Pre-Hospital Trauma Challenges in Ukraine

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RDCR – THOR
July 28, 2017

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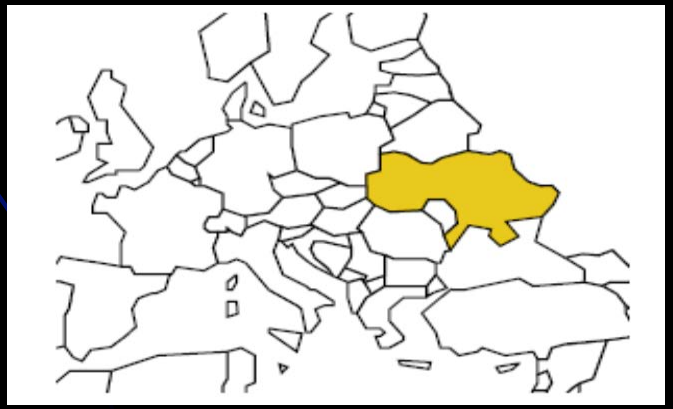
Overview

- *Combat War Injuries*
  - *Lessons of hybrid warfare in Ukraine*
- *Evolution of Trauma Systems*
  - *Before and after 2012*
- *Tactical Combat Casualty Care (TCCC)*
  - *History and current challenges*



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the Western Region
Lviv, Ukraine

Combat War Injuries
and
Lessons of Hybrid War in Ukraine

Prof. Ihor Trutyak MD, PhD
Roxolana Horbowyj MD, FACS

Ukraine

Central Europe, on the East-European plain
Seven neighboring countries
Climate: moderately continental,
except in Southern Crimea - subtropical, Mediterranean

At least 33.395 Ukrainian casualties (armed forces, civilians, members of the armed groups) in the conflict area of eastern Ukraine: at least 9.940 people killed (2000 civilian) and 23.455 injured.

United Nations Human Rights Council, 2017

Hybrid Warfare

Political, economical and information activities with protest by local population accompanied by a hidden military operations. The aggressor state uses various weapons including formally banned technology.

Battlefield Injury Types

Shell fragment injury	47,9%
Mine / bomb explosive injuries	25,4%
Polytrauma	17,3%
Gunshot injury	7,4%
Burns	2,0%

Modern Combat Injuries

60-65% - Multiple and combined injury

60-70% - Limbs injure: the most frequent injury

Personal protective equipment (PPE) infuences the structure and severity of the trauma (“body armor gunshot injury”)

High-velocity Bullet Injuries

- Wound channel deviation
- Defect and necrotic tissues
- Bone tissue defects
- Body general response

Sniper rifle
thoraco-abdominal gunshot injury

“Body-armor gunshot injury”

«Korsar» body-armor

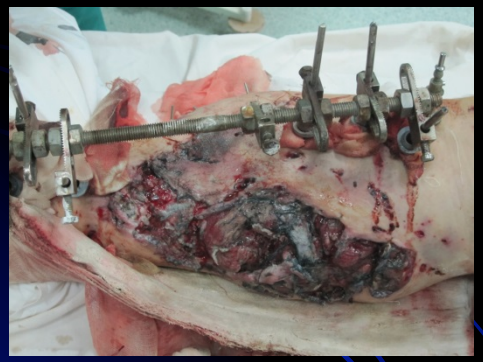
- No lateral torso protection

- Modern sniper rifles pierce the front body-armor plate but stop at the back plate, that causes severe organ and tissue damages

- Post-armor trauma: body-armor prevents penetration, but the high kinetic energy of the bullet causes bone fractures and secondary chest and abdomen organ injuries

Modern Combat Limb Injuries

- High velocity injury
- Difficulties fractures fixation
- Frequent healing complications
- Wounded limb loss



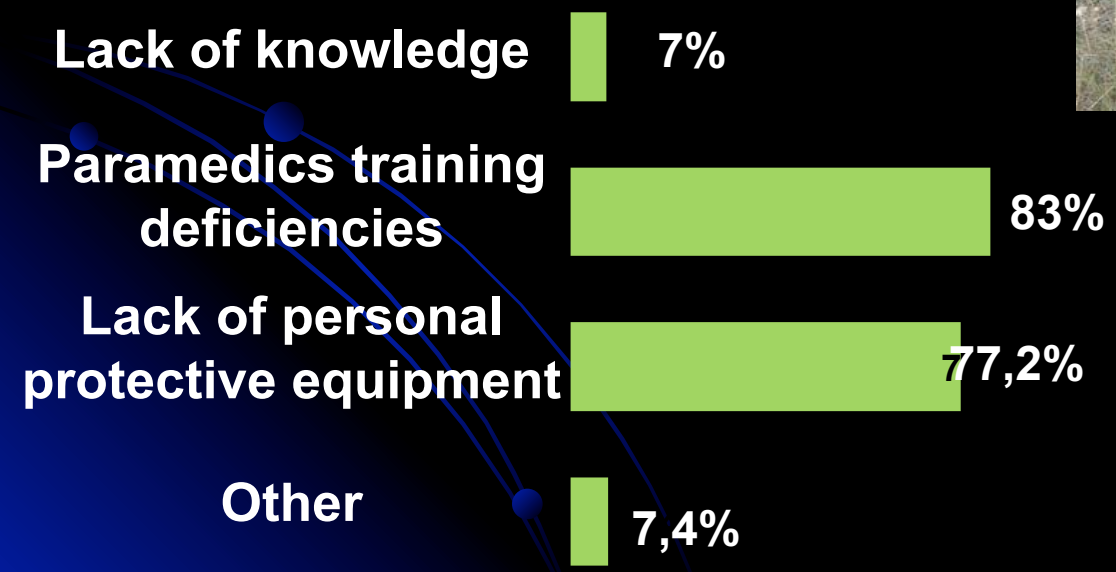
Lesson 1

Role I

«Life saving»

Physician training is 24 times longer and costly than a paramedic training

Causes of poor quality healthcare on the battlefield



Main Causes of Preventable Battlefield Death:

1. Bloodloss from injured limbs
2. Tension pneumothorax
3. Airways obstruction

Luhansk airport, 2014

Battlefield Care

Role I

- Stop external hemorrhage (tourniquet, hemostatics)
- analgesia
- vented occlusive dressing
- needle decompression of tension pneumothorax
- antibiotics
- immobilization
- warming
- evacuation

Ukrainian tourniquet for hemorrhage “SPAS”

Role I

Hemostatics
Celox granules

Ukrainian “Krovospas”

QuikClot Combat Gauze

Lesson 2

Medical Triage

Triage area

battlefield

TRIAGE TEAM

Green → III place

Yellow → II place

Red → I place

Blue → II place(as possible)

