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**AEROMEDICAL EVACUATION PATENT
CONSIDERATIONS AND STANDARDS OF
CARE**

COMPLIANCE WITH THE PUBLICAITON IS MANDATORY

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This instruction implements Air Force Policy Directive (AFPD) 41-3, *Worldwide Aeromedical Evacuation*, and establishes, defines, and implements nursing considerations and standards of care in the aero- medical evacuation (AE) system. It applies to all AE unit-assigned or associated in-flight care personnel, and all Air Force Reserve Command (AFRC) and Air National Guard (ANG) medical units. Send com- ments and suggested improvements on an AF Form 847, **Recommendation for Change of Publication**, through channels, to HQ AMC/SGN, 203 West Losey Street, Suite 1600, Scott AFB IL 62225-5219. This is the initial issue of this publication which replaces AMCR 164-1, Chapter 7, Air Mobility Com- mand Special Publication (AMCSP) 164-50, Volume 4, *Nursing Considerations and Nursing Care Stan- dards*.

SUMMARY OF CHANGES

This interim change establishes the AF 3899L, *Patient Movement Record En Route Critical Care*, as the required form for CCATT documentation, outlines minimum requirements for completing the AF 3899C, *Patient Movement Record Physical Assessment*, replaces Dramamine with Meclizine as the approved over-the-counter medication for air sickness, establishes guidelines for epidural analgesia and peripheral nerve block patients in the aeromedical evacuation system and establishes the AF IMT 3899M, *PCA Pain Management Flow sheet* and the AF IMT 3899N *Epidural Analgesia/Peripheral Nerve Block Flow sheet*. A margin bar (|) indicates newly revised material. The use of the name or mark of any specific manufacturer,

commercial product, commodity, or service in this publication does not imply endorsement by the Air Force.

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Chapter 1

GENERAL INFORMATION AND NURSING CONSIDERATIONS

1.1. Purpose. Standardizes AE clinical guidelines for providing a safe transportation environment for Department of Defense (DoD) beneficiaries and designees. Information presented in this Air Force Instruction (AFI) sets minimal standards for stable peacetime and stabilized wartime/contingency patient airlift operations. It is not intended to be all-inclusive or replace current national guidelines and practices. Each provider participating in AE missions must maintain professional expertise, accepting responsibility and accountability for their own judgment and actions. Individuals will provide care based upon their AFSC scope of practice/specific core competencies, level of knowledge, training, and skill.

1.2. Applicability. This AFI applies to all AE unit-assigned or associated in-flight care personnel, and all AF Active Duty, Air Force Reserve Command (AFRC) and Air National Guard (ANG) medical units.

1.3. Revisions. Direct any recommendations for improvements/changes and current references to HQ AMC/SGN through command channels, using AF Form 847, **Recommendation for Change of Publication**.

1.4. Publication Administration. Distribute this AFI to all AE and staging units. Each AE flight instructor and evaluator will maintain a copy. A copy will be a part of the AE mission publications kit. Unit commanders will determine further distribution requirements.

1.5. Responsibilities. It is the responsibility of AE unit commanders to ensure assigned personnel are using this document to provide initial and recurring training for aeromedical evacuation crewmembers (AECMs). Headquarters Air Mobility Command, Command Nurse (HQ AMC/SGN) is the major command office of primary responsibility for this AFI.

1.5.1. Definitions:

1.5.1.1. **Warning** - Procedures and techniques could result in personal injury or loss of life if not carefully followed.

1.5.1.2. **Note** - A procedure or technique that is essential to emphasize.

1.5.1.3. **Shall and Will** - Used to express that the requirements are binding and mandatory.

1.5.1.4. **Should** - Used to express a non-mandatory desire or preferred method of accomplishment and shall be construed as a non-mandatory provision.

1.5.1.5. **May** - Used to express an acceptable or suggested means of accomplishment and shall be construed as a non-mandatory provision.

1.6. Standards of Care and Performance - General:

1.6.1. **Standards of Care (SOC):** Refer to AFPD 46-1. The SOC in the air are adapted to the aircraft's capabilities and limitations, and the in-flight environment.

1.6.2. **Standards of Performance:** Refer to AFPD 46-1. The standards of professional performance are the expected level of function based on education, level of experience and criteria of the current AFSC position requirements. AMC/SGN has adopted the Air and

Surface Transport Nurses Association (ASTNA) standards of professional performance (when operationally feasible).

1.6.3. **Standards of Practice:** Refer to AFD 46-1. The identified level of accomplishment focuses on the personnel and includes competence, experience, and education of the medical personnel, as the situation permits. The primary goal of AE medical transport is to meet the perceived, actual, or potential health needs of the patient, while maintaining the continuum of care. **NOTE:** Commanders are responsible for assuring the clinical currency of assigned personnel.

1.6.4. **Continuum of Care:** Matching an individual's ongoing needs with the appropriate level and type of medical, psychological, health, or social service within an organization and across multiple organizations.

1.6.5. **Legal Considerations.**

1.6.5.1. All flight nurses (FNs) and aeromedical evacuation technicians (AETs) shall be familiar with legal standards of nursing practice as described in current texts and references listed in this AFI. The AECMs and Critical Care Air Transport Team (CCATT) members have a responsibility to notify the Medical Crew Director (MCD) of all incidents, accidents, and legal problems detected during the mission. Such matters shall be carefully documented as close to the occurrence as possible.

1.6.5.1.1. The medical crew director (MCD) is responsible for identifying and elevating the above issues to the Tactical Airlift Control Center/Air Mobility Operations Control Center/Air Operations Center/Patient Movement Requirements Center (TACC/AMOCC/AOC/PMRC) and AMC/SG.

1.6.5.2. **Patient's Property.** Use AF IMT 1053, *Record of Patient Storing Valuables*; on <http://www.e-publishing.af.mil/search.asp?keyword=1053&Go.x=23&Go.y=9>.

You may also access forms on AMC Aircrew Portal which has migrated to Air Force Portal web.

- Log-in to AF Portal as normal
- From the top menu bar, click Base-Orgs-Functional Areas and select MAJCOM A-Z listings
- Select Air Mobility Command (AMC)
- In the upper left margin, select sub organizations
- Click the "plus box" next to A3 and select A3V which will take you to Aircrew Portal Links and documents

1.6.5.3. **Medical-Legal Considerations.** Medical personnel may subject the Air Force to liability if negligent in the performance of duties or in the discharge of obligations. Negligence is the deviation from accepted standards of performance. All personnel must exercise sound and prudent judgment in providing patient care.

1.6.5.3.1. **Patient Injury.** In the event a patient is injured while in the AE System, the FN, AET, CCATT, staging facility nurse and medical technician or Flight

Surgeon will document the injury and care rendered on the patient's medical record. Complete and forward a DD Form 2852, **AE Event/Near Miss Report**; document occurrence on AF Form 3829, **Summary of Patients Evacuated by Air**.

1.6.5.3.2. Signing Forms for Patients. The FN may sign a document as required on behalf of an unconscious, incompetent or infectious patient, and if physically unable. When signing for the patient, indicate "for unconscious patient, John Doe." For other patients, an entry of "patient unable to sign" may be made. Two witnesses will sign the form in both instances.

1.6.5.3.3. Do Not Resuscitate (DNR) Orders.

1.6.5.3.3.1. AE personnel are not authorized to accept "partial" code orders. For example, CPR only, no intubation and chemical code only.

1.6.5.3.3.2.1. A completed AF Form 3838, ***DNR Certification for Aeromedical Evacuation***, attached to an AF IMT 3899, ***Patient Movement Record***.

1.6.5.3.3.2.2. "Do Not Resuscitate" order on DD Form 602 or AF Form 3899 that is signed, dated and timed. **NOTE:** DNR orders will not be more than 72 hours before the originating flight.

1.6.5.3.3.3. Prior to flight, verify the order with the patient and/or the patient's family.

1.6.5.3.4. Unaccompanied Minors/Incompetent Adults. Any unaccompanied minor, under the age of 18 or any unaccompanied non-active duty patient who is incapable of directing their own care will have a DD Form 2239, **Consent for Medical Care and Transportation** in the AE System attached to the DD Form 602 or AF Form 3899.

1.6.5.3.4.1. Minors under the age of 14 will have an attendant.

1.6.5.3.4.1.1. If a parent or guardian cannot accompany a minor under 14, the originating medical facility will send a responsible adult as the non-medical attendant (NMA). This NMA will carry a written Power of Attorney to cover the time period the minor will be in the AE system.

1.6.5.3.4.1.2. If the parent or guardian is unavailable to sign the DD Form 2239 a telephone consent may be obtained by two witnesses who will verify the call and sign the DD Form 2239.

1.6.5.3.4.2. Minors over the age of 14 may travel alone.

1.7. Special Considerations for Patients Who Are Seriously Ill and Those at Significant Risk. There is a critical need for ongoing interaction among all those concerned with carrying out the mission to ensure patient sensitivity, safety, continuum of care, quality assurance/risk management, and professionalism.

1.7.1. Medical Attendants (MA). MAs are required for patients whose needs exceed the capabilities of the medical crew or who require special attention en route. The supporting PMRC identifies the requirement for a MA and coordinates with the referring medical treatment facility (MTF). The referring MTF will provide the required MAs, except during contingencies. In some instances, MAs may be additional AECMs. All MAs are responsible

for providing patient care and coordinating patient care requirements with the MCD/FN. MAs will document care and administer medication in-flight, and will remain with the patient and coordinate breaks with the medical crew. At en route remaining overnight (RON) stops, MAs will brief personnel providing direct patient care for their patient(s) during rest periods and will remain available for consultations. The MA will accompany the patient to the MTF or may be relieved by the same level care provider from the receiving MTF at the flight line.

1.7.2. Critical Care Air Transport Team (CCATT). Each CCATT consists of one intensivist or non-intensivist physician (as the situation dictates), one critical care nurse, and one cardiopulmonary craftsman specially trained to provide critical care/specialty care during aeromedical transport. They represent a critical care team that can be added to the basic AE crew in order to offer a higher level of care to stabilized patients during AE staging and flight. The CCATT utilizes basic AE equipment and enhances treatment capability with expanded drugs and ventilation equipment. CCATTs have no stand alone electrical, mechanical, or oxygen equipment. The AF Form 3899L is the required CCATT documentation form and serves as the legal record of patient care while in the AE system.

1.7.2.1. During mission execution, CCATTs will organizationally align under the AE command structure, and will be a supporting element of the staging facility or any AE element. The CCATT physician is the clinical authority during missions, and with the other team members, is responsible for documenting and providing care; they may be called upon to consult and/or assist in the care of other patients. When in-flight, the CCATT works with and receives mission operational direction from the MCD. The mission operational management authority and responsibility remains with MCD.

1.8. Comfort Items and Procedures. Making a patient comfortable during airlift requires knowledge of the stresses and hazards of flight. Making an appraisal of the patient's particular situation, using available equipment and improvising can provide many small comfort measures.

NOTE 1: During contingencies, patients may not have personal hygiene, comfort items, and extra clothing. **NOTE 2:** Frequently assess adequacy of pain control measures.

1.8.1. Reducing Fatigue. All patients are susceptible to the effects of fatigue. Litter patients require special planning and care to reduce fatigue. Besides decreased atmospheric pressure, oxygen tension, humidity, and noise, they are subjected to constant vibration. Several basic nursing interventions can be accomplished to counter these stresses of flight.

1.8.1.1. When appropriate, place litter patients in seats for short periods of time. Mobilization of patients reduces fatigue and helps prevent venous stasis and deep vein thrombosis.

1.8.1.2. When condition or diagnosis prevents the patient from getting up, and is not contraindicated, backrests are available to elevate their head. The backrest is the best and easiest way of providing head elevation. Encourage active and passive exercises.

1.8.1.3. If special equipment is not available, elevate the patient's head with rolled towels or blankets as props or immobilizers. Patient's limbs should be supported in the position of function.

1.8.2. **Position Changes.** Combined with ambulation, head elevation, and support of limbs, there is a need for position change. Position changes should be made every 2 hours. When conditions do not permit position changes, range of motion exercises should be performed.

NOTE: When feasible, all litter patients should ambulate frequently, assisted to the lavatory and allowed to sit in a seat; ensure adequate pain control. Encourage ambulation every two hours for patients whose condition warrants to prevent deep vein thrombosis (DVT).

1.8.3. **Skin Care.** Lotion is a standard supply item for back rubs and/or skin care. Disposable wash- cloths are available and can be placed in a plastic bag, dampened with hot or cold water, and distributed to the patients. Antiseptic towelettes are available and will be offered before meals and after a patient uses a urinal or bedpan.

1.8.4. **Oral Hygiene.** When toothbrushes and paste are available, offer to patients so they may brush their teeth. Disposable “toothettes” make an acceptable substitute for toothbrushes. Patients who are to ingest nothing by mouth (NPO) can be given mouthwash. Mouth care is essential because of the reduced humidity in the aircraft cabin. The best way to combat reduced humidity and resulting dehydration in high-risk patients is to monitor intake and output (I & O), and provide adequate oral fluid intake at least every 2 hours. Comatose, paralyzed, and other patients at risk should have mouth care at least every 2 hours. A 4x4 sponge dipped in mouthwash can be used to clean the mouth. This process can be repeated until the mucous membranes of the mouth, tongue, and teeth are clean. If available, use a 4x4 sponge dipped in mineral oil and apply a very light coating on the mucous membranes. Application of petroleum jelly to the lips is also helpful.

1.8.5. **Sleep.** On long flights, provide patients with extra pillows and blankets to make them as comfortable as the environment allows. Disposable earplugs will be offered to each patient to reduce noise. Dimming the lights in-flight provides an atmosphere for sleep and relaxation. An uncomfortable position may hinder sleep more than the vibration and noise of the engines.

1.8.6. **Ambulatory Patients.** Ambulatory patients generally require minimal assistance for comfort. Observe patients for signs of discomfort from pain or fatigue. When possible, extra litters are carried for ambulatory patients unable to complete a flight sitting up. Periodically, during en route stops and long flying intervals, patients should be encouraged to stand up and stretch to promote circulation to the extremities. Any complaints of calf tenderness or new posterior leg pain must be evaluated by the AECM.

1.8.7. **Latrine Facilities.** Although the location of latrines is provided in the preflight briefing, this information may be of little value to litter-bound patients. Brief patients that urinals, bedpans, and modesty curtains are available for them; if not, patients may assume no provisions have been made. Some patients may wait until they are in extreme distress before inquiring about meeting elimination needs. **NOTE:** Assess toileting needs to limit the impact on the patient during mission launch and execution, especially with large patient loads.

1.9. **Vital Signs.** Because of the stresses of flight, special consideration is given to vital signs. They must be closely monitored since a change may be the first indication a patient’s condition is deteriorating.

1.9.1. **Temperature, Pulse, and Respiration (TPR).** Obtain any time a patient’s condition and/or nursing judgment indicates a need. TPRs are required and recorded on patients with

elevated temperatures, suspected or known infections, or abnormal pulse rates. In addition, in-flight TPR checks should be performed on VSI/SI patients, those with head injuries, inflammatory processes, infections, and/or those experiencing dehydration in-flight.

1.9.2. Blood Pressure (BP). When indicated, a BP should be obtained as part of the preflight assessment. If the BP is abnormal, compare readings bilaterally. Because of the noise level on aircraft, BP readings cannot always be heard by stethoscope and may have to be palpated.

1.9.2.1. If using palpation for determining the BP, the reading may vary 8 to 10 mm Hg when compared to an auscultation reading. The pressure is charted as systolic/P. Diastolic pressure cannot be determined in this manner.

1.9.3. Pulse Oximetry (pulse ox). Obtain a preflight oxygen saturation baseline and recheck at cruise altitude when patients have risk factors that may lead to in-flight hypoxia or aggravated by hypoxia.

1.9.4. Neurological Checks. Depending on the patient's condition, pupils will be checked and the level of consciousness noted on a specific schedule (Refer to **Table 3.1**, Glasgow Coma Scale). Assessment of grip, sensory, and motor responses is also necessary.

1.10. Nursing Care Guidelines. Ensure every effort is made to provide for the continuity of care for each patient. Personnel will:

1.10.1. Carefully observe all patients throughout the course of the mission.

1.10.2. Regularly inspect casts, dressings, drainage tubes, restraints, and the skin condition of chronic and immobilized patients and appropriately document findings.

1.10.3. Plan nursing care using the patient's chart and other information to control pain, conserve the patient's energy and avoid fatigue.

1.10.4. Maintain patient rapport; answer questions, keep the patient informed, comfortable, and well nourished/hydrated.

1.10.5. Administer medications and treatments as ordered. Administer medications in-flight on the same schedule as in the originating MTF or as near as possible. The goal of administering any type of medication or treatment in the AE system is to maintain the continuity of care from the originating MTF to the destination MTF without significant delays. Adjust administration times to the destination time zone, if there are no contraindications. **NOTE:** Frequently assess adequacy of pain control measures.

1.10.6. Maintain litters to present a neat, orderly appearance. Straighten or change sheets and position litter straps as required. Keep the aircraft interior neat and clean when possible.

1.10.7. Periodically distribute comfort items.

1.10.8. Provide ear plugs, blankets, and pillows if available.

1.10.9. Provide beverages for those not on fluid restrictions at least every 2 hours.

1.10.10. Serve meals as close to normal mealtimes as possible. Special diets are usually served first. Assist patients with eating as necessary.

1.10.11. The MCD and charge medical technician (CMT) will direct, supervise, and assist the other AECMs while they are performing patient care and other in-flight duties.

