THE WOUNDED PATHWAY TO CARE:

• Sailor/Marine is injured.

• Depending on scene, patient may be moved to the Corpsman or the Corpsman may see the patient at point of injury. [CASEVAC]

• Corpsman initiates life sustaining treatment and communicates the need for the patient for further care. If emergent air MEDEVAC (Helicopter) if possible, otherwise ground evacuation. [MEDEVAC]

• Patient transported to a Battalion Aid Station, typically there is a IDC or physician assigned. Triaged and treated further. If injuries more severe than the IDC/physician can handle, the patient is prepared for further evacuation.

• The next higher level of treatment is at temporary medical treatment facilities, emergent/urgent surgery frequently happens here. Once stabilized the patient will travel to a fixed facility for definitive care. [Aero-Evacuation]
CASUALTY EVACUATION:

The Battle Battalion Aid Station

Aero-Evacuation (AE)

Buddy CASEVAC

Forward Support Hospital (Temporary)

Red = Wounded

The Corpsman

MEDEVAC

Medical Center (Definitive Care)

Battalion Aid Station

The Battle
MEDICAL CONSIDERATIONS FOR PATIENTS ENTERING THE MEDICAL EVACUATION SYSTEM

• Medical Considerations/Requirements:
  • Medical evacuation request includes requirement for surgical equipment and/or providers.
  • Patient is sufficiently stabilized for the anticipated mode and duration of travel.
  • Patient’s airway and breathing are adequate for movement.
  • Patient’s IV lines, drainage devices and tubes are fully secured and patent.
  • Patient at high risk for thoracic barotrauma should be considered for prophylactic chest tube placement before prolonged aeromedical evacuation.
  • Heimlich valves on chest tubes are functioning.
  • Indwelling urinary catheters and nasogastric tubes are placed and allowed to drain.
MEDICAL CONSIDERATIONS FOR PATIENTS ENTERING THE MEDICAL EVACUATION SYSTEM

- Medical Considerations/Requirements:
  - Patient is covered securely with both a woolen blanket and an aluminized blanket for air transport, cold environment, or postoperative hypothermia.
  - Three litter straps are used to secure the patient to the litter.
  - Personal effects and all medical records accompany the patient.
  - Evacuation is initiated by the originating/sending physician.
  - Due to differences in the type of evacuation assets used and their effect on the patient’s medical condition, request to transport via USAF AE must be validated for evacuation by the theater validating flight surgeon.
  - Being evacuated from Role 2 MTF a brigade surgeon (or designee) determines the evacuation precedence, this is done with the Forward Surgical Team (FST) chief surgeon.
IMPLICATIONS:

• General:
  • Tailor vital signs monitoring requirements and frequency of wound and neurovascular checks as appropriate.
  • Some therapies which may not be required in a fixed MTF, may be needed for aero-evacuation, such as indwelling urinary catheter placement, nasogastric tubes, IV medications, extended duration IV antibiotics.
  • Consider liberal use of fasciotomies/escharotomies.
  • Consider securing the airway with a prophylactic endotracheal tube.
IMPLICATIONS:

• General:
  • Casts must be bivalved. If over a surgical wound site, “Window” the cast to allow for tissue expansion and emergency access. Document neurovascular checks prior to and frequently during flight.
  • Wounds dressed for delayed primary closure. AE crews do not routinely redress wounds. If a fever or sepsis develops en route wounds will be inspected.

Note: look where the window is, Dorsalis Pedis
IMPLICATIONS:

• Decreased Barometric Pressure:
  • The volume of a gas bubble doubles in size at 18,000 feet above sea level. Cabin pressures in most military aircraft are maintained at altitudes between 8,000-10,000 feet. Altitude may be maintained lower but this will significantly increase flight time and fuel consumption.

• Cabin Altitude Restriction (CAR)
  • Penetrating eye injury with intraocular air.
  • Free air in any body cavity.
  • Severe pulmonary disease.
  • Decompression sickness and arterial gas embolism.