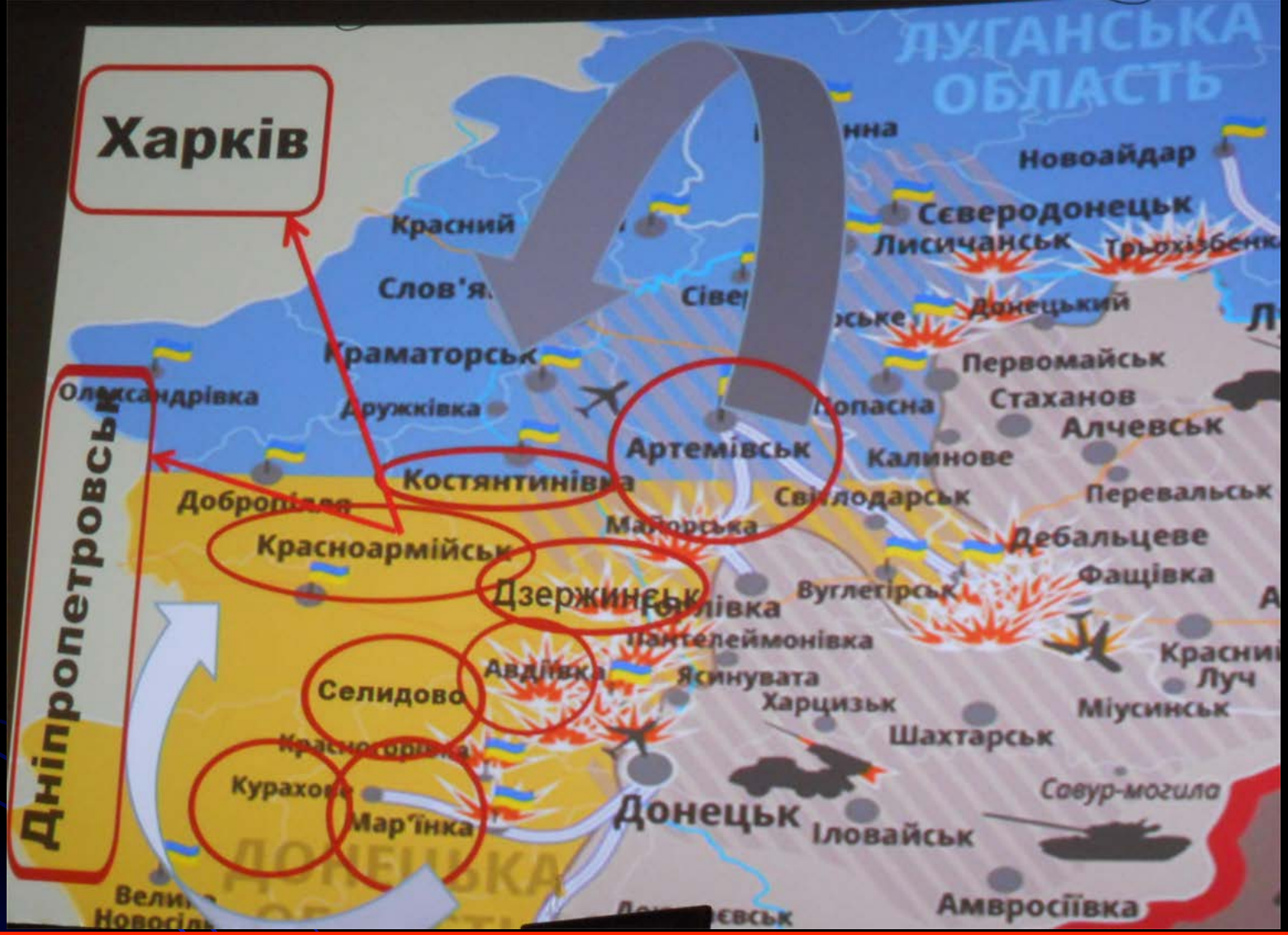
White → III place

HOSPITAL

Second triage

(Role II)

Military Mobile Field Hospital



66 Military Mobile Field Hospital

Lesson 3

Damage Control

66 Military Mobile Field Hospital (Ukraine)
43,1%

INDICATON

1. Hypotension, anstable hemodynamics > 2 hours (systolic blood pressure < 90 mm Hg.).
2. Severe intraabdominal bleeding, severe double hemothorax, severe increase retroperitoneal hematoma.
3. Multiple source of bleeding in different cavities
4. Blood loss > 30%, severe metabolic acidosis (pH<7.30), hypothermia (temperature <35°C), coagulopathy.

Specifics Damage Control Surgery in Wounded Combatant

- Medical and military tactical situation influence on the time and place of the planned re-exploration in theatre (third stage).

- Planned re-exploration in theatre may be to perform in the same hospital (role II) or in the role III hospital.

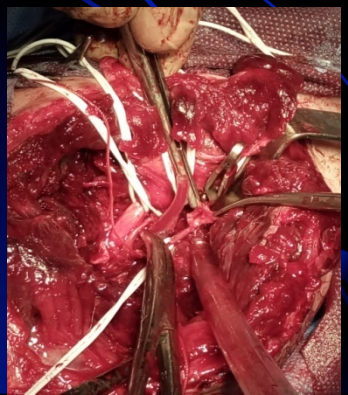
- Planned re-exploration in theatre may be to perform definitive repair of all injuries over the one or several anaesthesia.

Damage Control for Combat Limb Injuries (21%)

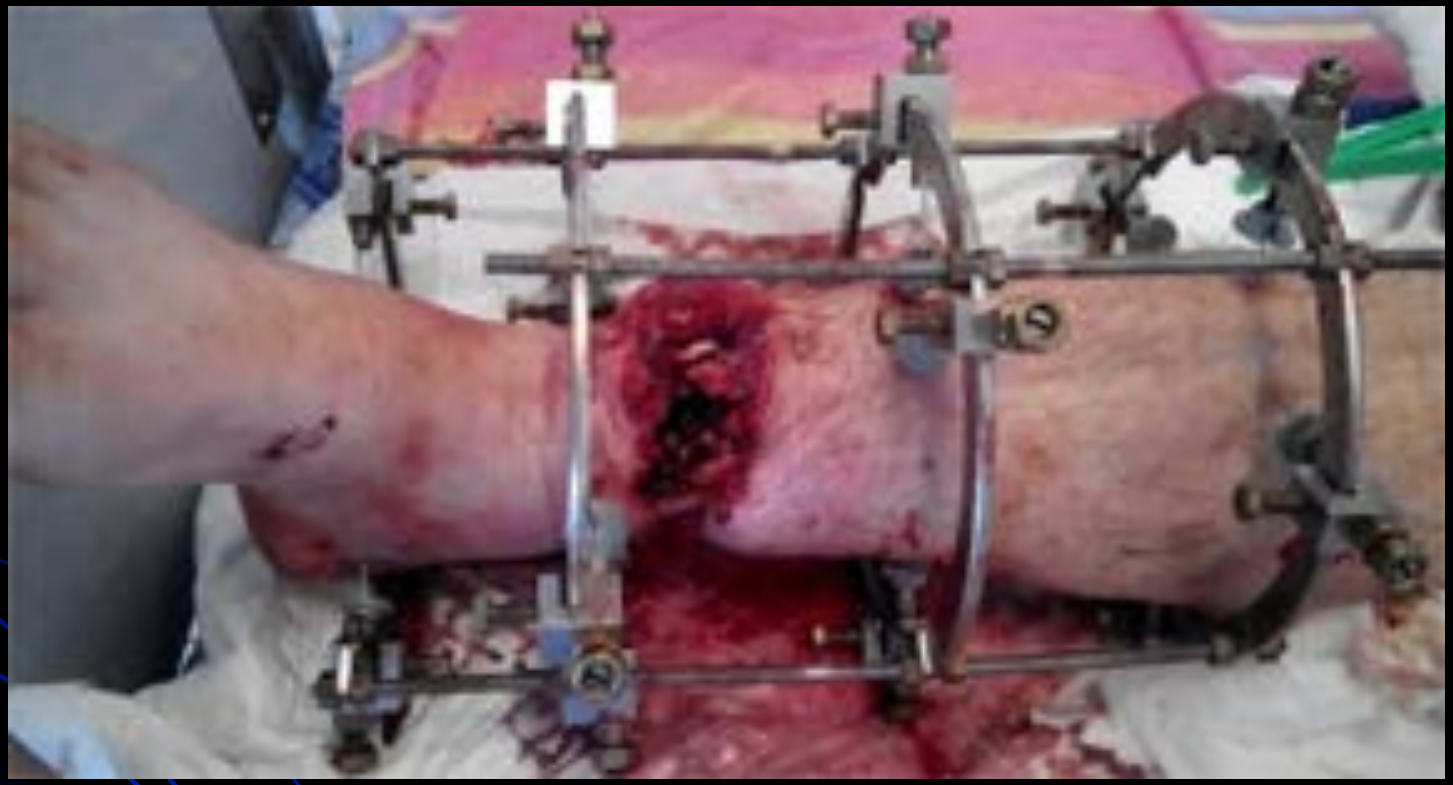
1 stage
- The rapid control of bleeding
- External fixation device (pelvic, thigh, leg fractures), others – plaster bandage
- The temporary vessels prosthetics.

2 stage
- Intensive therapy

3 stage
- Vessels surgery restoration
- Compartment-syndrome elimination
- External fixation device for others bones fractures
- Replacement method of bones fractures fixation.