1.11. Medical Emergency/Change in Patient Status.

1.11.1. In an emergency or wartime situation, a provider must take reasonable and necessary action within their knowledge and experience to preserve life and health.

NOTE 1: In the absence of direct physician contact/supervision and when operationally feasible, FNs will immediately start interventions following the most current American Heart Association advanced cardiac life support (ACLS) algorithms. Refer to **Attachment 13**, In-Flight Adult ACLS. If no AECMs are currently trained, follow basic life support (BLS) protocols, establish oxygen (O₂), and an intravenous (IV) line. All IV solutions will be either lactated ringers (LR) or normal saline (NS).

NOTE 2: A trained and competent FN may administer medication according to established protocols IAW this AFI. Refer to **7.4**.

1.11.2. Immediately notify the aircraft commander (AC) regarding the gravity and nature of the situation. Request and establish immediate radio communication with the Tactical Airlift Control Center/ Air Mobility Operations Control Center/Air Operations Center/Patient Movement Requirements Center (TACC/AMOCC/AOC/PMRC) for a physician and guidance for landing at an airfield capable of handling the situation, when indicated. If unable to contact TACC/AMOCC/AOC/PMRC, contact a physician on the ground for further direction of patient care.

1.11.3. Per TACC/AMOCC/AOC/PMRC guidance, land at the nearest airfield capable of handling the situation. In grave circumstances, the MCD may request the AC declare an in-flight medical emergency to expedite landing.

1.11.4. Notify the supporting TACC/AMOCC/AOC/PMRC regarding changes in patient status, mission irregularities, coordination of mission needs, and equipment/transportation requirements as soon as possible (ASAP).

NOTE: The patient's name and SSN will not be used in radio or cell phone communications; use the patient's cite number only.

1.11.4.1. Be ready to communicate age, sex, diagnosis, subjective and objective data, including vital signs and pulse oximetry, known allergies, and for women of childbearing years: Date of last menstrual cycle, if indicated. Also report treatment/intervention, date and time (if indicated), and the outcome. Be prepared to request orders, mission deviation/divert, etc. to expedite meeting patient and mission requirements.

1.11.5. Anytime a patient is removed from a flight for clinical evaluation or there is a significant change in status, notify TACC/AMOCC/AOC/PMRC, ASAP.

1.11.5.1. A member of the medical crew should accompany the patient to the MTF to maintain the same level of care and to provide report to the MTF physician. **NOTE:** In some instances, a civilian ambulance will respond to transport the patient to the MTF and the local memorandum of agreement may not permit military medical personnel to ride in the ambulance.

1.11.5.1.1. If a member of the medical crew cannot accompany the patient to the MTF, a report will be provided to the receiving MTF physician via radio or telephone. The original DD Form 602/AF Form 3899 and other medical records will accompany the patient to the MTF.

1.11.5.2. Whenever possible, the MCD will ensure a copy of the DD Form 602/AF Form 3899 is Faxed to the PMRC. If the DD Form 602/AF Form 3899 cannot be copied, provide detailed information on AF 3829, and complete DD Form 2852.

1.12. Patient Validation/Acceptance for Flight.

1.12.1. The patient movement clinical coordinator (PMCC) in the PMRC obtains all necessary clinical data and medical equipment requirements from the attending physician prior to manifesting the patient for movement.

1.12.2. If the patient requires total care or continuous observation, a MA from the originating medical facility or staging unit may be required to accompany the patient. The PMRC will coordinate this requirement with the originating physician. Depending on the severity of illness/injury and the situation, the CCATT may be the MAs on the mission. The PMRC will request CCATT support from the TACC/AMOC/AOC.

1.12.3. The PMCC will provide the MCD and the receiving MTF with all pertinent clinical data and equipment requirements. The MCD will brief the other AECMs and flight crew as necessary. **NOTE:** In the event the MCD has determined a patient is not stable/stabilized, is at significant risk for flight, or requires care beyond the scope of the AE crew, the MCD will coordinate with the TACC/AMOC/AOC/PMRC before refusing the patient. Depending on the contingency/tactical environment, refusing a patient for flight may not be applicable.

1.13. Enplaning/Deplaning Procedures. Refer to AFI 11-2AE, Vol 3 (forthcoming).

1.14. Patient Movement Classification: Designates patient status (either litter or ambulatory), based on diagnosis and ability to self-help in an emergency, and are assigned by originating physician in coordination with the PMRC. The MCD may assign a higher classification, e.g. 2B to 2A if the patient's condition warrants the upgrade. The MCD may not downgrade a patient's classification, e.g., 1A to 1C.

WARNING: Medical personnel should be mindful of unreported patient status changes or clinical encounters that occur after the initial reporting of patient movement requests, especially during AE missions and RON MTF locations. All medical personnel will continuously and independently reassess and document patient status, and ensure appropriate patient classification and treatments that lead to safe patient transport outcomes. This consists of recurring and focused patient/family interviews, patient education, and preflight, in-flight, and post-flight physical assessments. Very often in the in-flight environment, the primary assessment skills are inspection and palpation. Therefore, collaboration, communication, and documentation by clinical providers is critical in the AE environment.

NOTE: Immediately notify TACC/AMOC/AOC/PMRC if change in patient status/classification impacts continuity of care, transportation and other requirements. Complete DD Form 2852.

1.14.1. Psychiatric Classifications. Refer to **Attachment 6**, Mental Health/Behavior Management for more in-depth information.

1.14.1.1. 1A – Severely ill psychiatric patient, who requires close supervision, should arrive at the aircraft in hospital clothing, sedated, and restrained on a dressed litter.

1.14.1.2. 1B – A moderate to severely ill psychiatric patient who is sedated, should wear hospital clothing, and is transported on a litter. Restraints are not applied but one set is secured to the litter or maintained by the patient's medical attendant.

1.14.1.3. 1C – A cooperative, reliable, and moderately severe psychiatric inpatient traveling in ambulatory status, dressed in uniform or civilian clothes.

1.14.2. Litter Categories.

1.14.2.1. 2A – A litter patient who may not or cannot ambulate, and may be unable to perform self-care. Requires assistance in the event of an emergency. Travels in hospital clothing and may sit in a seat.

1.14.2.2. 2B – A litter patient, usually dressed in hospital clothing, able to ambulate and sit in a seat, and should be able to ambulate unassisted in the event of an emergency.

1.14.3. Ambulatory Categories.

1.14.3.1. 3A – Inpatient non-psychiatric, non-substance abuse patient requiring medical treatment, assistance or observation en route (usually minimal), or returning from an inpatient visit at a medical facility.

1.14.3.2. 3B – Recovering inpatient, returning to home station, and requires no medical attention en route.

1.14.3.3. 3C – Ambulatory drug or alcohol substance abuse inpatient going for treatment dressed in military or civilian clothing.

1.14.4. Infant Categories.

1.14.4.1. 4A - Infant, under 3 years of age, occupying a seat and going for treatment.

1.14.4.2. 4B - Infant, under 3 years of age, occupying a seat and returning from treatment.

1.14.4.3. 4C - Infant requiring an Airborne Life Support System (ALSS).

1.14.4.4. 4D - Infant under 3 years of age on a litter.

1.14.4.5. 4E - Outpatient under 3 years of age occupying a seat.

1.14.5. Outpatient Categories.

1.14.5.1. 5A Outpatient ambulatory going for treatment. Does not require a litter or medical assistance during flight.

1.14.5.2. 5B – Outpatient ambulatory drug or substance abuse patient going for treatment.

1.14.5.3. 5C – Psychiatric outpatient going for treatment.

1.14.5.4. 5D – Outpatient on litter for comfort or safety going for treatment.

1.14.5.5. 5E – Returning outpatient on a litter for comfort or safety.

1.14.5.6. 5F – Returning outpatient.

1.14.6. Attendant Categories.

1.14.6.1. 6A – Medical Attendant (MA). A physician, nurse, or technician who is assigned to provide specialized medical/nursing treatment en route through to the patient's destination facility.

1.14.6.2. 6B – Non medical attendant (NMA).

1.15. In-Flight Refueling Considerations . NOTE: Validating FS will approve if a mission requirement.

1.15.1. Patients prone to motion sickness (pregnancy, G.I. disturbances), anxiety, and pain from surgical or orthopedic injuries may require medication 20-30 minutes prior to refueling.

1.15.2. Patients with head and spinal injuries and those requiring advanced life-support should be reassessed just prior to starting refueling.

1.16. Death In-flight.

1.16.1. Refer to AFI 11-2AE, Vol 3, Chapter 8, paragraph 8.16.

1.16.2. DELETE

1.16.3. DELETE

1.16.4. DELETE

1.16.5. DELETE

1.17. Patient Movement (PM) Documentation.

1.17.1. AF IMT 3899, *Patient Movement (PM) Record*, is a legal medical document and part of the patient's permanent medical treatment record. Find electronic versions on <http://www.e-publishing.af.mil/forms/formlist.asp?puborg=AF&series=3800-3899>.

NOTES:

1. Mandatory for all patients in the PM System. Document all times in ZULU, type or print legibly using blue or black ink.
2. DD Form 602, *Patient Evacuation Tag*, and DD Form 1380, *US Field Medical Card*, may be the only forms available due operational constraints. Ensure appropriate documentation, including accountability of narcotics described herein.
 - 1.17.2. AE crews will complete an AF Form 3899C on all Urgent and Priority, non-CCATT patients. The exception to this requirement is for missions less than 45 minutes in duration and having greater than three patients on board, in which case the AF Form 3899C should be completed if mission duties allow.
 - 1.17.3. AF Form 3899L must accompany each CCATT patient to ensure appropriate care is documented during transport.

Figure 1.1. ZULU Time Chart.

	-12.	-11.	-10.	-9.	-8.	-7.	-6.	-5.	-4.	-3.	-2.	-1.	GMT.	+1.	+2.	+3.	+4.	+5.	+5.30	+7.	+8.	+9.	+9.30.	+10.	+12.
	New Zealand	Mid. West.	Hawaii.	Elmerdorf.	PST. (US).	MST. (US).	CST. (US).	EST. (US).	Puerto Rico.	Azores.	Ireland, England.	Germany, Italy, Spain.	Turkey, Greece, Egypt.	Bah. rain.	Tehran.	Korea, China.	New Delhi.	Thailand.	Taiwan, Philip. Ind.	Japan, Korea.	Alice Springs, AUS.	Qatar, Rich. mond. (AUS).	New Zealand.		
	0600.	0700.	0800.	0900.	1000.	1100.	1200.	1300.	1400.	1700.	1800.	1900.	2000.	2100.	2200.	2300.	2400.	0100.	0200.	0300.	0400.	0500.	0600.		
	0700.	0800.	0900.	1000.	1100.	1200.	1300.	1400.	1500.	1800.	1900.	2000.	2100.	2200.	2300.	2400.	0100.	0200.	0300.	0400.	0500.	0600.	0700.		
	0800.	0900.	1000.	1100.	1200.	1300.	1400.	1500.	1600.	1900.	2000.	2100.	2200.	2300.	2400.	0100.	0200.	0300.	0400.	0500.	0600.	0700.	0800.		
	0900.	1000.	1100.	1200.	1300.	1400.	1500.	1600.	1700.	2000.	2100.	2200.	2300.	2400.	0100.	0200.	0300.	0400.	0500.	0600.	0700.	0800.	0900.		
	1000.	1100.	1200.	1300.	1400.	1500.	1600.	1700.	1800.	2100.	2200.	2300.	2400.	0100.	0200.	0300.	0400.	0500.	0600.	0700.	0800.	0900.	1000.		
	1100.	1200.	1300.	1400.	1500.	1600.	1700.	1800.	1900.	2200.	2300.	2400.	0100.	0200.	0300.	0400.	0500.	0600.	0700.	0800.	0900.	1000.	1100.		
	1200.	1300.	1400.	1500.	1600.	1700.	1800.	1900.	2000.	2300.	2400.	0100.	0200.	0300.	0400.	0500.	0600.	0700.	0800.	0900.	1000.	1100.	1200.		
	1300.	1400.	1500.	1600.	1700.	1800.	1900.	2000.	2100.	2400.	0100.	0200.	0300.	0400.	0500.	0600.	0700.	0800.	0900.	1000.	1100.	1200.	1300.		
	1400.	1500.	1600.	1700.	1800.	1900.	2000.	2100.	2200.	0100.	0200.	0300.	0400.	0500.	0600.	0700.	0800.	0900.	1000.	1100.	1200.	1300.	1400.		
	1500.	1600.	1700.	1800.	1900.	2000.	2100.	2200.	2300.	0200.	0300.	0400.	0500.	0600.	0700.	0800.	0900.	1000.	1100.	1200.	1300.	1400.	1500.		
	1600.	1700.	1800.	1900.	2000.	2100.	2200.	2300.	2400.	0300.	0400.	0500.	0600.	0700.	0800.	0900.	1000.	1100.	1200.	1300.	1400.	1500.	1600.		
	1700.	1800.	1900.	2000.	2100.	2200.	2300.	2400.	0100.	0400.	0500.	0600.	0700.	0800.	0900.	1000.	1100.	1200.	1300.	1400.	1500.	1600.	1700.		
	1800.	1900.	2000.	2100.	2200.	2300.	2400.	0100.	0200.	0500.	0600.	0700.	0800.	0900.	1000.	1100.	1200.	1300.	1400.	1500.	1600.	1700.	1800.		
	1900.	2000.	2100.	2200.	2300.	2400.	0100.	0200.	0300.	0600.	0700.	0800.	0900.	1000.	1100.	1200.	1300.	1400.	1500.	1600.	1700.	1800.	1900.		
	2000.	2100.	2200.	2300.	2400.	0100.	0200.	0300.	0400.	0700.	0800.	0900.	1000.	1100.	1200.	1300.	1400.	1500.	1600.	1700.	1800.	1900.	2000.		
	2100.	2200.	2300.	2400.	0100.	0200.	0300.	0400.	0500.	0800.	0900.	1000.	1100.	1200.	1300.	1400.	1500.	1600.	1700.	1800.	1900.	2000.	2100.		
	2200.	2300.	2400.	0100.	0200.	0300.	0400.	0500.	0600.	0900.	1000.	1100.	1200.	1300.	1400.	1500.	1600.	1700.	1800.	1900.	2000.	2100.	2200.		
	2300.	2400.	0100.	0200.	0300.	0400.	0500.	0600.	0700.	1000.	1100.	1200.	1300.	1400.	1500.	1600.	1700.	1800.	1900.	2000.	2100.	2200.	2300.		
	2400.	0100.	0200.	0300.	0400.	0500.	0600.	0700.	0800.	1100.	1200.	1300.	1400.	1500.	1600.	1700.	1800.	1900.	2000.	2100.	2200.	2300.	2400.		
	0100.	0200.	0300.	0400.	0500.	0600.	0700.	0800.	0900.	1200.	1300.	1400.	1500.	1600.	1700.	1800.	1900.	2000.	2100.	2200.	2300.	2400.	0100.		
	0200.	0300.	0400.	0500.	0600.	0700.	0800.	0900.	1000.	1300.	1400.	1500.	1600.	1700.	1800.	1900.	2000.	2100.	2200.	2300.	2400.	0200.			
	0300.	0400.	0500.	0600.	0700.	0800.	0900.	1000.	1100.	1400.	1500.	1600.	1700.	1800.	1900.	2000.	2100.	2200.	2300.	2400.	0300.				
	0400.	0500.	0600.	0700.	0800.	0900.	1000.	1100.	1200.	1500.	1600.	1700.	1800.	1900.	2000.	2100.	2200.	2300.	2400.	0400.					
	0500.	0600.	0700.	0800.	0900.	1000.	1100.	1200.	1300.	1600.	1700.	1800.	1900.	2000.	2100.	2200.	2300.	2400.	0500.						

The “clock” at Greenwich, England aka Greenwich Mean Time (GMT) is used as an international reference of time in military activities and patient care that cross time zones. The letter designator for this clock is **Z**. **Note:** For those areas that practice Daylight Savings Time; and on hour (+1).

Chapter 2

FLIGHT PHYSIOLOGY AND THE PHYSIOLOGICAL STRESSES OF FLIGHT

2.1. General Principles of Flight Physiology/Gas Laws. The independent variables of temperature, pressure, volume, and relative mass of a gas govern the body's physiologic response to barometric pressure changes as the aircraft changes altitude.

2.1.1. Boyle's Law: The principles of gas expansion. At constant temperature, the volume of gas is inversely proportional to the pressure. An increase in altitude causes a decrease in barometric pressure. One example is the volume of gas in a balloon will expand at altitude.

2.1.2. Dalton's Law: The law of partial pressure. The total pressure of a gas mixture is the sum of the individual (or partial) pressures of all gases in the mixture. Barometric/atmospheric pressure is the pressure exerted against an object by the atmosphere. As altitude increases, barometric pressure decreases. Oxygen concentration remains 21% regardless of altitude. Barometric pressure multiplied by the concentration of gas is equal to the partial pressure of the gas. As altitude increases, the partial pressure of a gas decreases. The actual available oxygen decreases with altitude because oxygen molecules move farther apart, possibly resulting in hypoxia.

2.1.3. Charles' Law: When the pressure is constant, the volume of gas is nearly proportional to its absolute temperature. If the mass of gas is kept under constant pressure and the temperature of the gas increases or decreases the volume will increase or decrease accordingly. When flying at sea level to 35,000 ft, temperature decreases 1 degree every 100 meters (330 ft). As an example, the pressure reading in an oxygen tank decreases as the temperature decreases.

