αντιμετώπιση απωλειών υγείας σε εμπόλεμη ζώνη

Prehospital Trauma Care:
Military vs. Civilian

- Hostile fire
- Darkness
- Environmental extremes
- Different wounding epidemiology
- Limited equipment
- Need for tactical maneuver
- Long delays to hospital care
- Different medic training and experience
Tactical Combat Casualty Care (TCCC)
Τακτικές Φροντίδας Απωλειών Υγείας στη Μάχη

Three Objectives of TCCC

• Treat the casualty
• Prevent additional casualties
• Complete the mission
3 στάδια στην αντιμετώπιση των απωλειών υγείας

1. CARE UNDER FIRE

2. TACTICAL FIELD CARE

3. TACTICAL EVACUATION CARE
Care Under Fire Guidelines

1. Return fire and take cover.

2. Direct or expect casualty to remain engaged as a combatant if appropriate.

3. Direct casualty to move to cover and apply self-aid if able.

4. Try to keep the casualty from sustaining additional wounds.
5. Casualties should be extricated from burning vehicles or buildings and moved to relative safety. Do what is necessary to stop the burning process.

6. Stop life-threatening external hemorrhage if tactically feasible:
   a. Direct casualty to control hemorrhage by self-aid if able.
   b. Use a CoTCCC-recommended limb tourniquet for hemorrhage that is anatomically amenable to tourniquet use.
   c. Apply the limb tourniquet over the uniform clearly proximal to the bleeding site(s). If the site of the life-threatening bleeding is not readily apparent, place the tourniquet “high and tight” (as proximal as possible) on the injured limb and move the casualty to cover.
Care Under Fire Guidelines

7. Airway management is generally best deferred until the Tactical Field Care phase.
Care Under Fire

• If the firefight is ongoing - don’t try to treat your casualty in the Kill Zone!

• Suppression of enemy fire and moving casualties to cover are the major concerns.
Care Under Fire

- Suppression of hostile fire will minimize the risk of both new casualties and additional injuries to the existing casualties.
- The firepower contributed by medical personnel and the casualties themselves may be essential to tactical fire superiority.
- The best medicine on the battlefield is Fire Superiority.
1) While under fire and without a weapon, Gunnery Sgt. Ryan P. Shane runs to Sgt. Lonnie Wells, to pull him to safety during USMC combat operations in Fallujah.
CARE UNDER FIRE
3) Another Marine comes to help.
4) Gunnery Sgt. Shane (left) is hit by enemy fire.
CARE UNDER FIRE

5) Gunnery Sgt Shane, on ground at left, was hit by insurgent sniper fire.
CARE UNDER FIRE

C-Spine Stabilization

Penetrating head and neck injuries do not require C-spine stabilization

– Gunshot wounds (GSW), shrapnel
– In penetrating trauma, the spinal cord is either already compromised or is in relatively less danger than would be the case with blunt trauma.
CARE UNDER FIRE

C-Spine Stabilization

Blunt trauma is different!

- Neck or spine injuries due to falls, fast-roping injuries, or motor vehicle accidents may require C-spine stabilization.
- Apply only if the danger of hostile fire does not constitute a greater threat.
CARE UNDER FIRE

One-Person Drag
CARE UNDER FIRE

Two-Person Drag
CARE UNDER FIRE
Two-Person Drag Using Lines
CARE UNDER FIRE

SEAL Team Three Carry (2)

Also called the Shoulder-Belt carry.
CARE UNDER FIRE

Hawes Carry

Also called the Modified Firemen’s carry or Pack Strap Carry.
Early control of severe hemorrhage is critical.

– In the past, extremity hemorrhage was the most frequent cause of preventable battlefield deaths.

– Over 2500 deaths occurred in Vietnam secondary to hemorrhage from extremity wounds.

– Injury to a major vessel can quickly lead to shock and death.

– Only life-threatening bleeding warrants intervention during Care Under Fire.
CARE UNDER FIRE
Η σκληρή στατιστική του πολέμου του Βιετνάμ...

**Tourniquets: The Primary Driver for TCCC**

“The striking feature was to see healthy young Americans with a single injury of the distal extremity arrive at the magnificently equipped field hospital, usually within hours, but dead on arrival. In fact there were 193 deaths due to wounds of the upper and lower extremities, ...... of the 2600.”