Explosions Fragment Leg Injuries



Surgical procedure and external fixation device

Emergency X-ray and surgical procedure in Military Field Hospital

(Role II)

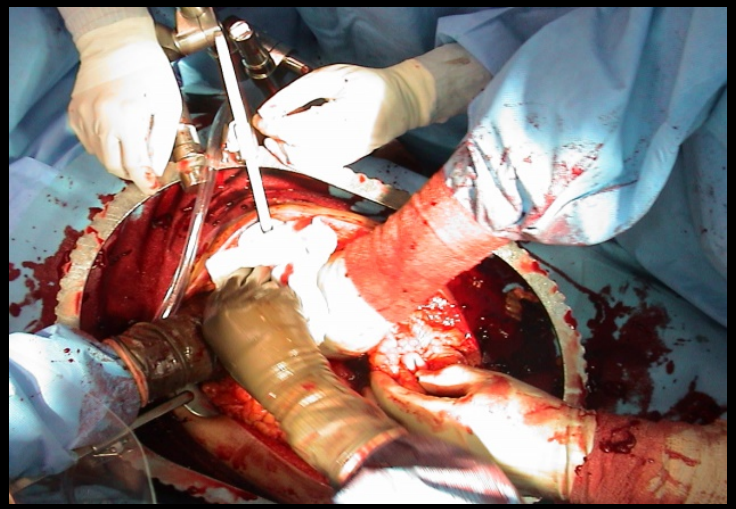
Explosion forearm injury. Intensive care, forearm amputation and medevac

Damage Control for Combat Abdominal Injury

DC in 2015 – 22%, mortality – 10,6%
DC in 2016 – 32%, mortality – 6,25%

1 stage

- Abdominal packing, splenectomy, nephrectomy, vessels clamp
- Damage hollow organ decontamination
- Temporary abdomen closure



Lesson 4

MEDICAL EVACUATION

Clinical professionalism does not compensate for the shortcomings of management

GROUND EVACUATION – non-standardized vehicles, standardized medical vehicles, ambulance, rail and water transport

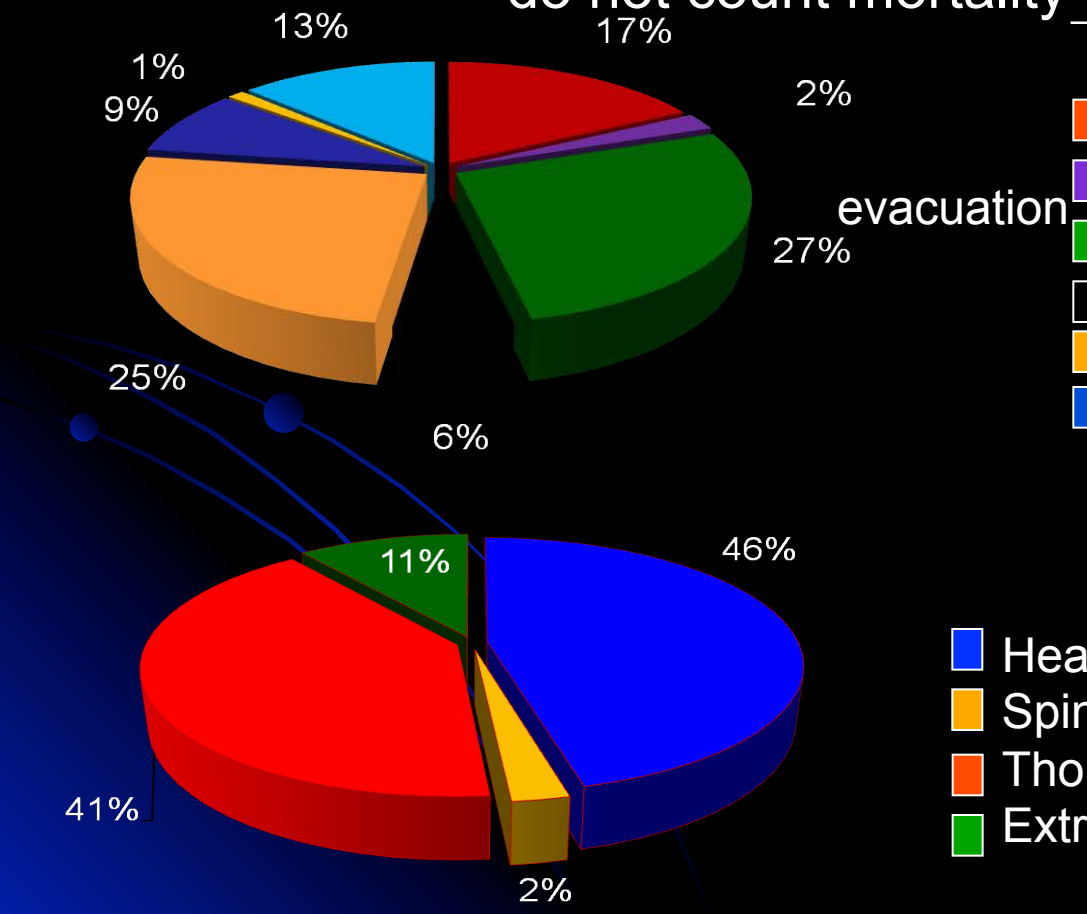
AIR EVACUATION – specially equipped helicopters and airplanes with medical staff (related of tactical situation).

Lesson 5

CAUSES of DEATH

For adequate perception of results consider:

- the number of death
- the timing of Role I care and evacuation to Role II
- the number of severe injured at hospital
- do not count mortality but the number of survivors