2.1.4. Henry's Law: The principle of evolved gas disorders. The solubility of gases in liquids: The quantity of gas dissolved in 1 cm³ (1 ml) of a liquid is proportional to the partial pressure of gas in contact with the liquid. The weight of gas dissolved in a liquid is directly proportional to the weight of the gas above the liquid. An example is shaking a can of soda and opening it immediately. The balance of pressure is altered, releasing the bubbles of gas in the soda. The release of nitrogen bubbles into the blood after a rapid decompression causing the bends is another example.

2.1.5. Graham's Law: The law of gaseous diffusion. Gases flow from higher pressure (or concentration) to a region of lower pressure (or concentration). Simple diffusion or gas exchange at the cellular level is an example.

2.2. Physiological Stresses of Flight. Patients in the AE environment are more susceptible to physiologic stresses encountered at altitude. These stresses of flight include decreased partial pressure of oxygen, barometric pressure and thermal changes, decreased humidity, noise, vibration, fatigue, and gravitational forces (G-Forces).

2.2.1. Decreased Partial Pressure of Oxygen (paO₂). Dalton's gas law states the total pressure of a mixture of gases is equal to the sum of the partial pressures of each gas in that mixture. This gas law in addition to Boyle's, Charles's and Henry's gas laws affects the volume, temperature, and pressure of all gases, at a given altitude. Therefore, with higher

altitude, the pressure on all gases, including oxygen, is decreased. This leads to the condition called hypoxia.

2.2.2. Barometric Pressure Changes. Boyle's Law states at a constant temperature, the volume of gas is inversely proportional to the pressure. On ascent gas expands and on descent gas contracts. Therefore, trapped or partially trapped gases within certain bodily cavities; i.e., the gastrointestinal (GI) tract, lungs, skull, middle ear, sinuses, and teeth expand in direct proportion to the decrease in pressure. This increased volume becomes significant as 1 liter of gas at sea level becomes 1½ liters at 9,000 feet. For example, the discomfort associated with certain types of diseases or injuries, gas expansion at higher altitudes may constitute a real threat by disturbing cardiopulmonary dynamics. Untreated gas expansion in the abdominal cavity can raise the diaphragm. With diaphragmatic crowding, lung volume, and expansion are decreased. If this distention is great enough, the vessels in the area will become compressed, altering the blood supply to vital organs.

2.2.2.1. Equilibrium of pressure is dependent upon the size of the opening into the cavity, the extent of the pressure changes, the density of pressure of the inside gas, and the elasticity of the cavity or chamber walls. Management in-flight is directed toward atmospheric changes in the aircraft cabin during ascent and descent. The equilibrium between the gas inside and outside the cavities, i.e., the ears and sinuses, must adjust as the cabin environment moves through the changes in barometric pressure.

2.2.3. Thermal Changes. An increase in altitude results in a decrease in ambient temperature. Aircraft cabin temperature fluctuates considerably depending on the temperature outside the aircraft. This is caused by the inability of temperature controls to respond rapidly, and the necessity to open aircraft doors at en route stops. Inside aircraft temperature variations from 15C (59F) or lower, to 25C (77F) should be expected in winter flying, and in summer 20C (68F) to greater than 35C (95F) is not uncommon. This wide variation requires the AE crewmember be aware of cabin temperature changes in relation to patient care and comfort.

2.2.3.1. Hyperthermia and hypothermia can be seen with many disease conditions, i.e., burns, and certain neurological disorders in the neonate. Both conditions increase the body's oxygen requirements. In hyperthermia, metabolic rate increases, whereas in hypothermia, shivering increases the energy needs and therefore, increases the body's oxygen consumption.

2.2.3.2. Thermal and vibration change, depending on if the change is to hot or cold, can have either an antagonistic or synergistic effect. The body's primary response to heat exposure is vasodilatation and activation of the cooling mechanisms. Cold exposure and vibration stimulate vasoconstriction and decreased sweating. Exposure to whole body vibration appears to interfere with the normal human response in a hot environment by reducing blood flow and decreasing the sweat rate. Turbulence can be produced by high and low temperature changes in the outside air. Turbulence increases stress during flight by promoting fatigue and increasing susceptibility to motion sickness and disorientation.

2.2.3.3. Maintenance of adequate body temperature can be accomplished by anticipating these thermal changes. Blankets, warm clothing, and liquids can be supplied to patients as needed. In the event of extreme temperatures, or malfunctioning of the aircraft heating or air-conditioning systems on the ground, request a H-1 heater (Ground heater) or MA-30

air conditioning unit (ground air-conditioner unit) or another approved system from Maintenance/Operations.

2.2.4. Decreased Humidity. When air is cooled, it loses its ability to hold moisture. Air at altitude is cold, possessing very little moisture. The higher the altitude, the colder and drier the air. The fresh air supply is drawn into the aircraft cabin from a very dry atmosphere. When an aircraft takes off, there is a small amount of moisture present in the cabin air, furnishings, clothing and other items in the cabin. Additionally, a small amount of moisture is generated from the respiration of the people on board. As the aircraft increases altitude, the air exhausted overboard eventually carries trapped moisture away. Eventually, virtually all the original moisture is lost. After 2 hours of flying time on a typical flight, there is less than 5% relative humidity. After 4 hours, relative humidity is less than 1%.

2.2.4.1. Patients with respiratory problems will begin to feel uncomfortable if the humidity drops much below 5 to 10%. For a healthy person, low humidity results in nothing more than chapped lips, scratchy or slightly sore throat, hoarseness, and general moisture loss. But for a patient, this decreased humidity often aggravates their condition.

2.2.4.2. Patients receiving oxygen therapy in-flight are doubly jeopardized because oxygen is a drying agent. Use humidification devices for all patients receiving oxygen whenever possible. Special units are available for warming humidification and to keep the secretions loose in the lower respiratory tract. Tracheostomy patients in particular may require warmed humidification during AE.

2.2.4.2.1. Some steps to minimize the problems caused by decreased humidity include, mouth care, lip balm, and adequate fluid intake.

2.2.5. Noise. Noise may be defined subjectively as a sound that is unpleasant, distracting, unwarranted, or in some other way undesirable. The human hearing mechanism has a wide range and is fairly tolerant, but in many aircraft this tolerance is exceeded.

2.2.5.1. Unprotected exposure to noise can produce undesirable effects, i.e., interference with effective communications, temporary (auditory fatigue), permanent threshold shifts (sensorineural hearing loss), and varying levels of fatigue.

2.2.5.1.1. Auditory fatigue incurred by noise is frequently accompanied by a feeling of "fullness," high-pitched ringing, buzzing, or a roaring sound (tinnitus) in the ears. Tinnitus of this type will usually subside within a few minutes after cessation of the noise exposure, but for some individuals it may continue for several hours. Most of the truly significant forms of undesirable response to acoustic noise, such as nausea, disorientation, and excessive general fatigue, are associated only with very intense noise, such as a blast or explosion. Other signs of exposure are loss of appetite and interest, diaphoresis, salivation, nausea or vomiting, headache, fatigue, and discomfort.

2.2.5.2. When reducing noise levels is not feasible, patients should be offered and encouraged to wear earplugs, and instructed in their proper use.

2.2.6. Vibration. When the human body is in direct contact with a source of vibration, mechanical energy is transferred, which is degraded into heat within those tissues that have dampening properties. The response to whole body vibration is an increase in muscle activity

both to maintain posture and to reduce the resonant amplification of body structures. This is reflected in an increase in metabolic rate, and a redistribution of blood flow with peripheral vasoconstriction. The increase in metabolic rate during vibration is comparable to that seen in gentle exercise, and respirations are increased to achieve the necessary elimination of increased carbon dioxide. Additionally, disturbances in visual acuity, speech, and fine-muscle coordination result from vibration exposure.

2.2.6.1. The effects of vibration on the body can be reduced by attention to the source of vibration, either by modification of the transmission pathways, or alteration of the dynamic properties of the body. Aircraft manufacturers have eliminated severe vibrations by using improved designs and materials; however, some vibrations still occur as a result of engine operation, flap, and landing gear extension and retraction, and general aircraft movement.

2.2.6.2. To minimize these reactions, AECMs should properly secure patients away from the bulkhead and floor, encourage and assist with position changes, and provide adequate padding and skin care.

2.2.7. **Fatigue.** All of the stresses of flight induce fatigue to some degree. It can be said that fatigue is an inherent stress in the airborne world. Erratic schedules, hypoxic environment, noise, vibration, and imperfect environmental systems will eventually take their toll. Fatigue is the end product of all the physiological and psychological stresses associated with exposure to altitude. Factors may be self-imposed stresses.

2.2.7.1. **D - Drugs.** Use of over-the-counter (OTC) drugs, misuse of prescription drugs, and use of stimulants such as caffeine can cause insomnia, tremors, indigestion, and nervousness.

2.2.7.2. **E - Exhaustion.** Exhaustion can lead to judgment errors, limited response, falling asleep, channeled attention, and changes in circadian rhythm.

2.2.7.3. **A - Alcohol.** Using alcohol may cause histotoxic hypoxia, affect efficiency of cells to utilize oxygen, interfere with metabolic activity, and can result in a hangover.

2.2.7.4. **T - Tobacco.** Besides exposing the body to tar, nicotine and carcinogens, smoking two packs of cigarettes per day results in 8-10% of the body's hemoglobin being saturated with carbon monoxide.

2.2.7.5. **H - Hypoglycemia.** Poor dietary intake can cause nausea, headache, dizziness and judgment errors.

2.2.8. **Gravitational Forces (G-Forces).** Acceleration and deceleration along the longitudinal axis (fore/aft) is the most important G-force to be considered in aeromedical transport. Newton's First Law of Motion states that unless acted upon by a force, a body at rest will remain at rest, and a body in motion will move at constant speed in a straight line.

2.2.8.1. The implications here are primarily applicable to the neurological patient, especially those sustaining head trauma. When the aircraft accelerates or decelerates, it is possible that already swollen or bruised brain or spinal cord tissue could experience further damage. These patients are secured on a padded litter with a backrest (if not contraindicated) with the head facing aft for flight.

2.2.8.2. Acceleration/deceleration in side facing and rear seats requires extra padding between the abdomen and seat belt for small children, pregnant women, and patients with abdominal surgery.

2.3. Hypoxia: A condition where there is a decrease in tissue oxygen or oxygen supply inadequate for meeting tissue needs. Hypoxia is a general term describing an oxygen deficiency in the tissues sufficient enough to cause impairment of function. Oxygen deficiency can result from various causes. A low partial pressure of oxygen (paO₂) may not mean tissue hypoxia and may be clinically acceptable.

2.3.1. Satisfactory oxygenation is contingent on certain factors. These include patent respiratory passages, neuromuscular function, elastic lungs, and a movable thoracic cage as well as an adequate rate and depth of respiration, which in turn is dependent on an intact respiratory center in the brain stem. Additional factors are: An adequate supply of blood at the alveolar level, diffusion of oxygen from alveoli to the blood, adequate hemoglobin in the blood, and adequate circulation of blood to tissue cells.

2.3.2. Stages of Hypoxia in Normal Individuals.

2.3.2.1. **Indifferent Stage:** Starts at sea level and extends to 10,000 ft. The body reacts with a slight increase in heart rate and ventilation. Night vision begins to diminish at 5,000 ft.

2.3.2.2. **Compensatory Stage:** Extends from 10,000 ft to 15,000 ft. The body attempts to protect itself against hypoxia by increasing blood pressure, heart rate, and the rate and depth of respiration. Efficiency and performance of tasks requiring mental alertness becomes impaired.

2.3.2.3. **Disturbance Stage:** Extends from 15,000 ft to 20,000 ft. Characterized by dizziness, sleepiness, tunnel vision, and cyanosis. Thinking becomes slowed and there is a loss of muscle coordination.

2.3.2.4. **Critical Stage:** Extends from 20,000 ft to 30,000 ft. Marked mental confusion, incapacitation followed by unconsciousness.

2.3.3. Major Causes of Hypoxia in the AE Environment:

2.3.3.1. **High Altitude:** Due to decreased paO₂ at altitude. **NOTE:** Altitude is the most important cause of in-flight hypoxia.

2.3.3.2. **Hypoventilation:** Decreased alveolar ventilation, or any condition resulting in decreased partial pressure of oxygen in the alveoli. Hypoventilation is often caused by diseases outside the respiratory system and can exist when lung tissue is normal.

2.3.3.3. **Lung Pathology:** Conditions of the lungs producing arterial hypoxia in the presence of normal alveolar paO₂ is termed "increased alveolar-arterial oxygen tension difference." Three mechanisms contribute to this condition:

2.3.3.3.1. **Diffusion Defect:** Interference with diffusion of oxygen from alveolar air into pulmonary blood results in lowered paO₂. This is seen in diffuse pulmonary infiltration, interstitial fibrosis or early edema, viral pneumonia, sarcoidosis, and anemias.

2.3.3.3.2. Abnormal Perfusion-Ventilation Ratio: An important aspect of normal lung physiology is local/regional optimization of alveolar perfusion based on the ventilation of the alveolar-capillary units. In certain lung diseases there is a breakdown of this optimization with a resulting deterioration in gas exchange. This is seen in patients with pulmonary emphysema, status asthmaticus, pulmonary edema, pulmonary embolus, or chronic bronchitis.

2.3.3.3.3. Intrapulmonary Shunts: When the ventilation perfusion ratio is abnormal due to poor ventilation of the alveoli, the blood passes through the involved parts of the lung without the oxygen-carbon dioxide exchange occurring. For example, in lobar pneumonia, the blood passes directly from the pulmonary arterial circulatory system into the pulmonary venous system without a gas exchange.

2.3.4. Types Of Hypoxia:

2.3.4.1. Hypoxic Hypoxia (Altitude Hypoxia): Caused by exposure to the airborne environment. Results in deficiency in alveolar oxygen exchange. A lower barometric pressure at altitude results in a decrease in alveolar paO_2 and interferes with ventilation and perfusion. Any condition requiring oxygen at sea level must be closely monitored at altitude.

<u>Altitude</u>	<u>Blood oxygen saturation</u>
Sea Level	98%
10,000 ft	87%
22,000 ft	60%

2.3.4.2. Hypemic Hypoxia: A reduction in the oxygen-carrying capacity of the blood caused by anemia, hemorrhage, hemoglobin abnormalities (sickle cell disease), drugs (sulfur nitrites), or chemicals (cyanide, carbon monoxide). Carbon monoxide has a 200 x greater affinity to bond to hemoglobin than oxygen.

WARNING: Pulse oximetry reading may not be accurate in carbon monoxide poisoning.

2.3.4.3. Stagnant Hypoxia: A reduction in total cardiac output due to the pooling of blood and the reduced blood flow to the tissues. Interferes with the transportation phase of oxygen by reducing systemic blood flow. Causes include: Respiratory failure, shock, continuous positive pressure ventilation, acceleration (G-Forces), pulmonary embolus, extremes in environmental temperature, postural changes, tourniquets, hyperventilation, embolus (clot or gas), cardiovascular embolus, high positive end expiratory pressure (PEEP), arterial spasm, and heart failure.

2.3.5. Characteristics of Hypoxia:

2.3.5.1. The onset of hypoxia may be gradual or insidious. Intellectual impairment occurs as slow thinking, faulty memory of events and immediate recall, delayed reaction time, and a tendency to fixate. As aircrew members, we are afforded the opportunity to experience and identify our own symptoms of hypoxia, during initial and refresher Altitude Physiology Training. Generally, patients are not familiar with their personal

symptoms of hypoxia, so we must be alert to all possible signs and symptoms they may exhibit. Because aeromedical patients are already in a compromised state, they will usually experience the effects of hypoxia earlier than normal. Hypoxia can be classified either by objective signs (those perceived by an observer) or by subjective symptoms (those perceived by the subject). **NOTE:** Cyanosis has been determined to be an unreliable sign of hypoxia because the oxygen saturation must be below 75% in persons with normal hemoglobin before it is detectable.

Table 2.1. Signs and Symptoms of Hypoxia.

<u>Objective Sign (Observed)</u>	<u>Subjective Symptoms (Felt)</u>
Confusion Tachycardia Stupor Seizures Dyspnea Hypertension Bradycardia Arrhythmias Restlessness Slouching Unconsciousness Hypotension (late) Cyanosis (late) Belligerence	Confusion Headache Tachypnea Insomnia Changing judgment or personality Dizziness Blurred Vision Tunnel Vision Hot and cold flashes Tingling Numbness Nausea Euphoria Anger

2.3.6. **Prevention:** Administer O₂ based on underlying pathology, preflight vital signs and pulse oximetry. Consider an altitude restriction and placement near O₂ for high-risk patients.

2.3.7. **Treatment of Hypoxia.** Refer to Airway, Breathing and Respiratory Management.

2.3.7.1. Maintain airway, breathing, and circulation (ABCs).

2.3.7.2. Administer O₂ at 4-6 liters via nasal cannula. Administer high flow O₂ for severe symptoms or respiratory/cardiac arrest. Encourage slow, deep breaths.

2.3.7.3. Obtain vital signs and use a pulse oximetry to maintain the O₂ saturation above 91%. Annotate maximum cabin altitude (MCA).

2.3.7.4. Request lower cabin altitude if unresponsive to high flow O₂ and operationally feasible. Complete DD Form 2852.

NOTE: Monitor oxygen equipment in-flight. The most frequently reported cause of hypoxia while using oxygen is lack of discipline and equipment malfunction. Conscientious equipment preflight checks and frequent in-flight monitoring will reduce this hazard. Inspection of oxygen equipment when hypoxia is suspected may reveal the cause. Correction of the malfunction should help bring immediate relief. If it does not, and other physiologic causes for all types of hypoxia have been addressed, oxygen contamination should be considered as the cause. Use an

emergency oxygen cylinder, and descent should be initiated as soon as possible and followed by the analysis of the oxygen system contents.