*CAPT J.S. Maughon*  
*Mil Med 1970*

* Extremity hemorrhage math in Vietnam:  
193 of 2600 = 7.4% x 46,233 fatalities = 3,421 preventable US deaths from extremity hemorrhage
CARE UNDER FIRE

Η μεγάλη σημασία της αιμόστασης

Preventable Combat Deaths from Not Using Tourniquets

  - 193 of 2,600
  - 7.4% of total combat fatalities
  - 77 of 982 (in both cohorts of fatalities)
  - 7.8% of total fatalities – no better then Vietnam
- Tourniquets became widely used in 2005-2006
- Eastridge – *J Trauma* 2012: OEF + OIF (to Jun 2011)
  - 119 of 4,596
  - 2.6% of total fatalities – a 67% decrease
CARE UNDER FIRE

When is bleeding life-threatening?

1. There is pulsing or steady bleeding from the wound.

Courtesy Dr. Lenworth Jacobs, Hartford Consensus Group
CARE UNDER FIRE

When is bleeding life-threatening?

2. Blood is pooling on the ground.

Courtesy Dr. Lenworth Jacobs, Hartford Consensus Group
CARE UNDER FIRE

When is bleeding life-threatening?

3. The overlying clothes are soaked with blood.

Courtesy Dr. Lenworth Jacobs, Hartford Consensus Group
CARE UNDER FIRE

When is bleeding life-threatening?

4. Bandages or makeshift bandages used to cover the wound are ineffective and steadily becoming soaked with blood.

Courtesy Dr. Lenworth Jacobs, Hartford Consensus Group
CARE UNDER FIRE

When is bleeding life-threatening?

5. There is a traumatic amputation of an arm or leg.

Courtesy Dr. Lenworth Jacobs, Hartford Consensus Group
CARE UNDER FIRE

When is bleeding life-threatening?

6. There was prior bleeding, and the patient is now in shock (unconscious, confused, pale).

Courtesy Dr. Lenworth Jacobs, Hartford Consensus Group
CARE UNDER FIRE

Tourniquet Application

• Non-life-threatening bleeding should be ignored until the Tactical Field Care phase.

• Apply the tourniquet without removing the uniform – make sure it is clearly proximal to the bleeding site.

• If you are not sure exactly where the major bleeding site is on the extremity (night operations, multiple wounds), apply the tourniquet “high and tight” (as proximal as possible) on the arm or leg.
Tourniquet Application

- Tighten the tourniquet until bleeding is controlled.
- If the first tourniquet fails to control the bleeding, apply a second tourniquet just above (proximal to) the first.
- Don’t put a tourniquet directly over the knee or elbow.
- Don’t put a tourniquet directly over a holster or a cargo pocket that contains bulky items.
CARE UNDER FIRE

GEN 7

Instructions for One-Handed Application

Courtesy of North American Rescue
CARE UNDER FIRE

Impact of Tourniquet Use
Kragh - Annals of Surgery 2009

• Ibn Sina Hospital, Baghdad, 2006
• Tourniquets are saving lives on the battlefield.
• Survival was better when tourniquets were applied BEFORE casualties went into shock.
• 31 lives were saved in this study by applying tourniquets in prehospital settings rather than in the Emergency Department.
• An estimated 1000-2000 lives had been saved by tourniquets as of 2008 (data provided to Army Surgeon General via an internal communication)
CARE UNDER FIRE

Tourniquet Pain

- Tourniquets HURT when applied effectively!
- Pain does not necessarily indicate a mistake in application.
- Pain does not mean you should take it off!
- Manage pain per TCCC Guidelines.
CARE UNDER FIRE

Airway – Will Cover in TFC

No immediate management of the airway is anticipated during Care Under Fire.

