A 30 year old infantry officer is injured in a rocket blast. He has a posterior knee injury that is actively bleeding as well as penetrating injuries across his abdomen and chest. He is having difficulty breathing.

What type of care would you expect at a Role 1, 2, 3, and 4?
EWS En Route Care

Objectives

- Understand capabilities at each level of care.
- Understand military medical evacuation terminology.
- Understand risks and limitations of aeromedical evacuation.
EWS En Route Care

Definitions

- **Casualty Evacuation (CASEVAC):** Move of a casualty from the point of injury to medical treatment by nonmedical personnel.

- **Medical Evacuation (MEDEVAC):** Movement and en route care provided by medical personnel to the wounded being evacuated from the battlefield to medical treatment facilities (MTF) or between medical facilities.

- **Aeromedical Evacuation (AE):** Generally utilized fixed-wing aircraft to move sick or injured personnel within the theater of operations (intratheater) or between theaters (intertheater).

- **En Route Care:** Maintenance of treatment initiated prior to evacuation and sustainment of the patient’s medical condition during evacuation.
**Reducing time to medical or surgical interventions improves patient outcomes.**

**Care starts on the battlefield and ends at definitive care facilities in the U.S.**

- As a general rule, no level of care will be bypassed except on grounds of medical urgency, efficiency or expediency.
- Four roles of care can have different names, but principles the same.

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### EWS Field Critical Care

**Background**

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*Note: Army Forward Surgical Team/Forward Surgical Resuscitative Team are a Role 3 capability used to expand care available at Role 2 by providing resuscitative surgical care.*

**Marine Corps Shock Trauma Platoon are a Role 2 capability that can be used to expand care available at Role 1 by providing advanced resuscitative care.*
Role 1: First medical care military personnel receive. This role includes:

- Immediate lifesaving measures
- Disease and non-battle injury prevention and care
- Combat and operational stress preventive measures
- Patient location and acquisition
- Treatment provided (May not have physician):
  - Maintaining the airway
  - Stopping bleeding
  - Preventing shock
  - Protecting wounds
  - Immobilizing fractures
  - Other emergency measures as able

Evacuation after Role 1 treatment
Source: Out of the Crucible.
Role 2: Provides advanced trauma management and emergency medical treatment.

- Continues resuscitation with greater capabilities provided at Role 1.
  - Packed blood products
  - Limited X-Ray
  - Laboratory
  - Dental support
  - Combat and operational stress control
  - Resuscitative Surgical Support

- Can conduct damage control surgery, but may have limited patient holding capabilities.
Role 3: Provides additional resuscitation, wound surgery, specialty surgery (general, orthopedic, neurosurgical, etc.) and post-operative treatment.

- May provide definitive surgery for local nationals.
- Patient holding until can tolerate and survive movement over long distances.

Patient on ECMO at Role 3 being prepared for transport
Source: Out of the Crucible
Role 4: Care found in U.S. and robust overseas hospitals

Represents the most definitive medical care available within the medical care system.

Landstuhl Regional Medical Center, Germany
Source: Out of the Crucible
Aeromedical evacuation is often how patients move from one role to another.

Air evacuation can reduce transport times, but creates unique stresses on the injured patient.

MEDEVAC helicopters outside Role 3
Source: Out of the Crucible
Movement of patients is a medical intervention with associated risks and benefits.

- Clinical parameters that suggest normal physiology:
  - Heart rate < 120 beats/minute
  - Systolic blood pressure > 90 mmHg
  - Hematocrit > 24%
  - Platelet count > 50/mm³
  - INR < 2.0
  - pH > 7.3
  - Base deficit < 5 mEq/L
  - Temperature > 35 C
When any one or more of these criteria are not met, continued care should be rendered at the current facility unless institutional capabilities are exceeded.

- Best outcomes occur when physiology is closest to normal.
- Resuscitation may be ongoing in route, but should not require dynamic, complex, or life-preserving adjustments en route.
- Packing and anticipation of patients needs is important and require careful planning.
- Documentation of interventions important.
EWS En Route Care

Requirements

Air transport requires proficient personnel and people familiar with theater standards.

- **2 levels** of capability recognized:
  - **Critical Care Transport**: Required when critical illness or injury impairs one or more vital organ system with threat to life during transport
  - **Intermediate Care**: Required if dedicated medical attendant with skills equivalent to a paramedic needed and patient not expected to deteriorate
Transport platforms are also required.