2.3.7.5. Altitude Restrictions and Supplemental Oxygen: The decision for an altitude restriction or supplemental oxygen administered at altitude should be based on the following:

2.3.7.5.1. Most aircraft normally used for AE must fly at altitudes much lower than their normal cruise to maintain sea level pressurization in the cabin. Flying lower at a lower altitude increases fuel consumption, decreases range, and increases the probability of turbulence. Inappropriate cabin altitude restrictions can result in the use of alternate routes, which lengthen air miles flown, and increase time and cost of flight.

2.3.7.5.2. At a 7,000 feet altitude, a healthy person's paO_2 is 60 mmHg or about 90 percent saturation. Studies indicate important parameters in assessing the risks of altitude exposure in patients with cardio-respiratory disorders. Patients with a paO_2 below 60 mmHg (90 percent saturation) will probably have difficulty with hypoxic hypoxia at or above 2,000 to 4,000 feet.

2.3.7.5.2.1. During cruise altitude, patients with decreased pulmonary perfusion and those with cardiac conditions should be closely observed. Patients having a pulmonary disease with an undetected coronary artery disease may be affected significantly by hypoxic hypoxia.

2.3.7.5.2.2. Patients with chronic obstructive pulmonary disease (COPD) should be administered low flow oxygen therapy (1 to 2 liters per minute via nasal cannula, or a 24 to 31 percent venturi mask) to avoid suppression of their hypoxic drive. **NOTE:** Closely monitor respiratory rate if receiving higher concentrations of O_2 .

2.3.7.5.3. Disease Pathologies Requiring Preflight Evaluation and Possible Altitude Restrictions: Pulmonary emphysema and chronic bronchitis. Extensive pneumonic consolidation, extensive tumors or granulomatous processes, pulmonary atelectasis and infarction, status asthmaticus, aspiration pneumonia, diffuse parenchymatous diseases, interstitial fibrosis, alveolar proteinosis, sarcoidosis, and lymphagitic spread of carcinoma. Refer to [Table 4.1](#) O_2 Delivery Systems.

2.4. Hyperventilation: An abnormal increase in the rate and depth of breathing. Hyperventilation is of concern because it produces changes in cellular respiration. Although unrelated in cause, the symptoms of hyperventilation and hypoxia are similar and often result in confusion and inappropriate corrective procedures. **NOTE:** Treat as hypoxia when in-flight.

2.4.1. Contributing Factors:

2.4.1.1. **Psychological stress:** Fear, anxiety, apprehension, and anger.

2.4.1.2. **Environmental Stress:** Decreased partial pressure of oxygen, barometric pressure changes, thermal changes, decreased humidity, noise, vibration, fatigue, and G-Forces.

2.4.1.3. **Drugs:** Salicylates and progesterone.

2.4.1.4. **Physiological:** Metabolic acidosis, increased temperature, pregnancy, and altered neuro- logical status.

2.4.2. **Treatment for Hyperventilation:**

2.4.2.1. At altitude, the treatment for hyperventilation and hypoxia of the AE patient is identical. Administer high flow O₂ and encourage slow deep breathing. Refer to [Table 4.1](#)

2.4.2.2. When a patient is hyperventilating from anxiety, the act of putting a mask on his or her face to administer oxygen may heighten the anxiety and increase tidal volume. Talk with the patient to find out why they are hyperventilating and give them exercises to reduce respiratory rate.

2.4.2.2.1. Methods to reduce the patient's respiratory rate include counting to 10 slowly as they exhale, working with the patient to control inhalations and exhalations to only 10 times a minute. Give the patient a watch with a second hand and instruct them to maintain a respira- tory rate between 10 and 16 breaths per minute.

2.5. Hypercapnia: Refers to increased amounts of carbon dioxide (CO₂) in the blood. CO₂ accumulates in the blood due to poor alveolar ventilation. As the O₂ in the blood is lowered, the CO₂ is raised. The increased CO₂ stimulates the respiratory center in the brain stem. Elevated partial pressure of arterial car- bon dioxide (paCO₂) is a powerful vasodilator, producing both peripheral and cranial vasodilatation. Any condition that causes poor alveolar ventilation can result in hypercapnia.

2.5.1. **Signs/Symptoms of Hypercapnia:** Headache, vertigo, hypertension, papilledema, hypoten- sion (late stage), coma, and cardiac failure.

2.5.2. Hypoxia and hypercapnia are physiologic states that often contribute significantly to the mar- ginal condition of the patient on the ground. The cabin altitude attained in a pressurized aircraft pro- duces only a modest reduction in hemoglobin oxygen saturation, but the reduction can cause a deficiency that is critical to vital tissues if the patient's pre-existing condition is marginal. Decreased partial pressure of oxygen (paO₂) will affect all of the body organs.

2.5.3. **Pathological States Primarily Producing Hypercapnia:**

2.5.3.1. **Central Nervous System.** Pharmacological depression (barbiturates, narcotics, alcohol, and tranquilizers), cerebrovascular accident, meningitis and encephalitis, severe intracranial hypertension, associated with trauma, and tumors may cause hypercapnia.

2.5.3.2. **Diseases of Nerves and Muscles:** Guillain-Barre' Syndrome, Muscular Dystrophy, Myasthenia Gravis, insecticide poisoning, tetanus, chronic progressive polyneuropathy, diptheric polyneuritis, and poliomyelitis.

2.5.3.3. **Diseases of the Chest Wall:** Flail chest and kyphoscoliosis.

2.5.3.4. **Metabolic Diseases:** Severe hypothyroidism, starvation, obesity, and electrolyte imbal- ance.

2.5.3.5. **Pulmonary Causes:** Chronic obstructive pulmonary disease (emphysema and chronic bronchitis), acute obstructive disease, severe asthmatic disease, acute bronchiolitis, mechanical obstruction such as blood, water, or pus, pulmonary edema,

massive parenchymal lung disease, restrictive disease of the pleura, severe pain or diaphragmatic embarrassment after surgery, mechanical obstruction of large airways, upper respiratory obstruction, and obstruction of trachea or large bronchi.

Chapter 3

PRE-FLIGHT ASSESSMENT

3.1. Assessment: Patient and mission requirements and the setting will determine how extensive this process will be. Tactical and peacetime patient information flow is variable. Obtain as much history as possible from the supporting PMRC, the patient, and other providers. The following guideline deals with the trauma patient entering the AE environment but can be modified to meet other types of patients.

3.1.1. Mechanism of Injury: Obtain as much history as possible to focus assessment.

3.1.1.1. Identify what force produced the wound (penetrating or blunt).

3.1.1.2. Identify areas of the body most subject to secondary trauma. Blunt trauma may not give a clue about injuries.

3.1.1.3. Identify injuries that can be predicted from history (i.e. ARDS, infection from open wounds, etc.).

3.1.1.4. Identify how the stresses of flight will affect the outcome for this patient.

3.2. Primary Survey: Accomplished at the scene or when the patient is initially seen by medical personnel at a first aid station, MTF, MASF, ASF, CASF or at the flight line. Life threatening conditions are identified and management begins. Ensure this is done prior to flight. Reassessment of ABCs is ongoing. **NOTE 1:** In the AE environment, the primary assessment skills are inspection and palpation. **NOTE 2:** The following are ASTNA and Trauma Nurse Core Course (TNCC) guidelines. Other nationally recognized primary and secondary trauma assessment standards that quickly identify and treat life-threatening conditions are acceptable.

3.2.1. **Airway with C-Spine Control.**

3.2.1.1. Assessment: Ascertain patency; rapidly assess for airway obstruction.

3.2.1.2. Treatment/Management.

3.2.1.2.1. Establish a patent airway. Refer to Airway and Respiratory Management.

3.2.1.2.2. If C-spine injury is suspected, maintain the C-spine in a neutral position with manual immobilization when establishing the airway.

3.2.2. **Breathing:** Ventilation and Oxygenation.

3.2.2.1. Assessment:

3.2.2.1.1. Expose the neck and chest. Maintain C-spine immobilization, if indicated.

3.2.2.1.2. Determine the rate and depth of respiration; effective/ineffective.

3.2.2.1.3. Inspect and palpate the neck and chest for tracheal deviation and vein distention, unilateral and bilateral chest movement, use of accessory muscles, nasal flaring, any signs of injuries or deformities, and crepitus.

3.2.2.1.4. Percuss the chest for presence of dullness or hyper-resonance.

3.2.2.1.5. Auscultate the chest bilaterally as environment allows.

3.2.2.2. Treatment/Management: Refer to Airway and Respiratory Management.

3.2.2.2.1. Administer high flow oxygen.

3.2.2.2.2. Ventilate with bag-valve mask or pocket mask.

3.2.3. Circulation.

3.2.3.1. Assessment.

3.2.3.1.1. Determine the source of external hemorrhage

3.2.3.1.2. Pulse: Quality, location and rate. **NOTE:** A palpable radial pulse indicates a systolic BP of at least 80 mm Hg; a palpable femoral pulse indicates a BP of at least 70 mm Hg; a palpable carotid pulse indicates a BP of at least 60 mm Hg.

3.2.3.1.3. Assess perfusion by evaluating skin color, moisture, temperature and capillary refill.

3.2.3.1.4. Obtain blood pressure and paradoxical pulse, if time permits.

3.2.3.2. Treatment/Management: Refer to Shock Management.

3.2.3.2.1. Control bleeding.

3.2.3.2.2. Insert 2 large bore IVs (14-16g), if indicated. Simultaneously obtain blood for hematological and chemical analysis, type and cross match, depending on clinical situation and local procedures. Not an in-flight requirement.

3.2.3.2.3. Initiate IV fluid therapy with (warmed, PRN) Ringer's Lactate solution (1st choice), or normal saline (2nd choice), and blood replacement as ordered.

3.2.4. **Disability:** Brief Neurologic Examination.

3.2.4.1. Determine the Level of Consciousness (LOC): The most important indicator of brain function. Avoid words such as stupor or coma, as these words have different meanings for different people. Refer to the following AVPU scale below for guidance:

A - Alert - Is the patient alert and oriented to person, place, and time?

V - Does patient respond purposefully to vocal stimuli?

P - How does patient respond to painful stimuli? Is the response purposeful?

Decorticate - extensor rigidity in the lower extremities combined with flexor posture in the upper extremities. May be more prominent on one side than the other.

Decerebrate - extensor rigidity in all extremities. Flaccid - no response.

U - Unresponsive

3.2.5. **Exposure/Environment:** If condition and situation warrants, completely undress the patient. Prevent hypothermia, if possible.

3.2.6. **Diagnostics:** History, vital signs, cardiac monitor and pulse oximeter applied as necessary.

3.3. Secondary Assessment. This assessment is a brief, systematic process to identify **ALL** injuries, obtain history and mechanism of injury as well as maintaining core body temperature, obtaining a complete set of vital signs, temperature, pulse oximetry, and the insertion of a Foley catheter and nasogastric tube, as required.

3.3.1. General Appearance: Note the patient's body position, posture and any guarding or self-protection movements. Observe for stiffness, rigidity, or flaccid muscles. Note unusual odors such as alcohol, gasoline, chemical, vomitus, urine or feces. Previous assessments, the patient's condition and environment determine the extent of this assessment.

3.3.2. Head and Maxillofacial.

3.3.2.1. Assessment:

3.3.2.1.1. Inspect and palpate entire head and face for lacerations, ecchymosis, contusions, crackling of subcutaneous air, puncture wounds/impaled objects, fractures, thermal injury, and drainage/discharge from the ears and nose.

3.3.2.1.2. Evaluate pupils and LOC.

3.3.2.1.3. Assess eyes for hemorrhage, penetrating eye injury, visual acuity, and the presence of contact lenses.

3.3.2.1.4. Check the mouth for vomitus, lacerations, and broken teeth.

3.3.2.1.5. Observe for flaring of the nares (one of the early signs of respiratory obstruction).

3.3.2.2. Treatment/Management: Focuses on preventing secondary brain anoxia injury.

3.3.2.2.1. Maintain airway, and continue ventilation and oxygenation as indicated.

3.3.2.2.2. Control hemorrhage.

3.3.3. Cervical Spine and Neck.

3.3.3.1. Assessment: Rule out C-Spine injury, if indicated.

3.3.3.1.1. Inspect for distended neck veins, deviated trachea, use of accessory muscles, and penetrating injuries. Palpate for tenderness, deformity, swelling, subcutaneous air and tracheal deviation.

3.3.3.2. Treatment/Management.

3.3.3.2.1. Maintain adequate in-line immobilization and protection of the cervical spine

3.3.4. Chest.

3.3.4.1. Assessment:

3.3.4.1.1. Inspect for symmetry of movement and use of abdominal muscles; anterior/lateral chest walls for lacerations, abrasions, contusions, puncture wounds/impaled objects and edema.

3.3.4.1.2. Palpate the chest wall to detect crepitus/deformities of clavicle, ribs, sternum, flail chest, tender areas and subcutaneous air.

3.3.4.1.3. Auscultate breath sounds for wheezing, rales, rhonchi, and heart sounds for presence of murmurs, friction rubs, and muffled sounds.

3.3.4.2. Treatment/Management: Refer to Airway and Respiratory Management.

3.3.5. Abdomen/Genitourinary (GU).

3.3.5.1. Assessment:

3.3.5.1.1. Inspect for signs of blunt/penetrating injury, internal bleeding, bruises, scars, rashes, and trauma. Such as:

3.3.5.1.1.1. Cullen's sign (indicates peritoneal bleeding) – bluish discoloration around the umbilicus.

3.3.5.1.1.2. Grey-Turner sign (indicates retroperitoneal bleeding or possible fractured pancreas) – ecchymosis in the flank area.

3.3.5.1.1.3. Kehr's sign (indicates ruptured spleen or irritation of the diaphragm from bile or other material in the peritoneum) – pain to left shoulder.

3.3.5.1.1.4. Hematoma (indicates renal injury) – in flank area.

3.3.5.1.1.5. Coopers sign (indicates pelvic fracture) – ecchymosis of the perineum and scrotum or labia.

3.3.5.1.1.6. Blood at the meatus or in the Foley catheter and rectal bleeding.

NOTE: Do not insert Foley if blood is present in the meatus.

3.3.5.1.2. Auscultate for presence or absence of bowel sounds, if environment allows (auscultate prior to palpating because palpation may change the frequency of the bowel sounds).

3.3.5.1.3. Palpate all four quadrants of the abdomen for tenderness, involuntary muscle guarding and rebound tenderness, rigidity; gently press on the pelvis noting any pain or tenderness.

3.3.5.2. Treatment/Management:

3.3.5.2.1. May require surgical intervention as soon as possible; limited in the AE environment. Insert nasogastric tube (NG) tube if indicated.

3.3.6. Musculo-Skeletal.

3.3.6.1. Assessment:

3.3.6.1.1. Inspect the upper and lower extremities for evidence of: soft tissue, blunt and penetrating injury to include contusions, lacerations, and deformity. (Always compare both extremities.)

3.3.6.1.2. Inspect for spontaneous movement and determine range of motion and motor strength/function.

3.3.6.1.2.1. Palpate the upper and lower extremities for pulses, movement, temperature, tenderness, crepitation, and sensation.

3.3.6.1.2.2. Gently palpate and compress the iliac crest inward to assess pelvic stability and deformity (evidence of fracture and associated hemorrhage).

WARNING: Do not rock the pelvis.

3.3.6.1.2.3. Palpate the thoracic and lumbar spine for evidence of blunt and penetrating injury from the cervical area down to the coccyx. Note contusions, tenderness, lacerations, deformity, and sensation.

3.3.6.1.2.4. Assess rectal sphincter tone.

3.3.6.1.2.5. Inspect and palpate posterior legs.

3.3.6.2. Treatment/Management:

3.3.6.2.1. Apply and/or readjust appropriate splinting devices for extremity fractures, as indicated.

3.3.6.2.2. Maintain immobilization of the patient's thoracic and lumbar spine (Log-roll to turn.)

3.3.6.2.3. Pain management, medication and comfort measures, as needed. **NOTE:** Frequently assess adequacy of pain control measures.

NOTE: Because of barometric pressure changes, military anti-shock trousers (MAST)/pneumatic trousers may be on but should not be inflated for flight.

3.3.7. **Neurologic:** Refer to Neurological Management.

3.3.7.1. Assessment: Re-evaluate the pupils and LOC; evaluate the upper and lower extremities for motor and sensory responses; evaluate for evidence of paralysis or paresis; and determine Glasgow Coma Scale (GCS) (**Table 3.1**). GCS can be utilized for continuity and is part of the patient's record.

3.3.7.1.1. Patient history may indicate Narcan and D50 intravenous push (IVP). Refer to **Attachment 11**, Unconscious/Known or Suspected Narcotic Overdose.