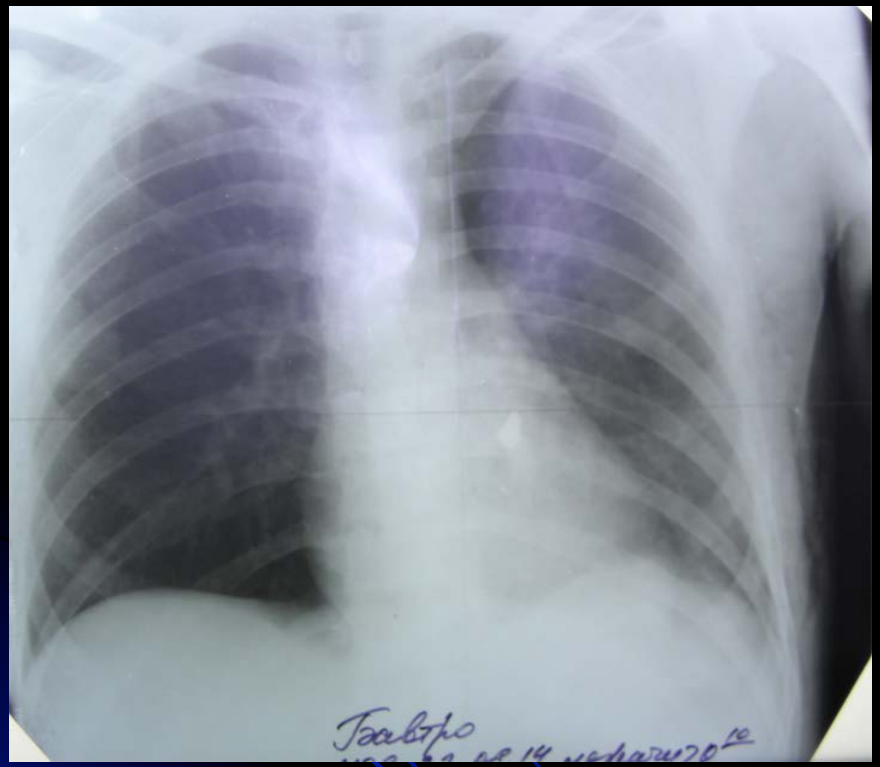


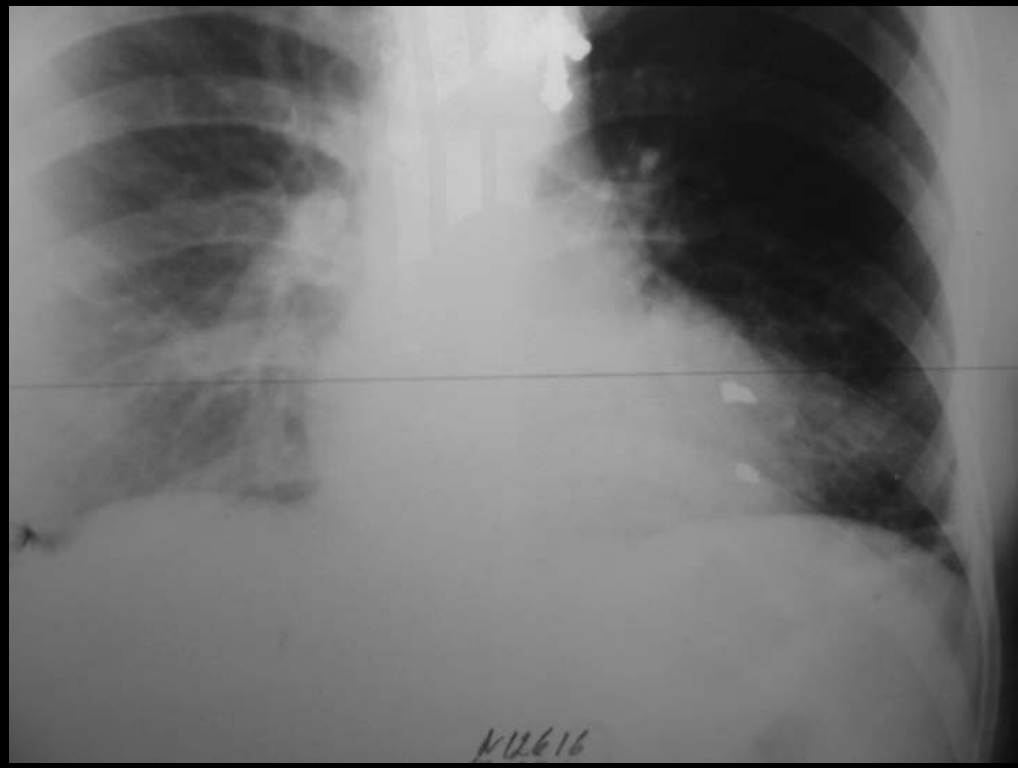
Military Medical Clinical Center of the Western Region (Lviv)

(Role III, IV, V)

Near 3000 war wounded patients for 2014-2016

Mine Explosion Mediastinum Injury



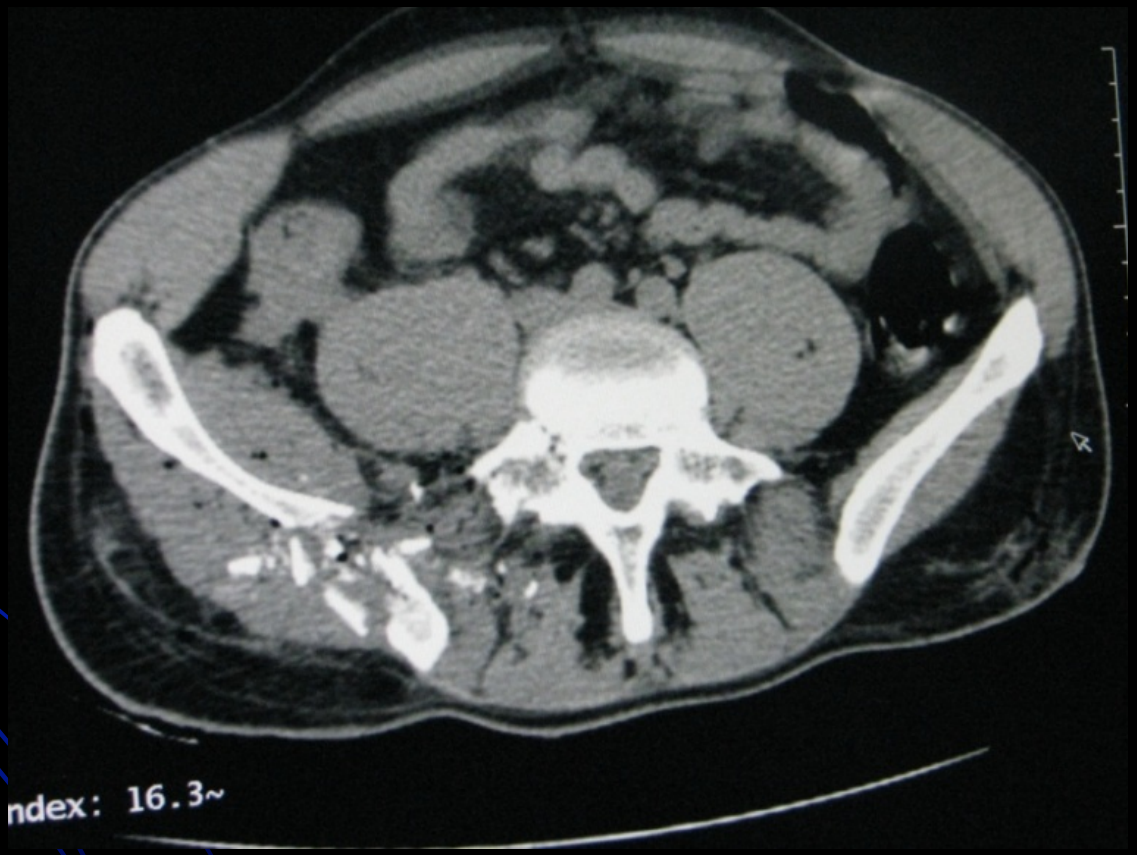


Mine Fragments
Right Lung Injury, Hemothorax

Body Explosion Fragments

Bullet spine injury

Bullet pelvis injury



Explosion multiple fragment leg injury

First stage: external fixation

Second stage: plate fixation

High-energy explosion multiple and combined abdomen and extremities injuries. Small intestine injuries. Open thigh fragment fracture with large soft tissue defects.