– Don’t take time to establish an airway while under fire.
– Defer airway management until you have moved the casualty to cover.
– Combat deaths from compromised airways are relatively infrequent.
– If the casualty has no airway in Care Under Fire, chances for survival are minimal.
3 στάδια στην αντιμετώπιση των απωλειών υγείας

1. CARE UNDER FIRE

2. TACTICAL FIELD CARE

3. TACTICAL EVACUATION CARE
Tactical Field Care

• Distinguished from Care Under Fire by:
  – A reduced level of hazard from hostile fire
  – More time available to provide care based on the tactical situation
• Medical gear is still limited to that carried by the medic or corpsman or unit members (may include gear in tactical vehicles)
TACTICAL FIELD CARE

MARCH

- Massive hemorrhage – control life-threatening bleeding.
- Airway – establish and maintain a patent airway.
- Respiration – decompress suspected tension pneumothorax, seal open chest wounds, and support ventilation/oxygenation as required.
TACTICAL FIELD CARE

MARCH

• **Circulation** – establish IV/IO access and administer fluids as required to treat shock.
• **Head injury/Hypothermia** – prevent/treat hypotension and hypoxia to prevent worsening of traumatic brain injury and prevent/treat hypothermia.
TACTICAL FIELD CARE

XSTAT 12
NSN 6510-01-657-4737

- First expanding wound dressing
  FDA-cleared for life-threatening
  junctional bleeding.
- Syringe-like applicator injects
  compressed minisponges into deep
  wounds.
- Minisponges rapidly expand on
  contact with blood – compressing
  the wound to stop bleeding.
Use additional applicators as necessary to completely pack the wound with mini-sponges.

Pack XSTAT into the wound to the same density you would gauze. The higher the sponge density in the wound cavity, the higher the pressure exerted on the damaged vessel.
4. Airway Management
   a. Unconscious casualty without airway obstruction:
      • Chin lift or jaw thrust maneuver
      • Nasopharyngeal airway
      • Place casualty in recovery position
Nasopharyngeal Airway:
(Note that the NPA is positioned at a 90° angle to the front plane of the face.)

- Lubricate!
- Insert along floor of nasal cavity
- If resistance met, use back-and-forth motion
- Don’t Force – Use other nostril
- If patient gags, withdraw slightly
Airway Support

Place unconscious casualties in the recovery position after the airway has been opened.
Maxillofacial Trauma

- Casualties with severe facial injuries can often protect their own airway by sitting up and leaning forward.
- Let them do it if they can!
The Need for Cricothyroidotomy

- 4,596 battlefield fatalities in Operation Iraqi Freedom and Operation Enduring Freedom combat casualties from October 2001 to June 2011
  - 87.3% of all injury mortality occurred in the prehospital environment (n = 4013)
  - Of the prehospital deaths, 24.3% were deemed potentially survivable. (n = 976)
  - The second most common cause (8%) of potentially preventable deaths was upper airway obstruction due mostly to direct injury to the airway structures of the face and neck. (n = 78)

TACTICAL FIELD CARE

Tension Pneumothorax

• Tension pneumothorax is another common cause of preventable death encountered on the battlefield.
• It’s easy to treat.
  • Tension pneumo may occur with entry wounds in the abdomen, shoulder, or neck.
  • Blunt (motor vehicle accident) or penetrating trauma (GSW) may also cause it.
TACTICAL FIELD CARE

Tension Pneumothorax

• Question: “What if the casualty does not have a tension pneumothorax when you do your needle decompression?”
• Answer:
  – If he has penetrating trauma to that side of the chest, there is already a collapsed lung and blood in the chest cavity.
  – The needle won’t make it worse if there is no tension pneumothorax.
  – If he DOES have a tension pneumothorax, you will save his life.
TACTICAL FIELD CARE
Hypothermia Prevention

- **Key Point:** Even a small decrease in body temperature can interfere with blood clotting and increase the risk of bleeding to death.
- Casualties in shock are unable to generate body heat effectively.
- Wet clothes and helicopter evacuations increase body heat loss.
- Remove wet clothes and cover casualty with hypothermia prevention gear.
- **Hypothermia is much easier to prevent than to treat!**
TACTICAL FIELD CARE

Tactical Field Care Guidelines

Analgesia Notes
a. Casualties may need to be disarmed after being given OTFC or ketamine.
b. Document a mental status exam using the AVPU method prior to administering opioids or ketamine.
c. For all casualties given opioids or ketamine – monitor airway, breathing, and circulation closely.
TACTICAL FIELD CARE

Pain Control – Fentanyl Lozenge

- Does not require IV/IO access
- Can be administered quickly
  - Oral transmucosal fentanyl citrate, 800 µg (between cheek and gum)
    - VERY FAST-ACTING; WORKS ALMOST AS FAST AS IV MORPHINE
    - VERY POTENT PAIN RELIEF
    - DO NOT CHEW THE FENTANYL LOZENGE – let it dissolve!
TACTICAL FIELD CARE