3.3.7.1.1.1. The following is a MNEMONIC for differentiating the causes and treatment coma/unresponsiveness:

U	Units of insulin
N	Narcotics
C	Convulsions
O	Oxygen
N	Nonorganic
S	Stroke
C	Cocktail
I	Intracranial pressure (ICP)
O	Organism
U	Urea
S	Shock

3.3.7.2. Assess the Pupils for Size, Equality, and Reaction to Light:

3.3.7.2.1. Size/shape - dilated/fixed.

3.3.7.2.2. Reactivity - equal and reactive to light.

3.3.7.2.3. Presence of a prosthetic eye.

3.3.7.2.4. Dilated pupils due to medication or chemical exposure.

3.3.7.3. Assess motor function and compare bilaterally.

3.3.7.3.1. Hand grip strength.

3.3.7.3.2. Arms/Legs.

3.3.7.3.2.1. Zero of four - No movement in extremities.

3.3.7.3.2.2. One of four - Moves extremity on bed, can't lift against gravity.

3.3.7.3.2.3. Two of four - Moves extremities against gravity, can't sustain.

3.3.7.3.2.4. Three of four - Offers some resistance.

3.3.7.3.2.5. Four of four - Strong and resistant.

3.3.7.4. Assess Behavior:

3.3.7.4.1. Overall appropriateness, facial expressions, eye contact, affect, and attentiveness.

3.3.7.4.2. Involuntary movements.

3.3.7.4.3. Signs of restlessness - check the basics. Rule out hypoxia, clamped Foley, and/or uncomfortable position.

3.3.7.5. Treatment/Management.

3.3.7.5.1. Continue ventilation and oxygenation.

3.3.7.5.2. Maintain adequate immobilization.

Table 3.1. Glasgow Coma Scale.

GLASGOW COMA SCALE	
Areas of Response	Points
Eye Opening	
Eyes open spontaneously	4
Eyes open in response to voice	3
Eyes open in response to pain	2
Best Verbal Response	
Oriented, e.g., to person, place, time	5
Confused, speaks but is disoriented	4
Best Verbal Response	
Incomprehensible sounds but no words are spoken	2
None	1

Best Motor Response	
Obeys command to move Localizes painful stimulus	6
Withdraws from painful stimulus	5
Flexion, abnormal decorticate posturing	4
Extension, abnormal decerebrate posturing	2
No movement or posturing	1
Total Possible Points	3 - 15

3.4. Ongoing Exam/Re-evaluation.

3.4.1. Repeat the Initial Assessment: Re-evaluate the patient noting, reporting, and documenting any changes in the patient's condition and responses to resuscitative efforts. Time, personnel and environment will determine this re-evaluation process.

Chapter 4

AIRWAY AND RESPIRATORY MANAGEMENT

4.1. Stresses of Flight.

4.1.1. Decreased Partial Pressure of Oxygen: Exacerbates possible oxygenation deficiencies due to the compromised respiratory system and diminished ciliary action.

4.1.2. Barometric Pressure Changes: May cause spontaneous pneumo-thorax in a trauma patient with significant respiratory compromise. GI tract gas expansion may cause diaphragmatic crowding leading to lower tidal volumes.

4.1.3. Thermal: Heat increases body temperature and cold produces muscle shivering increasing the metabolic rate and O₂ demand on the body. This is particularly true in ventilator dependent patients.

4.1.4. Decreased Humidity: The effectiveness of ciliary action is decreased and secretions are thicker.

4.1.5. Fatigue: Most patients with respiratory disorders are already fatigued from the added workload of just breathing. The overall effect of the previously mentioned stresses of flight and the total length of time in the AE system may exacerbate the patient's condition.

4.2. Assessment.

4.2.1. Ascertain the mechanism of injury or disease. Look, listen and feel for the following indicators requiring possible intervention:

4.2.1.1. Use of accessory muscles, intercostal and substernal retractions, crowing, stridor, nasal flaring, and position of patient.

4.2.1.2. Tongue obstructing the airway in an unconscious victim.

4.2.1.3. Loose teeth and/or other foreign objects.

4.2.1.4. Facial and/or oral bleeding.

4.2.1.5. Facial fractures resulting in loss of maxillary and mandibular structural integrity.

4.2.1.6. Inhalation injury or nasal/mucosal charring.

4.2.1.7. Tracheal edema.

4.2.1.8. Hematomas, bruising, wounds, and crepitus of neck and upper chest.

4.2.1.9. Severe respiratory distress or status epilepticus may require sedation or paralyzing agents.

4.2.1.10. Note position of trachea.

4.2.1.11. GCS < 8 may indicate hypoxia.

4.3. Treatment/Management of the Airway.

4.3.1. Airway Obstructed or Partially Obstructed:

4.3.1.1. Position patient to allow for maximum ventilation. Consider a backrest if not contraindicated.

4.3.1.1.1. Unconscious patient - place in the supine position with additional cervical spine immobilization, if indicated.

4.3.1.2. Clear the Airway: Techniques to open or clear an obstructed airway include:

4.3.1.2.1. Jaw Thrust (preferred technique for C-spine injuries).

4.3.1.2.2. Head Tilt/Chin Lift.

4.3.1.2.3. Manual removal of loose or foreign debris.

4.3.1.2.4. Suctioning (do not invoke a gag reflex).

4.3.1.2.4.1. Hyperventilate the patient for approximately 60 seconds with 100% oxygen before and after suctioning.

4.3.1.2.4.2. Do not suction longer than 10 seconds.

4.3.1.2.4.3. Suctioning or other manipulations of the oropharynx are performed gently to prevent stimulation of the gag reflex and subsequent vomiting.

4.3.1.3. **Use of Airway Adjuncts:** Refer to ACLS/ATLS/PALS for appropriate size selection.

4.3.1.3.1. Oropharyngeal or Nasopharyngeal Airways.

4.3.1.3.1.1. Oropharyngeal Airway.

4.3.1.3.1.2. Indications: Used for the unconscious patient.

4.3.1.3.1.3. Complications: Inappropriate size causes tongue to obstruct airway.

4.3.1.3.2. Nasopharyngeal Airway.

4.3.1.3.2.1. Indications: Used if gag reflex is intact or teeth are clenched, and when the insertion of an oral airway is technically difficult or impossible (because of trismus, massive-trauma around the mouth, mandibulo-maxillary wiring, etc.).

4.3.1.3.2.2. Contraindications: Facial or basal skull fractures.

4.3.1.3.2.3. Complications: If tube is too long or large, it may enter the esophagus producing gastric distention, and may cause severe epistaxis or adenoid bleeding, especially in children.

4.3.1.4. **Advanced Airway Treatment/Management. WARNING :** These procedures will be performed by specially trained healthcare professionals working within their ASFC scope of practice.

4.3.1.4.1. **Intubation.**

4.3.1.4.1.1. **Orotracheal Intubation.**

4.3.1.4.1.1.1. Indications: Cardiac arrest, inability of the patient or the rescuer to adequately ventilate with high flow O₂ or protect the airway with conventional methods.

4.3.1.4.1.1.2. Complications: Esophageal intubation, right mainstem bronchus intubation, induction of vomiting, dislocation of the mandible, fracture of the epiglottis, airway hemorrhage secondary to trauma, avulsion tear of the vocal cords, chipping or loosening of teeth, dislocation of cervical spine, atlanto-occipital dislocation, and conversion of cervical spine injury without neurological deficit to cervical spine injury with neurological deficit.

4.3.1.4.2. Nasotracheal Intubation.

4.3.1.4.2.1. Indications: Performed on patients with suspected cervical spine injuries, and as above.

4.3.1.4.2.2. Contraindications: Patients with facial fractures and/or fractures at the base of the skull.

4.3.1.4.2.3. Complications: As above (4.3.1.4.1.1.2).

4.3.1.4.3. Cricothyrotomy.

4.3.1.4.3.1. Indications: Temporary ventilation and oxygenation in patients where airway control is not possible by other methods.

4.3.1.4.3.2. Complications: Asphyxia, aspiration, cellulitis, esophageal perforation, exsanguination, hematoma, posterior tracheal wall perforation, subcutaneous emphysema, thyroid perforation, and inadequate ventilation leading to hypoxia and death.

4.3.1.5. Tracheostomy.

4.3.1.5.1. Indications: Protects against aspiration; allows for controlled and precise ventilation and drug administration. It also protects the airway in situations of progressive airway closure caused by epiglottitis, inhalation burns, soft tissue trauma or infections, and other obstructive conditions.

4.3.1.5.2. Complications: Ulceration, ischemic necrosis, pneumothorax, pneumomediastinum, aspiration, atelectasis, and tracheal rupture.

4.4. Preflight/In-Flight Considerations and Care for Respiratory Patients.

4.4.1. Maintain a patent airway with positioning, suctioning, and adequate humidified oxygen.

4.4.2. Assure there will be sufficient O₂ available in-flight.

4.4.3. Administer oxygen for:

4.4.3.1. Any signs of hypoxia and respiratory distress or significant change from original assessment. Refer to Flight Physiology and the Physiological Stresses of Flight and **Table 4.1**

4.4.3.1.1. When administering O₂ to correct hypoxia, allow approximately 3-5 minutes to elapse; this will provide a more accurate pulse oximeter reading. **NOTE:** Any patient with a prn order for O₂ who requires O₂ or who is unexpectedly placed on O₂ in-flight will have an entry on AF Forms 3899/DD Form 602, DD Form 1380

and AF Form 3829. This includes date/ time, assessment with vital signs, pulse oximetry, MCA, type of delivery/flow, and results.

4.4.4. General Clinical Guidelines for All Respiratory Patients.

4.4.4.1. If Breathing is Present.

4.4.4.1.1. Assessment.

4.4.4.1.1.1. Note and document respiratory rate, depth, symmetry, and maximum cabin altitude.

4.4.4.1.1.2. Maintain pulse oximetry greater than 91% by titrating O₂.

4.4.4.1.2. Treatment/Management.

4.4.4.1.2.1. Administer supplemental humidified O₂.

4.4.4.1.2.2. O₂ Delivery Methods. Refer to [Table 4.1](#) and [Table 4.2](#)

4.4.4.1.2.2.1. Maintain water in humidifiers.

4.4.4.1.2.3. Push oral (PO) fluids, if not contraindicated, to prevent dehydration.

4.4.4.1.3. Pulmonary Hygiene Measures.

4.4.4.1.3.1. Turn, cough, and deep breathe every two hours, and note color, amount and consistency of secretions (i.e.; soot, blood streaks, and clots).

4.4.4.1.3.2. Assist into sitting position if not contraindicated. Position on a backrest, if available.

4.4.4.1.3.3. Use a pillow for abdominal/thoracic splinting when coughing.

Table 4.1. O₂ Delivery Methods.

(American Heart Association, Advanced Cardiac Life Support (ACLS) Provider Manual, 2000).		
METHOD	Liters Per Minute (LPM)	O ₂ %
Nasal Cannula Low flow-O ₂ delivery mixes with ambient gas. Inspired O ₂ concentration depends on the flow rate and the patient's tidal volume.	Increasing O ₂ flow by 1 LPM increases inspired O ₂ concentration by approximately 4 %.	
	1	24
	2	28
	3	32
	4	36

Face Mask	10	60
Administer 6 to 10 LPM		
Face Mask with O₂ Reservoir	Increasing O ₂ 1 LPM over 6 LPM increases inspired O ₂ concentration by approximately 10 %.	
Constant flow of O ₂ enters the attached reservoir. Administer 6 to 10 LPM via a tight-fitting mask for patients who require a rapid clinical effect/high flow O ₂ .	6	
	7	60
	8	70
	9	80
	10	90
NOTE: Requires close monitoring for nausea and vomiting. Suction should be		
Venturi Mask	IAW manufacture's guidelines.	24
Use for patients who retain CO ₂ .		28
Initially use 24%, unless otherwise ordered, and observe for respiratory depression.		35
		40

NOTE 1: In the most serious cases, give high flow 100% O₂.

NOTE 2: Monitor pulse oximetry (O2 saturation) and titrate O2 up or down accordingly to maintain at least 91%.

NOTE 3: Increase oxygen flow rate to compensate for decreased partial pressure of oxygen at altitude. Refer to **Table 4.2**.

Table 4.2. Conversion for In-flight Oxygen Administration.

CABIN ALTITUDE																	
10,000	30	36	44	51	58	65	73	80	87	94	100						
9,000	29	35	42	49	56	63	70	77	84	91	98	100					
8,000	28	34	40	46	54	61	67	74	81	87	93	100					
7,000	27	32	39	45	52	58	65	71	78	84	91	97	100				

6,000	26	31	37	44	50	56	62	69	75	81	87	94	100				
5,000	25	30	36	42	48	54	60	66	72	78	84	90	96	100			
4,000	24	29	35	41	46	52	57	64	70	75	81	87	93	97	100		
3,000	23	28	33	39	45	50	56	61	67	73	78	84	89	95	100		
2,000	23	27	32	38	43	48	54	59	64	70	75	81	86	91	97	100	
1,000	22	26	31	38	41	47	52	57	62	67	73	78	83	88	93	98	100
FiO ₂	21	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100

Desired Sea Level Equivalent (SLE) Oxygen Percentage

Even though the delivered O₂ may be at 100%, the partial pressure of oxygen necessary to deliver 100% SLE cannot be obtained (ex: 100% O₂ @ 8,000 feet only provides 75% O₂ SLE).
Desired % O₂ SLE cannot be obtained at these altitudes.

EXAMPLE: A patient receiving fraction of inspired oxygen (FiO₂) of 30% while on the ground and who will be flying at a cabin altitude of 8,000 feet will need to have the FiO₂ increased to 40% to deliver the same partial pressure of oxygen as the patient was receiving on the ground.

4.4.4.2. If Breathing Ineffective or Absent.

4.4.4.2.1. Assessment.

- 4.4.4.2.1.1. Confusion and altered mental status.
- 4.4.4.2.1.2. Bronchial fremitus- vibration perceptible on palpation (rhonchal).
- 4.4.4.2.1.3. Asymmetrical expansion of the chest wall.
- 4.4.4.2.1.4. Use of accessory or abdominal muscles for breathing.
- 4.4.4.2.1.5. Sucking chest wounds.
- 4.4.4.2.1.6. Cyanosis.
- 4.4.4.2.1.7. Paradoxical chest wall movement.
- 4.4.4.2.1.8. Tracheal shift.
- 4.4.4.2.1.9. Distended neck veins.
- 4.4.4.2.1.10. GCS < 8.

4.4.4.2.2. Treatment/Management.

- 4.4.4.2.2.1. Maintain airway.
- 4.4.4.2.2.2. High flow O₂ and assist breathing.

4.4.4.2.2.3. Treat the underlying cause.

4.4.4.3. Endotracheal Tube (ET) and Tracheostomy Patients.

4.4.4.3.1. Send extra airways with patients requiring artificial airway management.

4.4.4.3.2. Attach an end-tidal CO₂ monitoring device or an in-line CO₂ indicator to the ET or tracheostomy.

WARNING 1: If a CCATT team and/or a cuff pressure monitor are unavailable and an endotracheal tube (ET) or tracheostomy tube cuff requires inflation for flight, ensure it is not inflated with air. Inflate cuffs with sterile normal saline (NS) solution or IAW the manufacturer's recommendations. Use the minimal leak technique to avoid tissue trauma. Document use of NS on DD Form 602 and AF Forms 3829 and 3899. **WARNING 2:** Using NS in the endotracheal or tracheostomy cuffs may decrease blood flow to tissue and interfere with future cuff management at the receiving MTF resulting in a more complex airway re-intubation.

NOTE: The CCATT physician may elect to fill endotracheal and tracheostomy tube cuffs with air and then attach to a cuff pressure monitor to minimize tissue trauma and the complications of re-intubation. Cuff pressure is usually maintained between 15-20 cm, and will be checked pre-flight, at cruise and hourly, on descent, and prior to deplaning. Document cuff pressures on DD Form 602 and AF Forms 3829 and 3899.

4.4.4.4. Ventilator Patients.

4.4.4.4.1. Only approved ventilators will be used for AE missions. AECMs are responsible for ensuring the ventilator interfaces with aircraft systems and a dedicated regulator/oxygen line is available to operate ventilators. **WARNING:** Refer to AFI 41-309, AE Equipment Standards, for a list of approved ventilators, and prior to attaching a ventilator to an oxygen source.

4.4.4.4.2. An MA familiar with the ventilator, a respiratory therapist, or both should accompany ventilator patients.

4.4.4.4.3. A dedicated suction unit and manual resuscitator is assigned to the patient.

4.4.4.4.4. Considerations for Ventilator Patients:

4.4.4.4.4.1. Cardiac monitor.

4.4.4.4.4.2. Pulse Oximetry.

4.4.4.4.4.3. CO₂ monitor.

4.4.4.4.4.4. In-line Mini-OX.

4.4.4.4.4.5. Vital signs at least q 2 hours.

4.4.4.4.4.6. Oral care q 2 hours.

4.4.4.4.4.7. NG tube inserted.

4.4.4.4.4.8. Soft wrist restraints in place to prevent extubation.

4.4.4.4.4.9. Re-evaluate the patient and ventilator settings at altitude; changes at altitude may require ventilator-setting adjustments. Tidal volume and FiO₂ are examples.

4.4.4.4.10. PEEP settings will remain constant at altitude. Patients with PEEP do not have additional risks at altitude. Refer to AFI 41-309.

4.4.4.5. En Route RON Considerations for all Respiratory Patients.

4.4.4.5.1. Evaluation by Flight Surgeon.

4.4.4.5.2. Chest X-Ray.

4.4.4.5.3. Laboratory Studies: ABGs, blood count, culture and sensitivity of sputum, if color changed from original assessment.

4.5. Chest Tubes. Chest tubes may be left in position for AE but a Heimlich valve should be in place prior to patient transfer to the flightline, and will be in place prior to flight. Chest drainage units listed in AFI 41-309 are approved for airborne use; follow individual equipment requirements as directed. Glass bottles will not be used in-flight.