- Vehicle selection can directly impact care.
- Weight and space restrictions dependent on vehicle used at time.
- Expendable supplies (e.g. blood, gauze, oxygen) from transferring location should be used until last possible moment given limitations on vehicles.

Source: Interfacility Transport CPG
General Considerations Prior to Transport

- Physicians should tailor vital sign monitoring, wound care requirements and neurovascular checks to an environment with altitude, restricted mobility and limited staffing

- Patients with significant medical or surgical conditions should have:
  - Foley catheters and NG Tubes
  - Provisions for IV medications
  - Appropriate nutrition setup
  - Consideration for prophylactic endotracheal tube
  - Wounds dressed for delayed primary closure
  - Splints or bivalved casts – avoid circumferential casts
  - Liberal use of fasciotomies/escharotomies
General Considerations Prior to Transport

- Volume of a gas bubble doubles at 18,000 feet above sea level.
  - Military planes routinely maintain pressurization between 8,000-10,000 ft.
- Can fly lower but impacts operations, fuel efficiency, and range
- Considerations can be made for:
  - Penetrating eye injuries with intraocular air
  - Free air in body cavity
  - Severe pulmonary disease
  - Decompression sickness and arterial gas embolism – destination altitude should not be higher then origin.
    - Fly with 100% oxygen if available.
General Considerations Prior to Transport

- Other recommendations:
  - Pneumothorax – chest tubes in all pneumothoraces
  - Air splints – avoid
  - Ostomy patients – Vent collection bags
  - Decreased Partial Pressure Oxygen – 
    At 8,000 feet, room air oxygen saturation 90% at room air. Corrects to 98%-100% with 2 L/min Oxygen
    - Neurosurgical patients – hypoxia may worsen neurologic injury; adjust oxygenation

MEDEVAC Helicopter Landing at Role 2.
Source: Out of the Crucible
Acceleration stress: Transient increase in intracranial pressure can effect TBI. Adjust patient position can minimize risk.

- Head forward on takeoff
- Head aft on landing

Thermal stress: Variability in temperature dependent on environment.

- Colder at higher altitudes
- Take steps to mitigate hypothermia
EWS En Route Care

Effects of Flying

- **Noise**: Heavy noise environment. Expect trouble communicating with staff; auscultation is impossible.
  - Non-invasive blood pressure monitoring and/or arterial line.
  - Place hearing protection on patient.
  - Audible alarms are useless.

*AE Evacuation on fixed wing asset, note dark conditions with ear protection.*
*Source: Out of the Crucible*
Nuclear, Biological, Chemical (NBC)

**NBC Environments**

- Nuclear and chemical casualties must be externally decontaminated. Allow time for off-gassing of residual chemical agents.
- Biological casualties varies by nature of agent.
- AE movement w/ NBC can be delayed.
  - Aircraft decontamination
  - Availability of non-contaminated crew
  - Cohorting of similarly affected patients
  - Special approval for highly communicable diseases
  - Decontamination of patients

*Chlorine gas release*
*Photo by US Army, Dugway Proving Ground Public Affairs*
EWS En Route Care

MEDEVAC Precedence

- Type of evacuation assets used depends on the evacuation environment and the patient status.
- Aeromedical liaison team and Aeromedical Staging Facilities facilitate movement through AE system.
- Consult with local flight surgeon to determine en route care plan and timing of evacuation.

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<tr>
<th>Evacuation Precedences*</th>
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<td>Movement Precedence</td>
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<td>Urgent</td>
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<tr>
<td>Priority</td>
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<tr>
<td>Routine</td>
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AE: aeromedical evacuation; ASAP: as soon as possible; MEDEVAC: medical evacuation.
*Timeline may vary based on patient requirements and logistical constraints.
A 30 year old infantry officer is injured in a rocket blast. He has a posterior knee injury that is actively bleeding as well as penetrating injuries across his abdomen and chest. He is having difficulty breathing.

What type of care would you expect at a Role 1, 2, 3, and 4?
EWS En Route Care

References

- Transport of Patients Between Theater Medical Treatment Facilities


Photos are part of the JTS image library unless otherwise noted.