• Destination altitude should not be higher than originating altitude. Transport on 100% oxygen, by aviator’s mask if available.
IMPLICATIONS:

• Pneumothorax: chest tube required for all pneumothoraces. A Heimlich valve or approved collection system must be in place prior to patient transfer.

• Air splints: should not be used if alternative measures available. Require frequent monitoring and adjustment during flight.

• Ostomy patients: vent collection bags to avoid excess gas dislodging the bag from the stoma wafer. Use a straight pin to put two holes in the bag above the wafer ring.

• Decreased Partial Pressure of Oxygen: Ambient partial pressure of oxygen decreases with increasing altitude. At sea level, a healthy person has an oxygen saturation of 98-100% at cabin altitude 8,000 feet this drops to 90%, corrected with 2 L/minute of Nasal Cannula to 98-100%
IMPLICATIONS:

- Neurosurgical patients: hypoxia may worsen neurological injury. Adjust ventilator settings to meet increased oxygen demands at altitude.

- Acceleration stress: traumatic brain injury patients can experience transient marked increases in intracranial pressure during takeoff or landing. Patient positioning onboard the aircraft helps minimize this risk (head forward on take off, head aft on landing).

- Thermal stress: plan for cabin temperature changes from 15 degrees C (15 degrees F) to 25 degrees C (77 degrees F) on winter missions and from 20 degrees C (68 degrees F) to 35 degrees C (95 degrees F) on summer missions. Normothermia should be maintained with using approved devices.

- Noise: Can produce problems with communication and patient evaluation. Provide patients hearing protection. Audible medical alarms are useless.
**IMPLICATIONS:**

- **Decreased humidity:** Airplanes have very low cabin humidity at altitude. Evaporative losses will increase; therefore patients require additional fluids, especially those with burns and at risk for mucous plugging.

- **Patient movement in Nuclear, Biological, and Chemical (NBC) environments:**
  - Nuclear and Chemical patients must be externally decontaminated and time allowed for off-gassing of residual chemical agent.
  - Movement of Biological agent depends on the agent, mechanism of transmission, and period of communicability.
  - Any NBC AE movement may be delayed due to: Air craft decontamination, Availability of non-contaminated aircrew, Co-horting similarly exposed patients, Quarantinable diseases (Plague and Smallpox) require special approval (Diplomatic and command) and/or Chemically and Radiologically contaminated casualties must be decontaminated.
# MEDICAL EVACUATION PRECEDENCES:

<table>
<thead>
<tr>
<th>Movement</th>
<th>MEDEVAC</th>
<th>Air Force (AE)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Urgent</td>
<td>Within 1 hour</td>
<td>ASAP</td>
<td>Immediate AE to save life, limb or sight.</td>
</tr>
<tr>
<td>• Priority</td>
<td>Within 4 hours</td>
<td>Within 24 hours</td>
<td>Prompt medical care not locally available. Medical condition could deteriorate and patient cannot wait for routine AE.</td>
</tr>
<tr>
<td>• Routine</td>
<td>Within 24 hours</td>
<td>Within 72 hours</td>
<td>Condition is not expected to deteriorate while waiting.</td>
</tr>
</tbody>
</table>
EVACUATION PROCESS:

• The medical crew is composed of flight nurses, aeromedical technicians, and medical attendants. This system is not designed as primary/scene response team.

• Aeromedical Evacuation Liaison Team (AELT): is a 4-6 person communication team usually co-located with a MTF to coordinate the AE system.

• Aeromedical Staging Facilities (ASFs) generally located at major transit points, manage the administrative processing and staging, providing limited medical care of casualties. Patients are held for 2-6 hours prior to evacuation.

• Originating physician consults with local flight surgeon to determine the en route care plan and timing of evacuation.

• Patients identified for transport must be stabilized (airway secured, hemorrhage controlled, shock treated, and fractures immobilized).
EVACUATION PROCESS:

- Originating physician communicates to the Flight Surgeon (request for AE) who communicates to the flight crew after deciding patient for transport (requirement for AE). Condition of patient, AE category (ambulatory or litter), and movement precedence of the patient.