4.5.1. In normal situations, patients with recently removed chest tubes will not be airlifted until the following conditions are met:

4.5.1.1. A minimum of 24 hours post chest tube removal.

4.5.1.2. Expiratory and lordotic chest x-ray at least 24 hours post chest tube removal with the interpretation documented in the patient's medical records. **NOTE:** In contingency operations these requirements may not be feasible.

4.5.1.3. Occlusive dressing is applied to the site where the chest tube was removed.

4.5.2. Preflight /In-Flight Considerations and Care for Chest Tube Patients. WARNING: Hands-on preflight assessment, including breath sounds, vital signs and pulse oximetry, and inspection of the chest tube and its connections are essential for successful patient outcomes.

4.5.2.1. Ensure all connections are taped, and tubing is not looped or kinked and not hanging below the drainage system.

4.5.2.2. Mark level of collection chamber, remembering water from the water seal chamber will be pulled into the collection chamber after each descent. Refer to AFI 41-309.

4.5.2.3. Document whether or not there is an air leak in the water seal (bubbling indicates free air in the chest).

4.5.2.4. Chest tubes may be left in position for AE and a Heimlich Valve is not needed if the chest drainage system has an integral one-way valve and is approved for in-flight use (i.e. Atrium model 4050). The Heimlich Valve is required when chest tubes are connected to straight drainage (i.e. empyema) and when using AE approved chest drainage systems without an integral one-way valve (i.e. Pleurevac).

4.5.2.4.1. Chest drainage units listed in the current AE Equipment Standards are approved for use in-flight; ensure familiarity with conditions for use. Other drainage units may be encountered in the AE system and are acceptable if a one-way valve system is present and conditions for use are followed and a waiver is obtained IAW the AMC AE Equipment Standards Guide. **NOTE:** The sending MTF is not required to supply Kelly Clamps for transfer to AE system.

4.5.2.5. Do not allow the chest drainage system to be above the level of the chest.”
ADD: NOTE: Position patient mid-tier to facilitate drainage. **WARNING:** When operationally feasible, one should not floor load patients with chest tubes.

4.5.2.6. Do not clamp the chest tube while moving the patient.

4.5.2.7. Maintain and document I&O on each trip segment and as required.

4.5.2.8. Check the suction control frequently; evaporation may occur in-flight, changing the amount of suction. Adjust the suction control to maintain minimal bubbling.

4.5.2.9. Move and drain chest drainage tubing hourly to facilitate flow and prevent clotting. Do not milk chest tubes because it causes increased intra-pleural pressure.

4.5.2.10. Unless contraindicated, position on a backrest for comfort. Pain medication as required.

4.6. Pulmonary Emergencies.

4.6.1. Initial Response.

4.6.1.1. Maintain the airway and assist breathing.

4.6.1.2. Administer high flow O2 to maintain pulse oximetry greater than 91%. Refer to [Table 4.1](#)

WARNING: If a COPD patient is unstable and/or needs assistance with a resuscitation device, give high flow O2 (Refer to **Table 4.1.**).

NOTE: High concentrations of O2 may produce respiratory depression in patients who retain CO2 (i.e.; COPD) because the increase in PaO2 blocks the stimulant effect of hypoxemia on the respiratory center. Administer O2 at 2-4 LPM via nasal cannula for stable COPD patients.

4.6.1.3. Start IV to keep vein open (KVO).

4.6.1.4. Consider altitude restriction based on mission requirements; confer with AC.

4.6.1.5. Contact TACC/AMOC/AOC/PMRC for guidance and possible diversion to a MTF capable of handling the situation, as required.

4.6.2. Asthma/Chronic Obstructive Pulmonary Disease (COPD).

4.6.2.1. Assess Signs and Symptoms:

4.6.2.1.1. Tachypneic, labored respirations with increased effort on exhalation (prolonged).

4.6.2.1.2. Possible cough and dyspnea.

4.6.2.1.3. Signs of Hypoxia: Fatigue, headache, dizziness, and irritability.

4.6.2.1.4. The absence of wheezing, difficulty speaking, and use of accessory muscles indicates an emergent situation.

4.6.2.2. Treatment/Management: Refer to Initial Response paragraph [4.6.1](#)

4.6.2.2.1. Administer medication and oxygen as directed. Refer to paragraph [4.6.1.2](#)

4.6.2.2.2. Force fluids or IV therapy, if not contraindicated.

4.6.3. Tension Pneumothorax.

4.6.3.1. Usually occurs as a result of blunt or penetrating thoracic trauma, and as a complication of treating an open pneumothorax; this may also include a kinked or clotted chest tube. Air enters the pleural space and is unable to escape on expiration. As a result, air accumulates in the inter- pleural space, and the interpleural pressure increases with each inspiration. The involved lung collapses and the mediastinum shifts to the opposite side, compressing the contralateral lung. Venous return to the heart is decreased and perfusion becomes poor.

4.6.3.2. Assess Signs and Symptoms:

4.6.3.2.1. Signs of hypoxia (agitation and tachycardia). Refer to [Table 2.1](#)

4.6.3.2.2. Severe respiratory distress with dyspnea (air hunger and rapid respirations) and cyanosis.

4.6.3.2.3. Tracheal shift to unaffected side.

4.6.3.2.4. Decreased or absent chest expansion on affected side.

4.6.3.2.5. Diminished or absent breath sounds on affected side.

4.6.3.2.6. Difficulty ventilating ET.

4.6.3.2.7. Distended neck veins and hypotension.

4.6.3.2.8. Hyperresonance on percussion.

4.6.3.2.9. Presence of clots in the chest tube or Hemilich valve.

4.6.3.3. Treatment/Management: For additional information, refer to ATLS/TNCC.

4.6.3.3.1. If this occurs preflight, the patient is not stable for flight. If this occurs in-flight, decrease the cabin altitude, if operationally feasible, and contact TACC/AMOC/AOC/PMRC for guidance and possible diversion to a MTF capable of handling the situation.

4.6.3.3.2. If chest tube is present:

4.6.3.3.2.1. Assure the drainage system is operational.

4.6.3.3.2.2. If clotting is suspected, “milk” the drainage tubing to move plugged clots. “Milk” the drainage tubing in the direction of the drainage system – assure all connections are secure. With one hand, hold the drainage tubing approximately four inches from the distal end of the Hemilich valve; with the other hand, squeeze the tubing and pull in the direction of the drainage system, approximately 12 inches. Monitor the drainage in the chest tube and the Hemilich valve for the presence of clots of fibrin; change the Hemilich valve if clotted.

4.6.3.3.3. If chest tube is not present:

4.6.3.3.3.1. Needle Thoracostomy (temporary procedure pending placement of chest tube): Pressure must be relieved immediately with large bore needle or intravenous catheter. **WARNING:** This intervention will be performed by specially trained healthcare professionals working within their ASFC scope of practice. For additional information, refer to ATLS/TNCC

4.6.4. Open Pneumothorax. Air enters the chest via an open wound; also known as a “sucking chest wound.”

4.6.4.1. Assess Signs and Symptoms:

4.6.4.1.1. Severe respiratory distress with dyspnea and cyanosis.

4.6.4.1.2. Gurgling, sucking wound.

4.6.4.1.3. Tachypnea and grunting.

4.6.4.2. Treatment/Management.

4.6.4.2.1. Cover the wound at the end of exhalation with a sterile occlusive dressing. Tape dressing on three sides to create a “flutter valve” effect. Air is prevented from entering the chest on inspiration but is allowed to escape on expiration.

4.6.4.2.2. If respiratory distress continues to increase, a tension pneumothorax may be developing. If this is suspected, remove the occlusive dressing to allow the trapped air to escape. Re-tape the dressing as described above.

4.6.5. Flail Chest.

4.6.5.1. Multiple rib fractures with loss of chest wall stability. Normal thoracic function and gas exchange is impaired, and the underlying pulmonary contusion and splinting of the fracture pain leads to hypoventilation and hypoxia. The flailing segment moves inward during inspirations and outward during expiration. Severe muscle spasms may conceal the flailing segment.

4.6.5.2. Signs and Symptoms.

4.6.5.2.1. Respiratory distress with dyspnea, cyanosis, and hypoxia.

4.6.5.2.2. Paradoxical chest wall movement.

4.6.5.3. Treatment/Management.

4.6.5.3.1. Administer high-flow humidified oxygen. Refer to [Table 4.1](#)

4.6.5.3.2. Intubate and assist with ventilation, based upon degree of hypoxia and the degree of stabilization. *WARNING:* This intervention will be performed by specially trained healthcare professionals working within their ASFC scope of practice.

4.6.5.3.3. May have PEEP or Continuous Positive Airway Pressure (CPAP) for stabilization.

4.6.5.3.4. Monitor intravenous fluid infusion to prevent over hydration.

4.6.5.3.5. Splint chest or place on affected side.

4.6.5.3.6. Pain control.

4.6.6. Massive Hemothorax.

4.6.6.1. Assess Signs and Symptoms:

4.6.6.1.1. Severe respiratory distress with dyspnea.

- 4.6.6.1.2. Labored breathing, not attributable to tension pneumothorax, open pneumothorax and flail chest, and combined with other data, e.g. mechanism of injury.
- 4.6.6.1.3. Signs of shock and hypoxia. Refer to paragraph 6.2.3.1. and Table 2.1.
- 4.6.6.1.4. Breath sounds decreased or absent.
- 4.6.6.1.5. Neck veins are flat.
- 4.6.6.1.6. More than 100cc of blood loss per hour from chest tube.
- 4.6.6.2. Treatment/Management of Shock. Refer to paragraph 5.3.
- 4.6.7. Pulmonary Embolism.
 - 4.6.7.1. Pulmonary Embolism. See Attachment 19, Pulmonary and Fat Embolism Management.
 - 4.6.7.1.1. DELETE
 - 4.6.7.1.1.1. DELETE
 - 4.6.7.1.2. DELETE
 - 4.6.7.1.2.1. DELETE
 - 4.6.7.1.2.2. DELETE
 - 4.6.7.1.2.3. DELETE
 - 4.6.7.1.2.4. DELETE
 - 4.6.7.1.2.5. DELETE
 - 4.6.7.1.2.6. DELETE
 - 4.6.7.1.2.7. DELETE
 - 4.6.7.2. DELETE
 - 4.6.7.2.1. DELETE
- 4.6.8. Adult Respiratory Distress Syndrome (ARDS).
 - 4.6.8.1. Lung injury that has several causes and may be a complication of other diseases or injuries. Most commonly found in male patients and the mortality rate is 50%.
 - 4.6.8.2. ARDS results from a severe alteration in pulmonary vascular permeability, which leads to a change in lung structure and function.
 - 4.6.8.3. Treatment/Management.
 - 4.6.8.3.1. Positive End Expiratory Pressure (PEEP).
 - 4.6.8.3.2. Supplemental Oxygen – Ventilator support.
 - 4.6.8.3.3. Pulse oximetry.
 - 4.6.8.3.4. Fluids should be restricted unless shock is present.

Chapter 5

SHOCK MANAGEMENT

5.1. Stresses of Flight.

5.1.1. Decreased Partial Pressure: Will exacerbate oxygenation deficiencies due to preexisting hypoxias and compromised respiratory function.

5.1.2. Thermal: Inadequate peripheral perfusion aggravated by the potential temperature extremes.

5.1.3. Humidity: Exaggerates fluid loss.

5.1.4. Fatigue: Can exacerbate the patient's underlying condition/diagnosis due to the overall effect of previously mentioned stresses of flight, and length of time the patient has been in the AE system.

5.2. Types of Shock.

5.2.1. **Anaphylactic Shock.** Refer to [Attachment 2](#).

5.2.2. **Cardiogenic Shock:** Refer to Medical Management.

5.2.3. **Hypovolemic Shock:** A decrease in circulating volume caused by severe burns, fluid/electrolyte loss associated with diabetes insipidus, diabetes mellitus, and severe diuresis, diarrhea and vomiting.

5.2.3.1. Signs and Symptoms: Clammy, cool, pale skin, thirst, decreased urine output, increased respiration and pulse rate, and narrowing of pulse pressure.

5.2.4. **Neurogenic Shock:** Spinal cord injury and alteration in vascular tone from drugs, food, plants, venom, and toxins.

5.2.4.1. In addition to the symptoms of hypovolemic and cardiogenic shock, patient may have impaired breathing, mental status changes, and control of body temperature.

5.2.5. **Septic Shock:** Widespread dilation of blood vessels due to severe infectious agent resulting in inadequate tissue perfusion.

5.2.5.1. Signs and Symptoms: Similar to hypovolemic shock, and may have chills and high fever.

5.2.6. **Obstructive Shock:** Inadequate circulating blood volume due to an obstruction or compression of the great veins, aorta, pulmonary arteries or heart as in a cardiac tamponade or tension pneumothorax.

5.2.6.1. Signs and Symptoms: Jugular vein distension, chest pain, narrowing pulse pressure, muffled heart sounds.

5.3. **Treatment/Management and Preflight/In-flight Considerations of Shock. Note:** Treatment entails rapid response and stabilization of underlying cause for adults only. Refer to PALS for treatment of pediatric trauma.

5.3.1. Maintain ABCs. Correct hypoxia. Refer to [Table 4.1](#)

- 5.3.2. Treat tension pneumothorax, if indicated. Refer to Breathing and Respiratory Management.
- 5.3.3. Treat cardiac tamponade with pericardiocentesis, if indicated. **WARNING:** This procedure will only be performed by highly trained medical professionals.
- 5.3.4. Control hemorrhage, and immobilize spine and fractures.
- 5.3.5. Treat arrhythmias, and shock unresponsive to fluid challenges.
- 5.3.6. Treat hypotension.
- 5.3.7. Establish two large bore IVs with preferably warmed Ringers Lactate (LR) or Normal Saline (NS) to replace volume.
- 5.3.8. Blood products as directed. AF Form 1225, Informed Consent for Blood Transfusion, signed if feasible. Refer to [Attachment 5](#).
- 5.3.9. Prevent heat loss.
- 5.3.10. Monitor vital signs, GCS ([Table 3.1](#)).
- 5.3.11. Pulse Oximetry may not be accurate due to peripheral vasoconstriction.
- 5.3.12. Monitor hourly urine output for effectiveness of fluid resuscitation.
 - 5.3.12.1. Following completion of fluid resuscitation, titrate IV fluids to maintain hourly urine output at 30-70 cc/hr for adults, and at 1 to 2 ml/kg/hour in children under 30 kg.
- 5.3.13. Antibiotics and antipyretics, as indicated.
- 5.3.14. Supine position with feet elevated unless contraindicated.
- 5.3.15. NPO.

Chapter 6

BURN MANAGEMENT

6.1. Burns. Burn patients are frequently transported on AE missions and require intensive in-flight nursing care. The expert management consultants for worldwide AE are at the US Army Institute of Surgical Research. CONUS burn patients transferring to this facility are normally accompanied by a burn team from the center. The burn team, only under special circumstances, accompanies burn patients from overseas. The TACC/AMOCC/AOC/PMRC will coordinate the delivery of the burn team and their equipment to the originating facility and subsequent AE airlift of the patient back to the burn center. In all cases, burn patients should be moved within 24 hours from the time of injury.

6.1.1. Conditions requiring immediate transport and contact with the burn team, if the situation allows.

6.1.1.1. Burns involving >10% total body surface (TBS) in children and adults over 50 years old.

6.1.1.2. All burns involving >20% TBS.

6.1.1.3. Significant burns to the hands, face, genitalia or perineum.

6.1.1.4. 3rd degree burns >5% TBS.

6.1.1.5. Burns with inhalation injury requiring intubation.

6.1.1.6. Burns with significant pre-existing medical disorders.

6.1.1.7. Multiple trauma associated with burns.

6.1.1.8. Significant electrical injury (including lightning).

6.1.1.9. Chemical burns as follows: White phosphorus burns involving >5% TBS; vesicant gas involving >5% TBS, conjunctivae, or significant injury to airway.

6.2. Stresses of Flight.

6.2.1. Decreased Partial Pressure: Exacerbates oxygenation deficiencies due to compromised respiration and/or the decreased partial pressure of oxygen in the presence of carbon monoxide poisoning.

6.2.2. Barometric Pressure Changes: Increases gastric distention and discomfort.

6.2.3. Humidity: Exacerbates fluid loss.

6.2.4. Vibration: May increase pain.

6.2.5. Thermal: Loss of natural insulation and skin integrity leaves the patient prone to hypothermia and pain. Severity of the burn affects the autonomic temperature regulatory functions and may increase oxygen demand.

6.2.6. Fatigue: Exacerbates the patient's underlying condition.

6.3. Preflight/In-Flight Considerations:

6.3.1. Assessment/Treatment/Management.

6.3.2. **Airway:** Secure early.

6.3.2.1. Check for patency and be alert for: Tracheal edema and inhalation injury.

6.3.2.2. **Assess Signs & Symptoms of Inhalation Injury.** **NOTE:** Inhalation injuries are at high risk for rapid airway obstruction; serious consideration should be given to intubation pretransport.

6.3.2.2.1. Suspect in blasts and being confined in a burning environment. **NOTE:** Onset may be delayed and other injuries may not be apparent.

6.3.2.2.2. Nasal/Mucosal charring.

6.3.2.2.3. Burns and/or soot on face, in mouth and nose.

6.3.2.2.4. Carbonaceous sputum.

6.3.2.2.5. Hoarseness.

6.3.2.2.6. Carbon monoxide poisoning symptoms include pink to cherry-red skin, tachycardia, tachypnea, headache, dizziness, and nausea; CNS symptoms vary with carboxyhemoglobin level. Refer to Medical Management for more in-depth information. **WARNING:** Pulse oximetry reading may not be accurate in carbon monoxide poisoning.