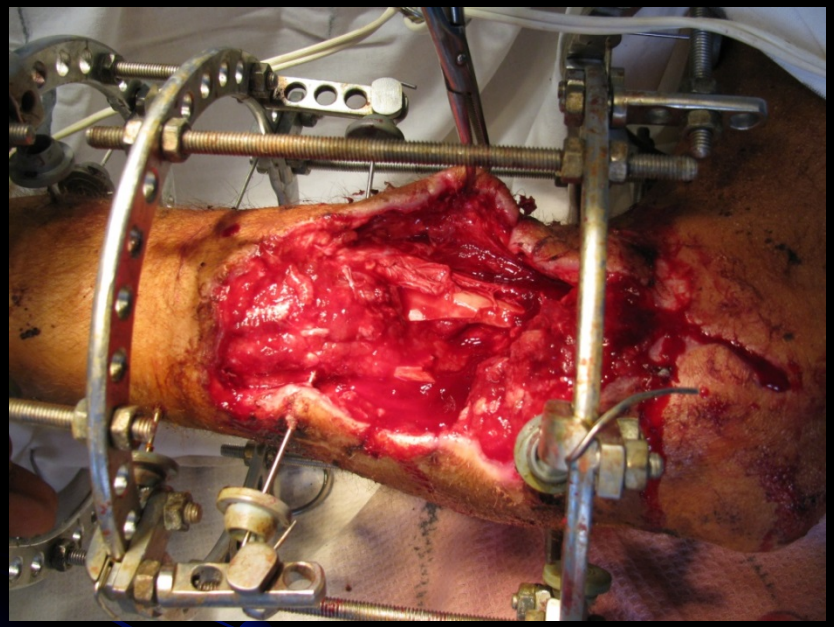
Primary debridement.
External fixation

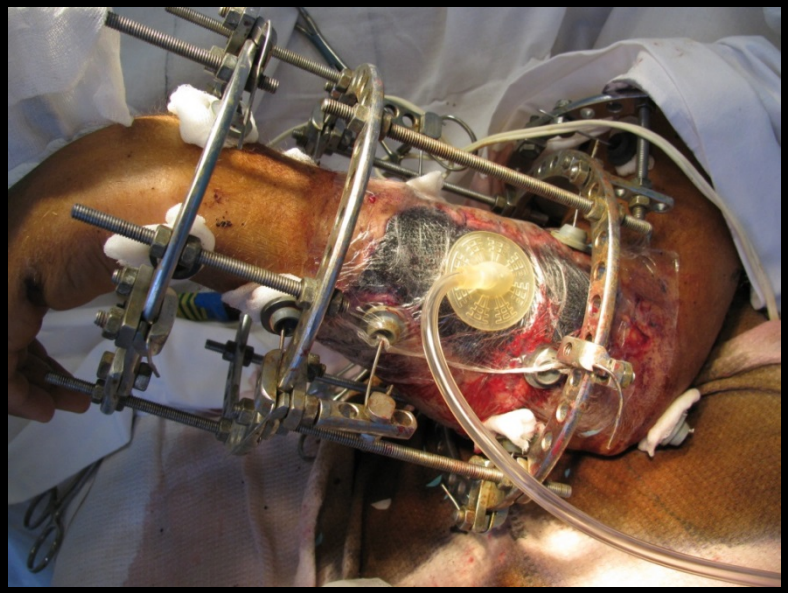
External fixation

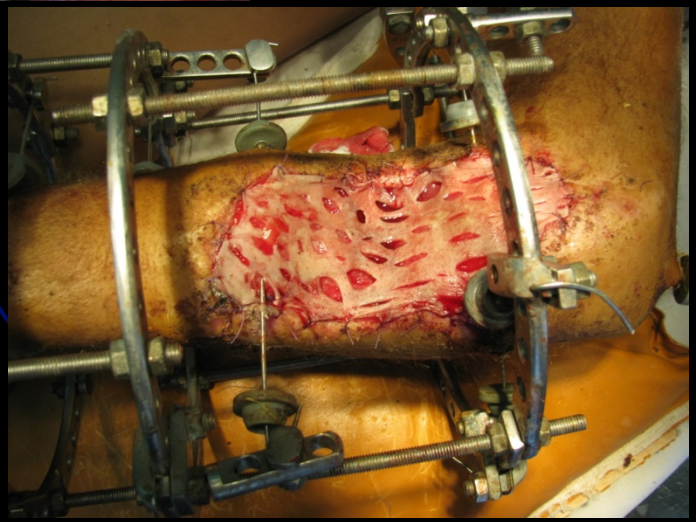
Intramedullar fixation

Rehabilitation

Surgical Debridement, VAC-therapy and Skin Grafting







Mine explosion hand injury. Soft tissue defect, necrosis, infection

Secondary debridement

Groin flap plastic

Explosive injury. Multiple chest, abdomen and both eyes fragment injury, open fragment fracture of the right hip, traumatic amputation of right hand

Polytrauma combat injury

Severe thoraco-abdominal-extremities injury: lungs contusion, liver crush IV stage with left hepatic duct injury, acetabulum fracture dislocation, leg fractures

Rehabilitation (Role V)

Rehabilitation (Role V)

Wounded spine injury patients

Thank you for your attention!

Дякую за увагу!

WELCOME to LVIV, UKRAINE

Evolution of Trauma Systems and Tactical Combat Casualty Care (TCCC) in Ukraine

Roxolana Horbowyj, MD, MSChE, FACS
World Federation of Ukrainian Medical Associations (US)
RDCR – THOR
July 28, 2017

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- *Arsen Hudyma, PhD,*
  - *Ternopil Medical University*

Pre-hospital Health Care in Ukraine before 2012

1990's: intermittent efforts

2004: World Health Organization (WHO) Milestones in international road safety: World Health Day 2004 and beyond – for road traffic injury prevention.

> *"Road traffic injuries are avoidable. They are not just accidents, they are human errors which with proper governmental policy can be dealt with."*
>
> http://www.who.int/violence_injury_prevention/publications/road_traffic/world_report/en/

2005: Individual training initiatives started, e.g., Ternopil Oblast volunteers traveled to the European Union for courses.

Prehospital Health Care in Ukraine before 2012

- Emergency medical services (EMS)
  - Insufficient number and quality of vehicles, staff, equipment
  - Outdated protocols and guidelines
  - No formal training for non-physicians: physicians travel to scene
  - Sub-optimal skill training and didactics at Medical Universities.
  - No post-graduate training for providers
  - Limited protective gear
  - Low trust within community

- No standards for care during or after a mass disaster

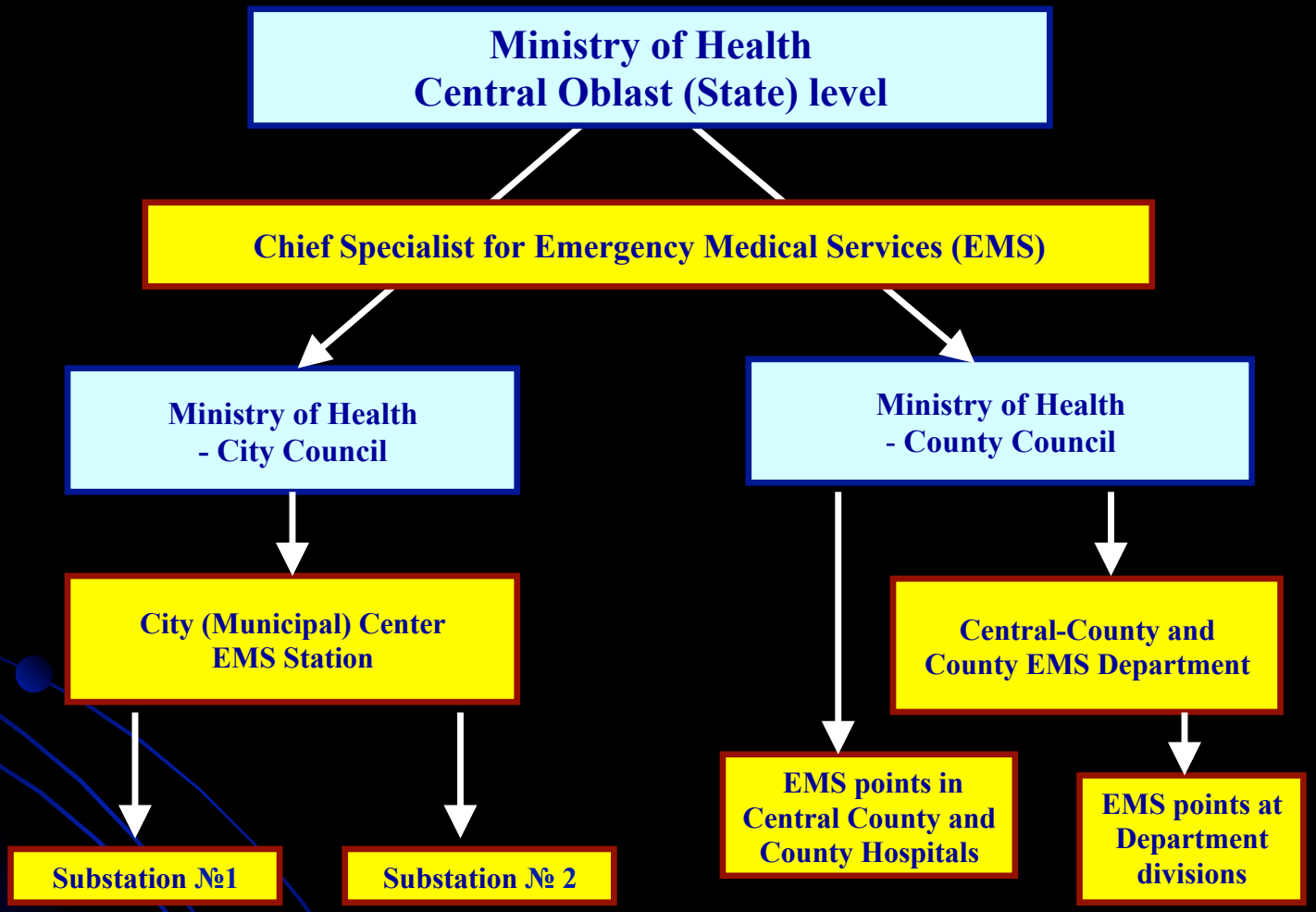
- Insufficient infrastructure and resources for communication and navigation to get the right patient to the right provider at the right time.