- To ensure optimum care, communicate with accepting physician and provide diagnosis, care rendered, and subsequent medical care plan.

- Ensure the patient has adequate quantities of supplies and medications for duration of transfer. 24 hours for INTRAtheater and 48 hours for INTERtheater.

- The local FLIGHT SURGEON determines whether the patient is physiologically ready for air transport.

- Clearance is between physicians and Validation is logistical event. Example a patient may be medically cleared for transport (stable), but there is no vehicle available so they are not validated for transport.
CCATT (CRITICAL CARE AIR TRANSPORT TEAM):

• Definition of a CCATT patient: those in need of intensive nursing care, constant hemodynamic monitoring, mechanical ventilation, frequent therapeutic interventions, or other medical or surgical interventions vital to sustain life, limb, and eyesight during movement of the patient through the aeromedical environment.

• Make of the team is:
  • Intensivist Physician; trained in Critical Care Medicine, General Surgery, Anesthesiology, or Emergency Medicine.
  • Critical Care Nurse; experienced in managing patients requiring mechanical ventilation, invasive monitoring, and hemodynamic support.
  • Cardiopulmonary Technician; experienced in management of patients requiring mechanical ventilation and invasive monitoring, trouble shooting ventilatory support, portable laboratory devices, and monitoring systems.
CCATT (CRITICAL CARE AIR TRANSPORT TEAM):
• Use a CCATT if the patient:
  Is intubated.
  Requires aggressive fluid administration.
  Received more than 10 units of blood products within last 24 hours.
  Requires blood replacement.
  Requires vasopressor support.
  Requires invasive hemodynamic monitoring.
  Requires intracranial monitoring.
  Requires frequent suctioning.
  Requires frequent nebulizer treatments.
  Has increasing oxygen requirements.
CCATT (CRITICAL CARE AIR TRANSPORT TEAM):

• Use a CCATT if the patient:

Has undergone a vascular reconstruction.

Has unstable angina.

Has a condition requiring the need to initiate/continue IV drips for pain relief, anticoagulation, etc. while in flight.

Has an unstable spine fracture.

Requires the Vacuum Spine Board for movement.

Has altered mental status.

Will require electrolyte replacement and monitoring in flight.
HUMANITARIAN TRANSPORT REQUESTS:

• The process may be long and complex taking more than 6 months to arrange. Between local US Embassy or State Department, host nation medical officials and transit nations’ ministries of foreign affairs or equivalent.

• Patients should have a single, fixable, stable problem.

• Lack of suitable host nation care must be confirmed and documented.

• Individual cases for humanitarian evacuation out of theater are unlikely to be successful without a passionate advocate. Personalizing the case with photos and compelling narrative is crucial for success.

• All children must have an attendant. Clearance must be obtained for both the patient and nonmedical attendant.
TERMINOLOGY:

• Aeromedical Evacuation (AE); generally utilizes US Air Force (USAF) fixed-wing aircraft to move sick or injured personnel within the theater of operation (INTRAtheater) or between two theaters (INTERtheater) such as moving a casualty from Afghanistan to Germany. This is a regulated system in which care is provided by AE crewmembers, the AE crew may be augmented with Critical Care Air Transport Teams (CCATTs) to provide ICU level of care.

• Casualty Evacuation (CASEVAC); is movement of the casualty from the point of injury to medical treatment by non-medical personnel. Casualties transported under these circumstances may not receive en route medical care. Typically, this involves a helicopter returning from the battlefield.

• Escharotomy; surgical procedure used to treat full-thickness circumferential burns.
TERMINOLOGY:

• Fasciotomy; surgical procedure where the fascia is cut to relieve tension or pressure commonly to treat the resulting loss of circulation to an area of tissue or muscle.

• Medical Evacuation (MEDEVAC); is the timely, efficient movement and en route care provided by medical personnel to the wounded being evacuated from the battlefield to MTFs using medically equipped vehicles or aircraft.