6.3.3. **Artificial Airways:** Refer to Airway and Breathing Management for more in-depth information.

6.3.3.1. Administer high flow O₂ via cool mist to maintain pulse oximetry greater than 91%.

6.3.3.2. Secure tubes with ties or suture rather than tape.

6.3.4. **Fluid Loss/Resuscitation.**

6.3.4.1. IV access via 2 large bore (18 gauge or larger), if needed.

6.3.4.2. First 24 Hours:

6.3.4.2.1. The goal of initial fluid resuscitation is to restore and maintain adequate tissue perfusion and vital organ function, in addition to preserving heat-injured but viable tissue. Fluid needs are based on the size of the patient and the extent of the burn. The two most common formulas for estimating fluid needs are the Parkland formula, (4 ml/kg/% BSA burned), and the Modified Brooke formula, (2 ml/kg/% BSA burned). These formulas have been combined and presented as the Consensus formula of 2 to 4 ml/kg/% BSA burned. **NOTE:** All of the formulas call for one-half of the total amount to be infused over the first 8 hours from the time of the injury, and the second half infused over the following 16 hours.

6.3.4.3. **Urinary Output:** Determines the adequacy of renal perfusion and fluid resuscitation.

6.3.4.3.1. Adult hourly output is maintained between 30 to 50 ml.

6.3.4.3.1.1. With electrical burns, maintain output at 75-100cc/hr to prevent buildup of myoglobin in the kidneys. **NOTE:** Urine will be rusty red in color.

6.3.4.3.2. Children, under 30 kg, hourly output is maintained at 1 to 2 ml/kg/% BSA burned.

NOTE: Patients with 20% TBS or more, excluding first-degree burns, should have an IV, NG, and Foley catheter in place during all phases of AE.

6.3.5. **Dressings:** Refer to Infection Control and Wound Management for more in-depth information.

6.3.5.1. Ensure burns are dressed with clean, dry, non-constrictive, bulky dressings.

6.3.5.2. Cover dressings with clean linens to help decrease pain from air currents and prevent gross contamination during transport.

6.3.5.3. Cover sheets with “space” blankets and clean blankets or sleeping bags for temperature control. **NOTE:** Do not change dressings in-flight; reinforce only.

6.3.6. Antacid therapy, as directed.

6.4. Cardiac Monitoring: For patients with cardiac history, hypertension, electrical burns, and patients over 50 years of age.

6.5. Circulation Checks: (All extremities). Refer to Musculo-Skeletal Management for more in-depth information.

6.6. Mental Status: Key indicator of hypoxia and cardiovascular stability. Perform neurovascular assessments frequently.

6.6.1. Treat hypoxia from shock, carbon monoxide poisoning, sepsis or the effects of altitude.

6.7. Temperature Control: Extremely prone to hypothermia. Monitor temperature and maintain a high temperature in the cabin, if possible.

6.8. Positioning and Exercise:

6.8.1. Essential to promote circulation and provide comfort and prevents contractures, pressure sores, thrombosis, and conversion of burns.

6.8.2. Maintain the position of function (i.e.; hands, joints, and feet).

6.8.2.1. Elevate upper torso: Assists cerebral venous return, slows down edema formation, and assists respiratory functions by reducing diaphragm crowding.

6.8.2.2. Elevate extremities: Reduces edema, increases venous return, and reduces pain.

6.9. Narcotics/Analgesics:

6.9.1. Used for both sedation and pain relief. Administered in frequent small-titrated dosages via IV.

Chapter 7

IV THERAPY/ DRUG MANAGEMENT

7.1. Intravenous (IV) Therapy.

7.1.1. Stresses of Flight.

7.1.1.1. Barometric Pressure Changes: Air expansion at altitude may cause some IV rates to fluctuate. The rate of ascent/descent varies with different aircraft, so does the rate and flow of IV fluid. Pressures are constantly changing due to en route stops, weather conditions, and capabilities of the aircraft pressurization system.

7.1.1.1.1. Situations potentially dangerous to a patient are a sudden surge of fluid, unregulated flow to the patient, and air bubbles in the administration tubing.

7.1.2. **Critical Area of Consideration:** Accurate administration of IV therapy poses one of the greatest concerns in-flight. Drip rates will be reevaluated once cruise altitude is reached, frequently throughout the flight, after descent and after a rapid decompression. **NOTE:** “Dial-a-flows” will not be used to regulate IV rates in-flight.

7.1.3. IV Containers.

7.1.3.1. Plastic IV Containers: Plastic solution containers are preferred for in-flight use because they are easy to handle and secure, do not break, and expand/contract with changes in barometric pressure without venting.

7.1.3.2. Glass IV Containers: Not routinely used in today’s medical environment. However, there may be some instances where medication/fluids in glass containers will be infused in-flight. IV glass bottles without integral venting rods do not allow for the escape of expanding air. The expansion of air will force the fluid out of the bottle or the IV will not drip at all. **NOTE:** Do not use glass bottles without venting them.

7.1.3.3. Venting Procedures: Any rigid plastic or glass IV bottle requiring venting is done utilizing aseptic technique.

7.1.3.3.1. Insert an 18-gauge needle through the bottle cap into the lumen of the integral air rod of the bottle.

7.1.3.3.2. Remove the cap from the air vent on the drip set and insert a sterile 2 cc syringe into the vent.

7.1.3.3.3. Secure the syringe and plunger into the vent by running a strip of tape over the plunger of the syringe and around the neck of the IV bottle. As the air of the bottle expands it leaves via the needle inserted into the air rod; the syringe acts as a plug, held in place by the tape, and prevents fluid from pouring out of the bottle.

7.1.3.3.4. Non-Vented Drip Sets: When non-vented drip sets are used, it is necessary to insert a needle only into the integral air rod of the IV bottle.

7.1.3.3.5. Volutrol (Metered Drip Sets Constructed of Pliable Plastic): The meter chamber is filled and clamped off between the bottle and the chamber. (Since the meter chamber collapses as it empties, air does not enter or expand in the chamber).

7.1.3.3.6. Metered Drip Sets Constructed of Rigid Plastic: Systems with air vents in the metering section of the drip set allow air in the tubing during rapid decompression and will not be used.

7.1.4. Additional Fluid Therapy Techniques.

7.1.4.1. **Arterial and Hemodynamic Lines.** Fluid chamber must be completely filled with fluid to prevent the possibility of air in the line during patient movement. High-pressure tubing must be used with all invasive hemodynamic lines.

7.1.4.2. **Total Parenteral Nutrition (TPN).** Patient routing should be as short and direct as possible. **NOTE:** TPN must be refrigerated en route.

7.1.4.3. An order for TPN or D10W is written on the AF Form 3899/DD Form 602/DD Form 1380 and includes quantity, frequency, rate, and lab studies required at RON MTFs. **NOTE:** D10W may be used en route if TPN solution is not available.

7.1.5. Preflight/In-flight Considerations for IV Therapy.

7.1.5.1. Document the IV start time, site, catheter gauge, and the last dressing change, if known.

7.1.5.2. Label IV bag with solution, date, start and stop times and initials. Do not use markers because they are absorbed into the plastic bag.

7.1.5.3. Infusion Pumps will be used for heparin, cardiac and vasoactive medications, neonatal/pediatric patients, and TPN. Refer to AFI 41-309, *AE Equipment Standards*.

7.1.5.4. Ensure line is patent.

7.1.5.5. Assess insertion site and evaluate for infection/irritation: Redness/red streaks at insertion site, warmth, edema, purulence/drainage, and pain.

7.1.5.6. Ensure patient has enough IVs, medications, and supplies to reach the destination facility.

7.1.5.6.1. When patient medical supplies and patient movement items (PMI) are coordinated with the AE system in advance, most items will be provided from the AE staging base. Without advance coordination, the originating facility will be responsible for providing these items and should provide a 1-day minimum of supplies, except for patient movement from theater to CONUS and within CONUS where a 3-day minimum should be provided.

7.1.5.7. Patients receiving TPN require glucose monitoring. **WARNING:** Currently, there is no glucose monitor or chemstrip on the approved basic AECM in-flight medical equipment list. In-flight glucose monitoring may not be accurate due to barometric changes, and requires close observation of objective and subjective signs of hypoglycemia and hyperglycemia. When available, assist the patient and/or family in utilizing the patient's or the originating facility's monitor at en route stops; MTFs at RON destinations will perform quality testing of glucose monitors just prior to the patient's departure to the flightline. **NOTE 1:** If the patient or family is unfamiliar with the glucose monitor, the originating facility will provide training to ensure the AECMs are knowledgeable and proficient on the use of the glucose monitor prior to takeoff. **NOTE 2:** The

CCATT equipment package may include an ISTAT that is capable of in-flight glucose monitoring.

7.1.5.8. Place patients receiving IV therapy in the middle to low tier to facilitate IV flow, if possible.

7.1.5.9. After a Rapid Decompression, the following difficulties may be encountered: Bags/bottles break, drip sets pop out, blood backs up into tubing, and excessive air and fluid is forced into patient.

7.1.5.9.1. AECM Action Following a Rapid Decompression: Clamp tubing, check infusion site, bottle or bag, infusion pump (if applicable), and tubing. Assess for signs and symptoms of infiltration. Clear the tubing of air and resume infusion if not clotted or infiltrated.

7.2. Administration of Medication.

7.2.1. General Information. Administer medications in-flight on the same schedule as in the originating MTF, or as near as possible. The goal of administering any type of medication or treatment in the AE system is to maintain the continuity of care from the originating MTF to the destination MTF without significant delays. Drug administration time may be adjusted to the destination time zone, if there are no contraindications.

7.2.2. **Documentation:** Includes patient assessment, complaint, pain control management, pertinent past treatment/medication, allergies, medication dose, time administered, other interventions or measures used, results of treatment.

NOTE: Use AF IMT 3899I *Patient Movement Medication Record*. Document all medication administration times in ZULU.

7.3. Controlled Drugs.

7.3.1. A controlled drug accepted by the healthcare provider becomes his/her responsibility for accountability, control, safeguarding, and disposition.

7.3.1.1. AF IMT 579, **Controlled Substance Register**. Mandatory for unit accountability and documentation of all narcotic inventories. Completed at change of shift/beginning/end of every mission and when accessed for patient use.

7.3.2. When controlled drugs are brought onboard the aircraft, the MCD and MTF representative together will complete an inventory.

7.3.2.1. The name and quantity of drugs are noted and signed for on the AF IMT 3899A, (Front) **Controlled Drug Accountability** (Refer to Table 1.1.). If these drugs are returned to the MTF, the representative and MCD must annotate the AF IMT 3899A with the statement "Refused and Returned," and both persons sign the form.

7.3.3. Prescribed controlled drugs entrusted to a patient/attendant are considered to be the property of the individual, who is then responsible for safeguarding and administering the drug(s). FNs will determine if the patient or attendant is competent to safely manage these drugs.

7.3.4. All controlled substances will accompany the patient to the destination MTF.

7.3.5. Upon termination of the mission, all unaccompanied/unserviceable controlled drugs are documented on the AF Form 3859, Turn-In of Unaccompanied Narcotics, and turned into the drug room for disposition per local policy. Annotate AF Form 3829.

7.3.6. If off loaded at the incorrect MTF, notify TACC/AMOCC/AOC/PMRC for immediate tracking.

7.3.7. Drugs Missing/Unaccounted For.

7.3.7.1. As soon as the FN realizes that controlled drugs are missing, report the loss immediately to the aircraft commander.

7.3.7.2. As soon as possible, the FN makes a written statement or affidavit documenting the circumstances surrounding the loss, type, and quantities of drugs missing. If possible, obtain written statements or affidavits from any persons having knowledge of the circumstances surrounding the loss. Send documents to the Drug Room manager and the PMRC medical director.

7.3.7.3. If the FN suspects drugs were stolen by person(s) onboard the aircraft, the aircraft commander should notify the Office of Special Investigations or the security police upon landing at the first military airfield. Keep all persons onboard the aircraft until an investigation is accomplished.

7.3.7.3.1. If the drugs are still not located, the FN should prepare statements or affidavits stating actions taken and results for the investigating agency. Complete DD Form 2852.

7.4. Administration of Medication According to Established Protocols. In emergency situations, the FN initiates care based on individual competency, level of knowledge and skill. Refer to the current edition of the *“Nursing Drug Handbook or Physicians’ Desk Reference.”*

NOTE 1: The medications described in the related chapters/attachments of this AFI may be administered one time, unless otherwise stated, by a “trained and competent” FN. Once treatment is started, concurrently contact the TACC/AMOCC/AOC/PMRC for further physician orders and for guidance and possible diversion to a MTF capable of handling the situation.

NOTE 2: Follow the most current ACLS guidelines for cardiac arrest.

NOTE 3: Unless contraindicated, administer IV medications rapidly followed by an immediate 20-30cc bolus of IV fluid and elevate the extremity.

7.4.1. Documentation will include subjective and objective data for giving the medication; vital signs, if indicated; known allergies; for women of childbearing years: date of last menstrual cycle; date and time of administration and notification of a physician, and the outcome. The following statement will be documented on AF Form 3899/DD Form 602/DD Form 1380: “(Insert name of drug) was administered IAW AFI 41-307.” When administering drugs/treatment protocols (7.4.3) IAW this AFI, complete DD Form 2852.

7.4.2. **Over-the-Counter-Medication. NOTE:** Does not require notification of a physician.

7.4.2.1. **The FN May Administer the Following as Indicated Below.**

7.4.2.2. Afrin Nasal Spray (oxymetazoline) x 2 sprays. Refer to paragraph 11.2.3.5.1.

7.4.2.3. Meclizine 25 mg PO once daily. Refer to paragraph 11.2.3.5.5.

7.4.2.4. Mylanta (aluminum magnesium simethicone) 15-30 cc PO.

7.4.2.5. Neo-synephrine (phenylephrine) Nasal Drops. Refer to paragraph [11.2.3.5.3](#) and para- graph [14.8.4](#) (Pediatrics)

7.4.2.6. Sudafed (pseudoephedrine) 60 mg PO. Refer to paragraph [11.2.3.5.2](#)

7.4.2.7. Tylenol 650 (acetaminophen) mg PO. **NOTE:** Refer to manufacture's dosages for Chil- dren's Tylenol Drops.

7.4.3. Drug/Treatment Protocols.

7.4.3.1. Anaphylactic Reaction: Epinephrine ([1:1000](#)), Benadryl (diphenhydramine), and Epi- nephrine ([1:10,000](#)). Refer to [Attachment 2](#) (Adults and Pediatrics).

7.4.3.2. Healthcare Worker BBF Post Exposure Plan: Combivir [zidovudine (AZT) and lamivu- dine (3TC)]. Refer to [Attachment 3](#).

7.4.3.3. Ischemic Chest Pain: Nitroglycerin and Aspirin. Refer to [Attachment 4](#).

7.4.3.4. Medical Emergency/Cardiac Arrest. Refer to paragraph [1.11](#) and paragraph [8.3](#), and [Attachment 13](#).

7.4.3.5. Mental Health/Behavior Management. Acute Exacerbation of Psychiatric/Behavior Dis- orders: Haldol (haloperidol) and Valium (diazepam). Refer to [Attachment 6](#).

7.4.3.6. Reaction to Blood: Epinephrine ([1:1000](#)), Benadryl (diphenhydramine), and Epinephrine ([1:10,000](#)) and Normal Saline 1000cc IV. Refer to [Attachment 7](#).

7.4.3.7. Severe Hypoglycemia: D50 IVP. Refer to [Attachment 8](#).

7.4.3.8. Status Epilepticus: Valium (diazepam). Refer to [Attachment 9](#).

7.4.3.9. Unconscious/Known or Suspected Narcotic Overdose: Narcan (Naloxone) and D50 IVP. Refer to [Attachment 11](#).

7.5. Areas of Special Interest.

7.5.1. Management/Administration of Blood and Blood Products. Refer to [Attachment 5](#).

7.5.2. Magnesium Sulfate Toxicity/Administration of Calcium Gluconate IVP. Refer to [13.4.4](#)

7.5.3. TPN. Refer to [7.1.4.2](#)

7.5.4. Triage/Contingency Operations (War, MOOTW, Homeland Defense, and Disaster Response). Refer to [Attachment 10](#).

Chapter 8

MEDICAL MANAGEMENT

8.1. Cardiac Management.

8.1.1. Stresses Of Flight.

8.1.1.1. Decreased Partial Pressure of Oxygen: Increases myocardial workload, predisposing compromised patients to arrhythmias, chest pain and may lead to myocardial infarction. Consider cabin altitude less than 6000 ft for cardiac patients.

8.1.1.2. Barometric Pressure Changes: Gas expansion in the GI tract may cause diaphragmatic crowding and decrease in tidal volume.

8.1.1.3. Thermal: Excessive heat may cause patients on cardiac medication to become hypotensive. Hyperthermia and hypothermia may increase cardiac oxygen requirements.

8.1.1.4. Fatigue: Cumulative effect of stresses may exacerbate the patient's condition.

8.1.1.5. G-Forces: Takeoff may increase returning blood flow and cardiac workload for some cardiac patients. Use a backrest for cardiac patients on a litter.