Prehospital Health Care in Ukraine before 2012

Resources divided between city and county administrations: "Care Gaps"

Source: Ukrainian EMS & Disaster Management Clinical Learning Center, A. Hudyma, PhD

Prehospital Health Care in Ukraine pre-2012



Source: Ukrainian EMS & Disaster Management Clinical Learning Center, A. Hudyma, PhD

2012 Prehospital Care Reform in Ukraine

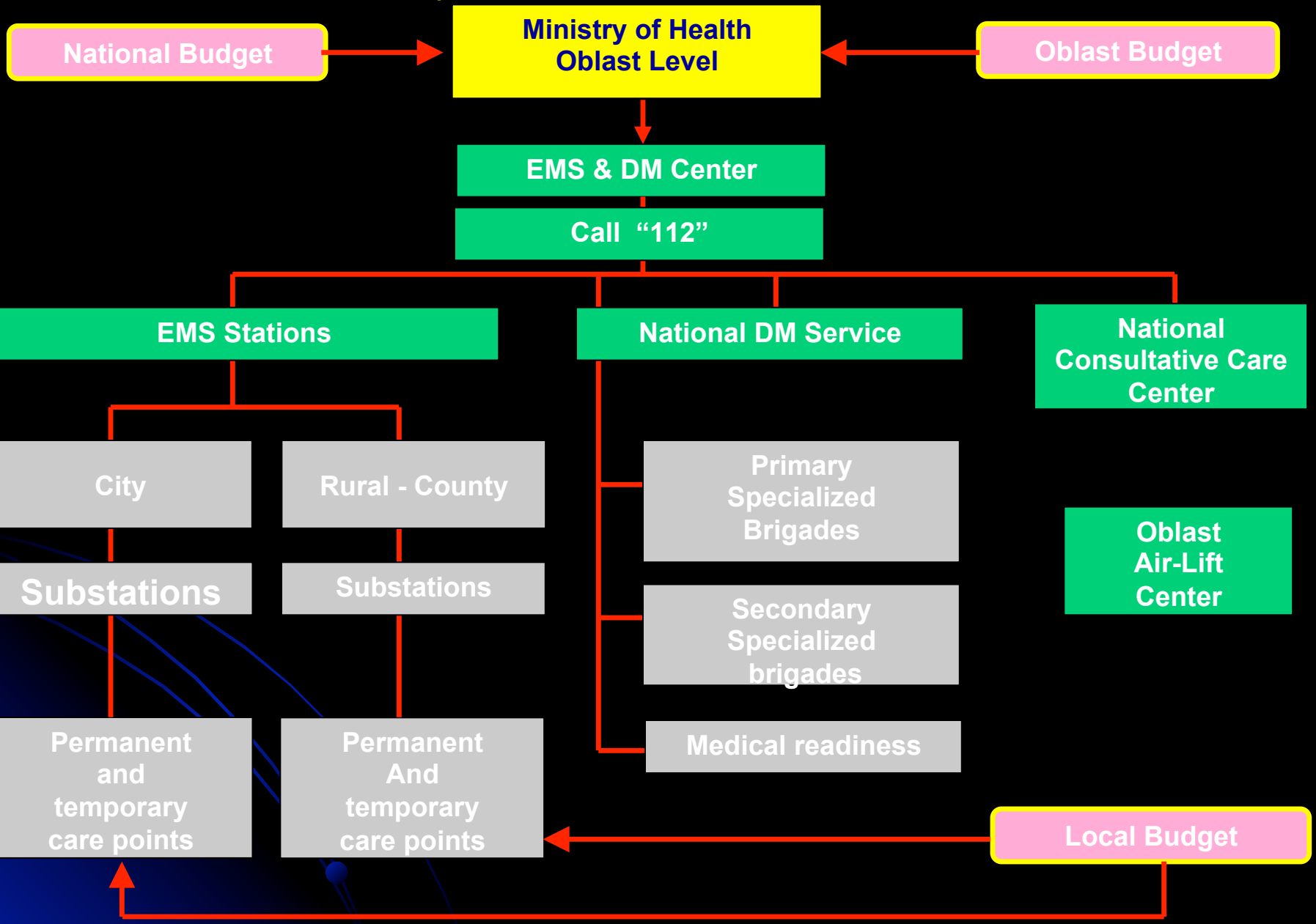
Ministry of Health of Ukraine Orders of 2012, Resolutions:

- *Outlined strategy for pre-hospital care reform and staff development:*
  - *Functionally and structurally based upon best global practices, adapted to the resources and needs of Ukraine.*
  - *Included economic, organizational, material and learning initiatives.*
- *Required consistent systematic change, proportional to available finances and everyone's steadfast work.*

http://zakon2.rada.gov.ua/laws/show/5081-17

Source: Ukrainian EMS & Disaster Management Clinical Learning Center, A. Hudyma, PhD

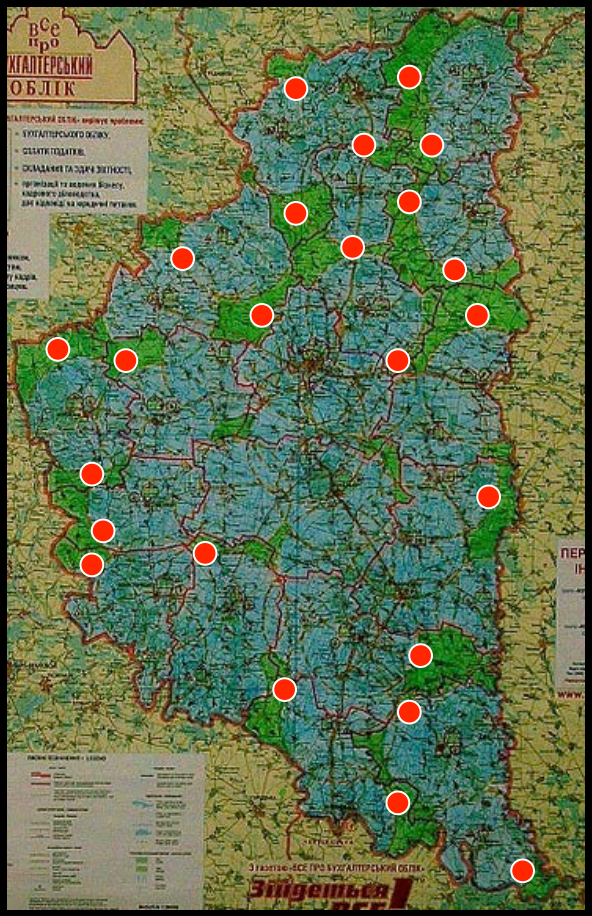
2012 Pre-hospital Care Reforms in Ukraine



Source: Ukrainian EMS & Disaster Management Clinical Learning Center, A. Hudyma, PhD

2012 Prehospital Care Reforms in Ukraine
EMS Travel Time to Scene

- Urban: 10 minutes
- Rural: 20 minutes



Source: Ukrainian EMS & Disaster Management Clinical Learning Center, A. Hudyma, PhD

2012 Prehospital Care Reforms in Ukraine
Dedicated Dispatcher Areas

Rural and urban county dispatchers to coordinate with their designated central EMS and Disaster Management site.

Source: Ukrainian EMS & Disaster Management Clinical Learning Center, A. Hudyma, PhD

2012 Prehospital Care Reform in Ukraine Oblast Dispatcher Service

Source: Ukrainian EMS & Disaster Management Clinical Learning Center

2012 Pre-Hospital Reforms in Ukraine

- Created urgent care units near admission rooms in multi-specialty hospitals.

Creating emergency care departments, e.g., as in the US, was under consideration.

Source: Ukrainian EMS & Disaster Management Clinical Learning Center

2012 Prehospital Care Reform in Ukraine

Urgent care unit near admission room:

Patient-ready - 24 / 7

2012 Prehospital Reform in Ukraine

Facilitated EMS delivery of victims to hospital intensive care units in multi-specialty as part of Disaster Management.

Source: Ukrainian EMS & Disaster Management Clinical Learning Center

2012 Pre-hospital Care Reforms in Ukraine

Warmed vehicle shelter at hospital entrance for patient transfer from EMS vehicles during cold weather

Source: Ukrainian EMS & Disaster Management Clinical Learning Center, A. Hudyma, PhD

2012 Prehospital Care Reform in Ukraine

New well-equipped EMS vehicles

Over 1200 Class "B" and "C" vehicles planned for deployment

Source: Ukrainian EMS & Disaster Management Clinical Learning Center, A. Hudyma, PhD

2012 Prehospital Care Reform in Ukraine

New vehicles for ancillary staff transport to scene

Source: Ukrainian EMS & Disaster Management Clinical Learning Center, A. Hudyma, PhD