Combat Wound Medication Pack

Mobic 15mg
Tylenol ER 650mg, 2 caplets
Moxifloxacin 400mg

Pain Management and Infection Control
For Combat Casualties
"Just Got Easier To Swallow"
## Tactical Field Care

### Tactical Casualty Information

<table>
<thead>
<tr>
<th>Tactical Data</th>
<th>Medical Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Threat Identification</td>
<td>• Injuries?</td>
</tr>
<tr>
<td>• Casualty Identification</td>
<td>• Conscious/Unconscious?</td>
</tr>
<tr>
<td>• Casualty Location</td>
<td>• Treatment rendered / required?</td>
</tr>
<tr>
<td>• Casualty Weapon Systems</td>
<td>• Get Medic to Casualty OR Casualty to Medic?</td>
</tr>
<tr>
<td>• Can casualty shoot, move, communicate?</td>
<td>• Evacuation requirements?</td>
</tr>
<tr>
<td>• Does casualty need assistance?</td>
<td>• Triage for multiple casualties?</td>
</tr>
<tr>
<td>• C2 notification</td>
<td>• Casualty evac category?</td>
</tr>
<tr>
<td></td>
<td>• Need more Class VIII?</td>
</tr>
</tbody>
</table>
TACTICAL FIELD CARE

Communicate with Evac System

- Evacuation Request (9-Line MEDEVAC)
- MIST Report
17. Cardiopulmonary resuscitation (CPR)

a. Resuscitation on the battlefield for victims of blast or penetrating trauma who have no pulse, no ventilations, and no other signs of life will not be successful and should not be attempted. However, casualties with torso trauma or polytrauma who have no pulse or respirations during TFC should have bilateral needle decompression performed to ensure they do not have a tension pneumothorax prior to discontinuation of care. The procedure is the same as described in section (5a) above.
TACTICAL FIELD CARE

CPR

NO battlefield CPR
TACTICAL FIELD CARE

The Cost of Attempting CPR on the Battlefield

- CPR performers may get killed
- Mission gets delayed
- Casualty stays dead
TACTICAL FIELD CARE

Prep for Evacuation

Casualty movement in TFC may be better accomplished using litters.
Litter Selection

- Selection is based on the mission and the unit type.
- Rigid litters work better than pole-less or improvised.
- Consider terrain and obstacles in the operating area.
3 στάδια στην αντιμετώπιση των απωλειών υγείας

1. CARE UNDER FIRE

2. TACTICAL FIELD CARE

3. TACTICAL EVACUATION CARE
TACTICAL EVACUATION CARE

TACEVAC Responsibilities

- Triage and ensure appropriate placement during loading.
TACTICAL EVACUATION CARE

TACEVAC Responsibilities

• Re-assess ALL previous interventions and treatments.
  – Assess all interventions for effectiveness.
TACTICAL EVACUATION CARE

Airway in TACEVAC

- Additional Options for Airway Management
  - Supraglottic airway
  - Endotracheal Intubation
- Confirm ETT placement with CO2 monitoring.
- These airways are advanced skills not taught in the basic TCCC course.
TACTICAL EVACUATION CARE

Respiration/Breathing in TACEVAC

- Watch for tension pneumothorax as casualties with a chest wound ascend into the lower pressure at altitude.
- Pulse ox readings will become lower as casualty ascends unless supplemental oxygen is added.
- Chest tube placement may be considered if a casualty with suspected tension pneumo fails to respond to needle decompression.
Supplemental Oxygen in Tactical Evacuation Care

Most casualties do not need supplemental oxygen, but have oxygen available and use it for:

- Casualties in shock
- Low oxygen sat on pulse ox
- Unconscious casualties
- Casualties with TBI
  (maintain oxygen saturation > 90%)
- Chest wound casualties
TACTICAL EVACUATION CARE

Tactical Evacuation Care Guidelines

5. Circulation

c. Tranexamic Acid (TXA)

- If a casualty is anticipated to need significant blood transfusion (for example: presents with hemorrhagic shock, one or more major amputations, penetrating torso trauma, or evidence of severe bleeding):
  - Administer 1 gram of tranexamic acid in 100 ml Normal Saline or Lactated Ringer’s as soon as possible but NOT later than 3 hours after injury.
  - Begin second infusion of 1 gm TXA after initial fluid resuscitation has been completed.
TACTICAL EVACUATION CARE

Tactical Evacuation Care Guidelines

6. Traumatic Brain Injury
   a. Casualties with moderate/severe TBI should be monitored for:
   5. Hypothermia
   6. PCO2 (If capnography is available, maintain between 35-40 mmHg)
   7. Penetrating head trauma (if present, administer antibiotics)
   8. Assume a spinal (neck) injury until cleared

Continued...
Remember: Prevention of Hypothermia in Helicopters!