2012 Prehospital Care Reform in Ukraine
Medical airlift and resuscitation considered

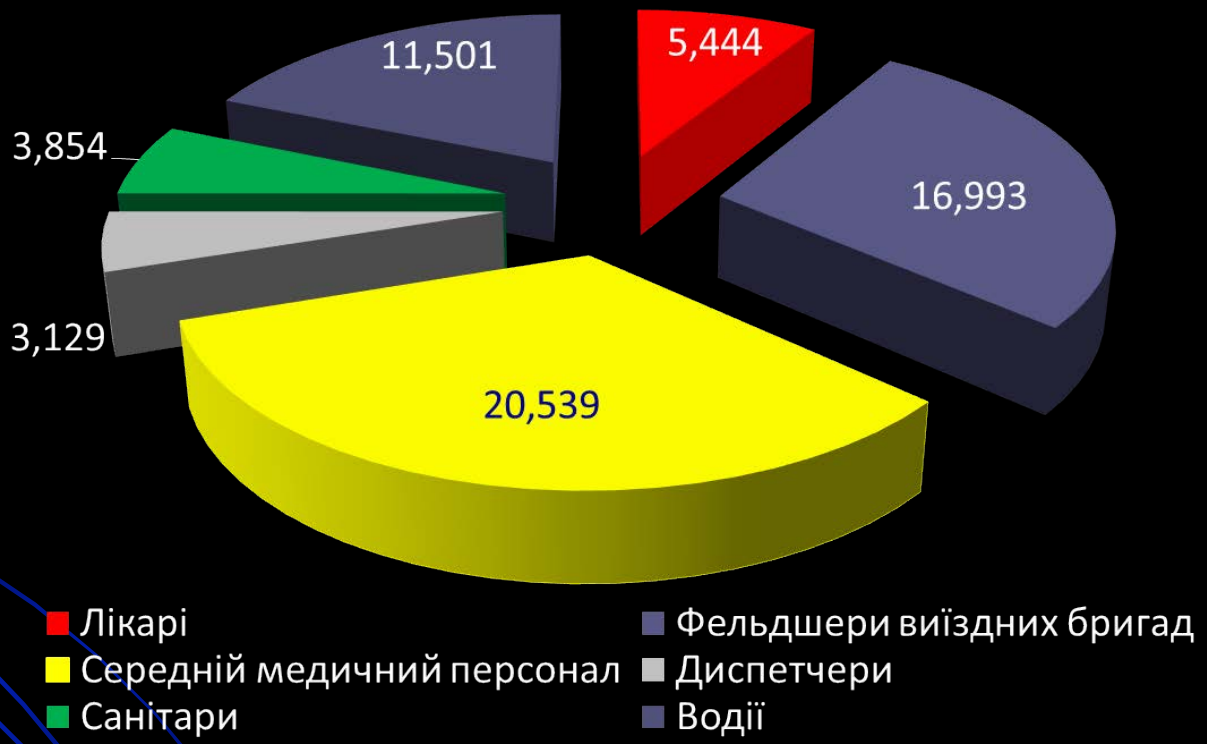
Source: Ukrainian EMS & Disaster Management Clinical Learning Center, A. Hudyma, PhD

2012 Prehospital Care Reform in Ukraine Staff Development

1. EMS and Disaster Management Departments created at medical universities as of September 2012,
2. “EMS and Disaster Management” learning curricula for all medical specialties.
3. Simulation centers for EMS training at medical universities.

Source:
Management
A. Hudyma,

EMS Staff (2013)



Source: Ukrainian EMS & Disaster Management Clinical Learning Center, A. Hudyma, PhD

“EMS staff development”
– an annual national clinically academic conference with international participation

Source: Ukrainian EMS & Disaster Management Clinical Learning Center, A. Hudyma, PhD

2012 Pre-hospital Care Reforms in Ukraine

National EMS Team Championships
- Expanded in 2008
to Oblast and inter-Oblast levels

Source: Ukrainian EMS & Disaster Management Clinical Learning Center, A. Hudyma,

Improving Public Awareness and Regard to EMS

"**HELP**

RAPID RESCUE!"

"**Make way**

for EMS!"

Source: Ukrainian EMS & Disaster Management Clinical Learning Center, A. Hudyma, PhD

Advanced Trauma Life Support (ATLS)

ATLS Provider training:

- October, 2013: six trauma surgeons from Ukraine trained successfully in the US.

- ATLS promulgation plans initiated, site visit planned for February, 2014.

GETTY IMAGES

Kyiv

Referred: 886
Admitted: 695
Died: 30.11.2013-5.02.2014 3

MBC

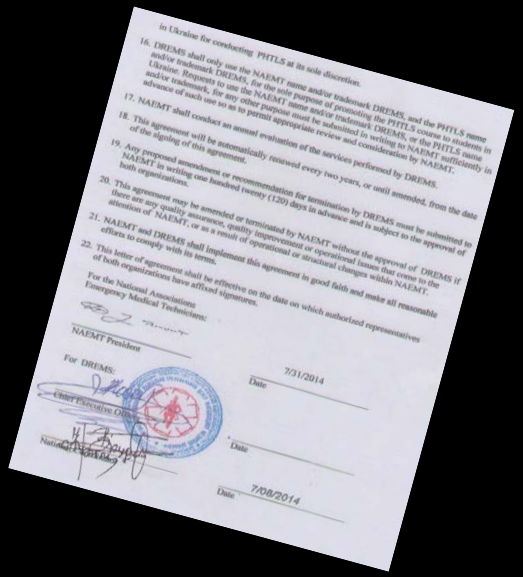
Referred: 1811; 623
Admitted: 1214; 515
Died: 95/20 17

18.02.2014-16.04.2014

Source: Y. Zarubin

Pre-Hospital Trauma Life Support (PHTLS)

- May, 2014: Tulane University
  - 12 Surgeons from Ukraine
    - First trainees – broad representation of Ukraine.
    - Promulgation approved


in Ukraine for conducting PHTLS at its sole discretion.

16. DREMS shall only use the NAEMT name and/or trademark DREMS, and the PHTLS name and/or trademark DREMS, for the sole purpose of promoting the PHTLS course to students in Ukraine. Requests to use the NAEMT name and/or trademark DREMS, or the PHTLS name and/or trademark, for any other purpose must be submitted in writing to NAEMT sufficiently in advance of such use so as to permit appropriate review and consideration by NAEMT.

17. NAEMT shall conduct an annual evaluation of the services performed by DREMS.

18. This agreement will be automatically renewed every two years, or until amended, from the date of the signing of this agreement.

19. Any proposed amendment or recommendation for termination by DREMS must be submitted to NAEMT in writing one hundred twenty (120) days in advance and is subject to the approval of both organizations.

20. This agreement may be amended or terminated by NAEMT without the approval of DREMS if there are any quality assurance, quality improvement or operational issues that come to the attention of NAEMT, or as a result of operational or structural changes within NAEMT.

21. NAEMT and DREMS shall implement this agreement in good faith and make all reasonable efforts to comply with its terms.

22. This letter of agreement shall be effective on the date on which authorized representatives of both organizations have affixed signatures.

For the National Association of Emergency Medical Technicians:

NAEMT President

Date

For DREMS:

Chief Executive Officer

7/31/2014

Date

7/08/2014

Date

Tactical Combat Casualty Care (TCCC)

- October, 2014: Munich, Germany
  - Inaugural course
  - 4 Physicians from Ukraine
    - First trainees - broad representation of Ukraine
    - Promulgation approved

TCCC

- Best practice guidelines and standard phased pre-hospital battlefield care
- Refined based upon practice feedback:

  US Joint Trauma System (JTS) data
- Administered by the National Association of Emergency Medical Technicians (NAEMT)
- Open – source course materials: www.naemt.org

http://www.naemt.org/docs/default-source/education-documents/tccc/150807-brief-history-of-tccc-v2.pdf?sfvrsn=0

NAEMT TCCC Guidelines & Curriculum

naemt.org/education/TCCC.aspx

NAEMT
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Tactical Combat Casualty Care

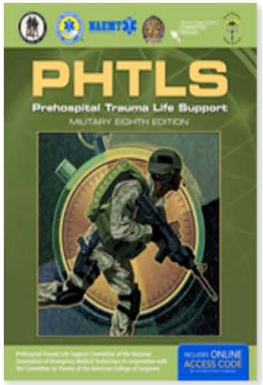
The U.S. Department of Defense's **Tactical Combat Casualty Care** course, conducted by NAEMT, introduces evidence-based, life-saving techniques and strategies for providing the best trauma care on the battlefield. NAEMT's TCCC course is the only TCCC course endorsed by the American College of Surgeons.

- What is TCCC?
- TCCC-MP Guidelines and Curriculum
- TCCC-AC Guidelines and Curriculum
- Become a TCCC Instructor
- Become an NAEMT Training Center
- Brief History of TCCC
- Hartford Consensus IV

NAEMT's Tactical Combat Casualty Care course (TCCC) was recognized by the Board of Critical Care Transport Paramedic Certification (BCCTPC) as "helping to prepare students to take the TP-C exam." Learn more.

FEATURED RESOURCES

- Locate a Course
- SOMA: Special Operations Medical Association
- Challenges to Improve Combat Casualty Survival



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TCCC

- **Originally a Special Operations research effort – now used throughout the US Military and by most allied countries**
- **Military units that have trained all of their members in Tactical Combat Casualty Care have documented the lowest incidence of preventable deaths among their casualties in the history of modern warfare.**

Source: Dr. F. Butler, Co-TCCC

Tactical Combat Casualty Care
TCCC in Ukraine

Start: 2015 - Official NAEMT- registered TCCC courses

Model: Military to Military training

- Instructors: active duty military
- Slides and text: English
- Didactics, skills, scenarios: Ukrainian
- Guidelines: parallel English / Ukrainian
- Skills: Partial trainers
  Non-invasive self and buddy practice
  Videos

Site: Military Medical Clinical Center of the Western Region (Lviv, Ukraine)

TCCC in Ukraine
Current NAEMT courses

- Single, as well as concurrent, mobile courses
  - TCCC: for medical military personnel
  - TCCC – AC (All Combatants): for NON-medical military
  - LEFR – TCC: for Law Enforcement and First Response
  - TECC: Tactical Emergency Casualty Care
  - PHTLS: Prehospital Trauma Life Support

TCCC in Ukraine

Current American College of Surgeons courses +/- FAST exam:

- Rural Trauma Team Development Course (RTTDC)
- Trauma Education and Management (TEAM)
- Bleeding Control (B-CON)
- ATLS (pending)

Students: Matched to course type.
Previous course experience range from none (0) to multiple unofficial TCCC courses

April 2017: ~ 30 NAEMT instructors trained and monitored in ~50 courses: ~600 students

TCCC in Ukraine
Self, Buddy and Partial Trainer Practice

- Limb tourniquet placement for massive hemorrhage control: 4 limb practice on self and buddy because learning appears to be limb dependent, does not transfer.

Direct pressure

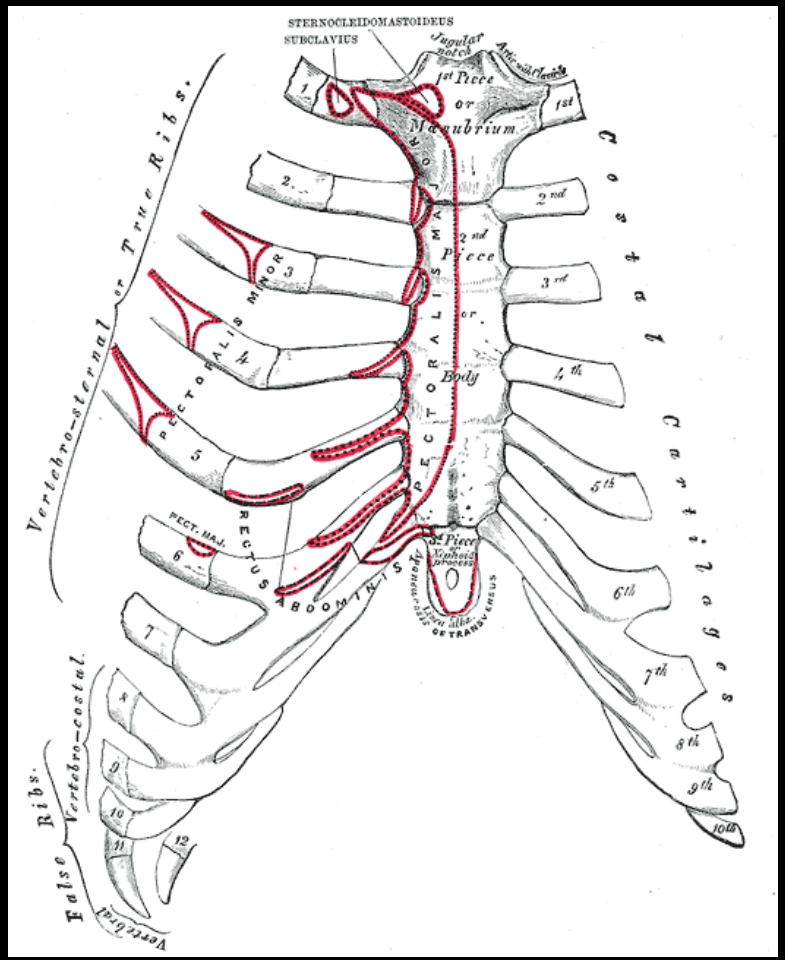
TCCC in Ukraine
Airway

- Sit forward position
- Jaw thrust
- Bag-mask valve
- Nasal pharyngeal airway
- Suction
- Laryngeal mask airway
- Cricothyroidotomy

TCCC in Ukraine – Pneumothorax Decompression

- 2-3 intercostal space (ICS), midclavicular line
- 5-6 ICS at the axillary line for chest tube placement and needle decompression (just behind Pectoralis Major m. insertion to rib)

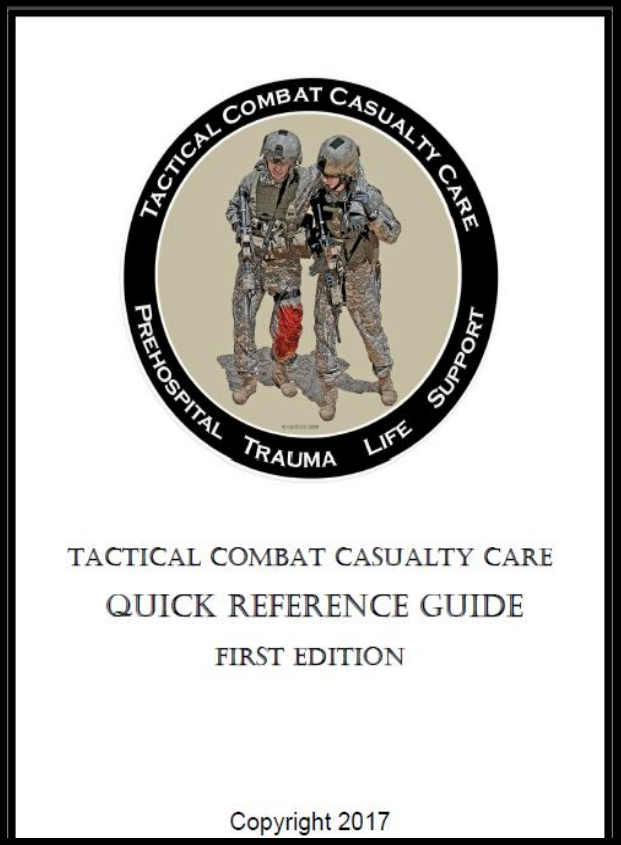
https://upload.wikimedia.org/wikipedia/commons/3/3d/Gray115.png



Tactical Combat Casualty Care
TCCC in Ukraine

TCCC Quick Reference Guide

- Provided as a training resource to all TCCC students
- Developed by the Co-TCCC
- Contains new TCCC Clinical Algorithms
- Also equipment lists and TCCC medication references



Source: Dr. F. Butler, Co-TCCC

TCCC in Ukraine
Challenges

Include

- Rapid scale-up, sustained promulgation and quality
- Systemized documentation for data driven performance improvement
- Practice to maintain infrequently used skills
- Ready access to new information and products to help effectively adapt and implement change locally

- Unofficial TCCC courses

TCCC in Ukraine
Challenges: unofficial TCCC

Students from unofficial courses often fail official TCCC pre-test, have inadequate skills.

- Inconsistent messaging
- Instructor drift
- Lack of benefit from updates, e.g.:
  - Outdated carries,
  - Pelvic wrap with sheet twist,
  - *"Never take off a tourniquet in the field"*

The same students usually pass official post-course test after taking the official TCCC course.

How to achieve consistency amongst training groups to promote common language, skills, paradigms and rescue-culture?

- *Designed by national TCCC course leadership (COL I. Bohdan, MD)*
- *NAEMT approved*
- *Provided for those who complete official NAEMT TCCC*

Thank you!

Tusen takk!

Д я к у ю!