- Cabin wind and altitude cold result in cold stress.
- Protection is especially important for casualties in shock and for burn casualties.
18. CPR in TACEVAC Care

a. Casualties with torso trauma or polytrauma who have no pulse or respirations during TACEVAC should have bilateral needle decompression performed to ensure they do not have a tension pneumothorax. The procedure is the same as described in section (4a) above.
18. CPR in TACEVAC Care (cont)

b. CPR may be attempted during this phase of care if the casualty does not have obviously fatal wounds and will be arriving at a facility with a surgical capability within a short period of time. CPR should not be done at the expense of compromising the mission or denying lifesaving care to other casualties.
ΣΥΜΠΕΡΑΣΜΑΤΑ

• Η ΑΝΤΙΜΕΤΩΠΙΣΗ ΤΩΝ ΑΠΩΛΕΙΩΝ ΥΓΕΙΑΣ ΣΤΟ ΠΕΔΙΟ ΤΗΣ ΜΑΧΗΣ ΔΙΑΦΕΡΕΙ ΑΠΟ ΑΥΤΗ ΠΟΥ ΓΙΝΕΤΑΙ ΣΤΟΥΣ ΧΩΡΟΥΣ ΚΑΠΟΙΟΥ ΝΟΣΟΚΟΜΕΙΟΥ.

• ΠΡΙΝ ΑΠΟ ΤΗΝ ΠΑΡΟΧΗ ΠΡΩΤΩΝ ΒΟΗΘΕΙΩΝ ΠΡΟΗΓΕΙΤΑΙ Η ΕΞΟΥΔΕΤΕΡΩΣΗ ΤΟΥ ΕΧΘΡΟΥ.

• ΥΨΙΣΤΗ ΣΗΜΑΣΙΑ ΕΙΝΑΙ Η ΑΝΤΙΜΕΤΩΠΙΣΗ ΤΗΣ ΑΙΜΟΡΡΑΓΙΑΣ ΜΙΑ ΚΑΙ ΤΑ ΠΕΡΙΣΣΟΤΕΡΑ ΠΕΡΙΣΤΑΤΙΚΑ ΘΑΝΑΤΟΥ ΠΟΥ ΘΑ ΜΠΟΡΟΥΣΑΝ ΝΑ ΕΙΧΑΝ ΔΙΑΣΩΘΕΙ ΟΦΕΙΛΟΝΤΑΙ ΣΕ ΑΙΜΟΡΡΑΓΙΕΣ ΤΩΝ ΑΚΡΩΝ ΔΥΝΗΤΙΚΑ ΑΝΤΙΜΕΤΩΠΙΣΙΜΕΣ

• ΕΠΑΓΡΥΠΝΗΣΗ ΓΙΑ ΤΗΝ ΠΙΘΑΝΟΤΗΤΑ ΠΕΝΥΜΟΘΩΡΑΚΑ ΥΠΟ ΤΑΣΗ ΚΑΙ ΑΠΟΦΡΑΞΗ ΑΝΩΤΕΡΩΝ ΑΕΡΑΓΩΓΩΝ.

• ΤΑΧΕΙΑ ΚΑΙ ΑΣΦΑΛΗ ΑΠΟΜΑΚΡΥΝΣΗ ΤΩΝ ΑΠΩΛΕΙΩΝ ΥΓΕΙΑΣ ΟΤΑΝ ΤΟ ΕΠΙΤΡΕΨΟΥΝ ΟΙ ΣΥΝΘΗΚΕΣ ΜΕΤΑ ΑΠΟ ΣΩΣΤΗ ΔΙΑΛΟΓΗ
ΕΥΧΑΡΙΣΤΩ...