8.2. Preflight/ In-Flight Considerations for Cardiac Patients.

8.2.1. Patients with a recent acute myocardial infarction (AMI) are considered for AE on an individual basis. Consultation between the referring physician and the validating flight surgeon is the foundation for developing a safe movement care plan for all patients. When continuous cardiac monitoring or other critical care modalities are required, the validating flight surgeon, in consultation with the referring physician, shall determine if a CCAT team, or medical attendants such as a physician, or ACLS trained nurse will accompany the patient. The referring physician and validating flight surgeon will work together to determine the appropriate AE timeframe and clinical support for cardiac patients. The final decision for determining these requirements rests with the validating flight surgeon. A 12-Lead EKG tracing taken within 24 hours of scheduled flight and read by a qualified physician should accompany the patient.

8.2.2. Patient History.

8.2.2.1. Assess if patient is free of chest pain; the last episode of chest pain and if it was associated with shortness of breath (SOB), nausea and diaphoresis, and what actions and/or medications are used to relieve pain. Identify other current medications (some cardiac medications induce hypotension), and the presence of a pacemaker or implantable cardioverter-defibrillator.

8.2.3. Assess ability to ambulate for prolonged periods and climb stairs.

8.2.4. Assure Nitroglycerin and other medications are available prior to takeoff.

8.2.5. All inpatient cardiac patients should have preflight vital signs and pulse oximetry; repeat pulse oximetry at altitude.

8.2.6. Use a backrest if on litter.

8.2.7. Place near O2 for flight.

8.2.8. **WARNING:** Electromagnetic interference (EMI) from handheld and stationary surveillance systems interferes with implantable cardiac pacemakers and implantable cardioverter-defibrillators (ICD). Changes in pacing rates, shock, and possible cardiac arrest may occur. Use alternate anti-hijacking procedures for patients and passengers with these medical devices. In-flight Adult ACLS. Notify TACC/AMOC/AOC/PMRC. **NOTE:** Assess the airway, breathing, circulation, mental status, and the possible causes for symptoms. Secure the airway and have monitor/defibrillator available. Perform cardiopulmonary resuscitation (CPR), if indicated. All patients suspected to be symptomatic, at high risk or unstable will be placed on high flow O2 (Refer to Table 4.1.), have an IV access with a large bore IV catheter, and placed on the cardiac monitor and a pulse oximeter. Attach EKG strips to document rhythm on DD Form 602, 1380, AF Forms 3829 and 3899. **WARNING:** Treat the patient, not the monitor. An adequate airway, ventilation, oxygenation, chest compressions and defibrillation take priority over obtaining IV access and administering medications.

8.3. Cardiac Emergencies/Cardiac Arrest: Refer to current ACLS Guidelines and **Attachment 13**, In-flight Adult ACLS. Notify TACC/AMOC/AOC/PMRC. **NOTE:** Assess the airway, breathing, circulation, mental status, and the possible causes for symptoms. Secure the airway and have monitor/defibrillator available. Perform cardiopulmonary resuscitation (CPR), if indicated. All patients suspected to be symptomatic, at high risk or unstable will be placed on high flow O2 (Refer to [Table 4.1](#)), have an IV access with a large bore IV catheter, and placed on the cardiac monitor and a pulse oximeter. Attach EKG strips to document rhythm on DD Form 602, 1380, AF Forms 3829 and 3899. **WARNING:** Treat the patient, not the monitor. An adequate airway, ventilation, oxygenation, chest compressions and defibrillation take priority over obtaining IV access and administering medications.

8.3.1. **Ischemic Chest Pain.** Refer to [Attachment 4](#).

8.3.2. **Congestive Heart Failure/Cardiogenic Shock:** Pump failure that may result from a MI, valvular malfunction, septal defect, left ventricular aneurysm or cardiac trauma.

8.3.2.1. Assess cardiopulmonary, neurological and hemodynamic status - BP, HR, pulse oximetry, GCS, peripheral perfusion, presence of edema, color, and warmth of skin.

8.3.2.1.1. Signs and Symptoms: Anxiety. Dyspnea/shortness of breath with rales and rhonchi. Distended neck veins, tachycardia, hypertension or hypotension (cardiogenic shock). Diaphoresis, arrhythmias. Appears ashen, with cool and clammy skin.

8.3.2.2. Treatment/Management. Refer to paragraph [8.3](#) and [Table 4.1](#)

8.3.2.2.1. Cardiac monitor.

8.3.2.2.2. Strict I & O.

8.3.2.3. Contact TACC/AMOC/AOC/PMRC for guidance and possible diversion to a MTF capable of handling the situation. The physician may order Furosemide IV, Morphine IV, Nitroglycerin SL, and if hypotensive, a vasopressor.

8.3.3. **Cardiac Tamponade.** Rapid or slow accumulation of fluid into pericardial sac compresses the heart and decreases cardiac output. Results from inflammation, traumatic wound injury to heart, heart failure, cardiac contusion, neoplasm, and aortic dissection.

8.3.3.1. Assess Signs & Symptoms: Beck's Triad: high venous pressure - distended neck veins, low arterial pressure and distant/muffled heart sounds. Dyspnea, tachypnea, cyanosis, tachycardia, hypotension, and severe anxiety. QRS may have smaller amplitude.

8.3.3.2. Treatment/Management: Refer to [8.3](#) and to current ACLS Guidelines.

8.3.3.2.1. Avoid positive pressure ventilation via bag-mask or ET tube. The physician may order a fluid challenge.

8.3.3.2.2. The only treatment that alleviates the cause is pericardiocentesis.

WARNING: This procedure will only be performed by highly trained healthcare professionals.

8.3.4. Symptomatic Premature Ventricular Contractions (PVCs) and Tachycardia, Symptomatic Bradycardia, and Cardiac Arrest. Refer to current ACLS guidelines for drug indications, actions and precautions.

8.3.4.1. Symptomatic Premature Ventricular Contractions (PVCs) and Ventricular Tachycardia (VT). Refer to current ACLS Guidelines.

8.3.4.1.1. Presence of multi-focal and/or frequent PVCs, and VT, in conjunction with chest pain, SOB, low BP, change in mental status, shock, pulmonary congestion, congestive heart failure and acute MI.

8.3.4.2. Symptomatic Bradycardia. Refer to current ACLS Guidelines.

8.3.4.2.1. Signs and symptoms: Low BP, pulmonary congestion, SOB, chest pain, and decreased level of consciousness, shock, pulmonary congestion, congestive heart failure and acute MI.

8.3.4.2.1.1. A pulse rate, relative to the blood pressure, is too low. An example is a heart rate of 65 and a BP of 80/50.

8.3.4.2.2. Consider transcutaneous pacing (TCP) with AE approved Cardiac Monitor/Defibrillator. FNs may initiate pacing IAW current ACLS Guidelines and will contact Command and Control (C2) for mission diversion and physician guidance and sedation and pain medication prior to starting TCP. **NOTE:** TCP is used for short intervals until transvenous pacing can be initiated (with appropriate equipment waiver via HQ AMC/A3/VM for in-flight use).

8.3.4.2.3. En route adult transvenous pacing requires direct CCATT or physician supervision IAW the PMRC VFS and the tasked unit Chief Nurse Executive (CNE) for appropriate medical crew complement.

8.3.4.2.4. All pediatric patients requiring en route transvenous or transcutaneous pacing require direct physician supervision.

8.3.4.3. Ventricular Fibrillation/Pulseless Ventricular Tachycardia (VF/VT). **NOTE 1 :** Follow current ACLS guidelines for defibrillation. **NOTE 2:** Place a blanket or a long cardiac board underneath the patient for protection and the even distribution of the delivered current while defibrillating on the floor of the aircraft. **NOTE 3:** All types of litters may be used during defibrillation as long as safety precautions are followed.

8.3.4.4. **Asystole and Pulseless Electrical Activity (PEA).** Follow current ACLS guidelines.

8.3.4.4.1. Consider and treat the possible causes: hypovolemia (volume infusion); hypoxia (ventilate); tension pneumothorax (needle decompression); drug overdose (tricyclics, digitalis, *B*-blockers, calcium channel blockers, narcotics); hyperkalemia; numerous blood transfusions; cardiac tamponade, pulmonary embolism, and acidosis.

8.4. Blood Dyscrasia. Affects one or more of the blood components, the bone marrow or the entire blood system. It can be acute or chronic, acquired or congenital. Seen in chemotherapy, post-transplant, post-trauma, renal and liver disease. Refer to Lippincott.

8.4.1. Stresses of Flight.

8.4.1.1. Decreased Partial Pressure of Oxygen: Exacerbates the body's decreased oxygen transport capability in the blood leading to hypoxia and cardiac decompensation.

8.4.1.2. Thermal: Hot and cold temperatures increases the body's oxygen requirements.

8.4.1.3. Decreased Humidity: Dehydration causes headaches and decreases blood volume.

8.4.1.4. Fatigue: Complicates the underlying pathology.

8.4.2. **Red Blood Cells (RBCs):** Transport oxygen and carbon dioxide. The efficiency of RBCs depends on the quantity and quality of the hemoglobin it contains. Normal hemoglobin concentration is 14-16 g per 100cc, and varies with the patient's sex and age.

8.4.2.1. Patients with hemoglobin below 8.0 mg may be transported if the condition is chronic and stable, and not related to bleeding. Patients with a hematocrit below 25% are not airlifted without concurrence of the Validating Flight Surgeon (VFS). Low flow O₂ is used continuously on patients with extremely low hemoglobin or hematocrit levels, as in dialysis and chemotherapy patients. An altitude restriction below 5000 feet may be ordered by the VFS. Refer to [Table 8.1](#)

8.4.2.1.1. Types of Anemias.

8.4.2.1.1.1. Hemolytic: Destruction of erythrocytes by bacteria, parasites, venom, transfusions, chemicals, and genetics (thalassemia and sickle cell – sickling can occur at cabin altitudes as low as 4000 ft).

8.4.2.1.1.2. Aplastic: Failure of the bone marrow to produce erythrocytes due to chemicals, drugs and disease.

8.4.3. **White Blood Cells (WBCs or leukocytes):** The main function of leukocytes is to isolate areas of inflammation or infection. Normal adult blood contains 5,000-10,000 WBCs per cubic centimeter of whole blood.

8.4.3.1. Leukocyte Disorders.

8.4.3.1.1. Caused by abnormal WBCs (too few, too many or abnormal morphology).

8.4.3.1.2. Monitor pre-flight absolute neutrophil count (ANC) and en route temperature. ANC below 1000 is considered neutropenic and at risk for infection; below 500 is a severe risk for infection and for flight. Monitor temperature every four

hours. Temperature above 100.4 F is considered significant; above 101.0 F requires antibiotics, usually gentamycin or vancomycin.

8.4.3.1.2.1. Results in low resistance to gram-negative organisms. Use good hand wash- ing, protective isolation with the patient wearing a N95 mask, and no fresh fruits or black pepper (contains high levels of gram negative bacteria).

8.4.4. Platelets (thrombocytes).

8.4.4.1. Thrombocytopenia: observe for bruising, uncontrolled bleeding, petechiae, hematuria, hemotomas, and GI bleeding. Normal platelet count is greater than 150,000.

8.4.4.2. Avoid aspirin and non-steriodal anti-inflammatory drugs that may interfere with platelet function.

8.4.5. Preflight/In-flight Nursing Care for Blood Dyscrasias.

8.4.5.1. Oxygen administration as needed. Refer to [Table 8.1](#) and [Table 4.1](#)

Table 8.1. Guidelines to Determine Oxygen Requirements.

PATIENTS CONDITION	IN-FLIGHT O ₂ REQUIREMENTS
Chronic Low Hgb:	
8.5-10	Oxygen Available
7.0-8.5	Oxygen at 2L for flight
Below 7.0	AE Validating Flight Surgeon
Post-Op Low Hgb (acute):	
9.0-10	Oxygen Available
8.0-9.0	Oxygen at 2L for flight
Below 8.0	AE Validating Flight Surgeon

NOTE: These parameters are based on hemoglobin because hematocrit may be decreased or elevated in dehydration or fluid overload.

8.4.5.2. Litter with backrest.

8.4.5.3. Offer blankets; patients with anemias tend to have a greater sensitivity to cold.

8.4.5.4. Offer fluids often to avoid headaches and decreased blood volume.

8.4.5.5. Administer blood products, as ordered. AF Form 1225, Informed Consent for Blood Transfusion, signed if feasible.

8.4.5.6. Use Standard and Transmission Based Precautions. Refer to Infection Control for more in-depth information.

8.5. Diabetes Mellitus. Refer to Lippincott.

8.5.1. Stresses of Flight.

8.5.1.1. Decreased Partial Pressure of Oxygen: Diabetic retinopathy and peripheral vascular symptoms may be exacerbated.

8.5.1.2. Decreased Humidity: Leads to dehydration.

8.5.1.3. Thermal: May contribute to poor circulation, exacerbating sensitivity.

8.5.1.4. Fatigue: May precipitate/exacerbate condition.

8.5.2. Preflight/In-flight Considerations for Diabetes Mellitus.

8.5.2.1. Ascertain time of last meal.

8.5.2.2. Type, time and amount of hypoglycemic medication.

8.5.2.3. Assure medications and special diet are onboard and available.

8.5.2.4. Ensure meal is served on time. Observe for objective and subjective signs of hypoglycemia and hyperglycemia. MTFs at RON locations will test blood glucose just prior to the patient's departure to the flight line. Although glucose monitors are not included in the AE allowance standard, use of a glucose monitor approved for in-flight use is authorized. AECMs should be prepared to assist patients and/or attendants in performing blood glucose checks using an approved monitor on the ground and in the air. A current listing of blood glucose monitors approved for in-flight use can be found on the Air Force Medical Equipment Development Laboratory website at https://medlog.detrick.af.mil/mlc/site_apps/clineng/afmedl/.

8.5.2.5. **Hyperglycemia.** Early: polydipsia, polyuria, fatigue, nausea, vomiting, abdominal pain and cramps; dry, warm, flushed skin. Later: Kussmaul respiration, fruity, sweet breath, hypotension, stupor and coma.

8.5.2.5.1. Treatment/Management. Insulin and IV fluids as directed by a physician.

8.5.2.6. **Hypoglycemia (potentially life-threatening).** Refer to [Attachment 8](#).

8.6. Decompression Sickness: Caused by the evolution of free gas bubbles from the tissues and fluids of the body as a result of marked decreases in barometric pressure. Nitrogen, a metabolically inert gas, is primarily involved. Nitrogen behaves predictably according to Henry's Law: evolves in a manner similar to the formation of bubbles in a bottle of carbonated beverages when the cap is removed. Refer to Flight Physiology for more in-depth information.

8.6.1. Stresses of Flight.

8.6.1.1. Decreased Partial Pressure of Oxygen: Exacerbates existing hypoxia.

8.6.1.2. Barometric Pressure Changes: Nitrogen escapes and exacerbates symptoms.

8.6.1.3. Noise, Thermal Changes, Vibration, and Fatigue: Exacerbates underlying pathology

8.6.2. **Symptoms of Decompression Sickness.** There is no regular sequence, and it is possible to exhibit various symptoms simultaneously.

8.6.2.1. Skin: itching, tingling, cold or warm sensations, and occasionally a mottled rash – the "Creeps".

8.6.2.2. Joints: pain in or around the body joints – the "Bends." More commonly, the larger joints of the elbows, shoulders, knees, and ankles are involved.

8.6.2.3. Respiratory: deep and sharp sub-sternal pain, dry progressive cough, and a feeling of suffocation – the “Chokes.”

8.6.2.4. Central Nervous System (CNS): Most Dangerous. Includes muscular weakness, headache, visual impairment, speech difficulties, mental confusion, bowel and bladder dysfunction, paralysis, and coma – the “Staggers”.

8.6.3. Preflight/ In-flight Considerations En Route to the Hyperbaric (Decompression) Chamber. (May also apply to individuals with carbon monoxide poisoning, gas gangrene, or extensive wound infections).

8.6.3.1. Requires continuous 100% O₂ via a tight fitting mask, unless otherwise ordered. Follow local guidance if the Bends Kit (12P Crew Mask with extension hose, and a high pressure O₂ line) is utilized.

8.6.3.2. Requires destination field altitude as the MCA (recommended) en route.

8.6.3.3. Immobilize joints and maintain complete bedrest, unless otherwise ordered.

8.6.3.4. Trendelenberg position increases cerebral edema and ischemia, and is contraindicated.

8.6.3.5. May have an IV to maintain hydration.

8.6.3.6. The use of narcotics may mask CNS symptoms.

8.6.3.7. A potential in-flight hazard any time cabin pressurization is lost. Any individual experiencing symptoms during flight needs prompt treatment. Suspect if individual has been Scuba diving within the last 24 hours.

8.6.3.7.1. Administer 100% O₂ and immobilize the painful area. Refer to [Table 4.1](#)

8.6.3.7.2. Request a lower cabin altitude and notify TACC/AMOCC/AOC/PMRC PMRC for guidance and possible diversion to a MTF capable of handling the situation, as required.

8.6.3.7.3. Must be evaluated by a flight surgeon even if the symptoms disappear during descent.

8.7. Unconscious/Known or Suspected Narcotic Overdose. Refer to [Attachment 11](#).

Chapter 9

NEUROLOGICAL MANAGEMENT

9.1. Stresses Of Flight.

9.1.1. Decreased Partial Pressure of Oxygen: Lower levels of O₂ causes brain cell and tissue ischemia and ultimately death, and produces cerebral edema and increased intracranial pressure (ICP) which leads to hypoventilation and further hypoxemia. **NOTE:** One hypoxic episode in the presence of TBI may lead to a catastrophic secondary brain injury.

9.1.2. Barometric Pressure Changes: Penetrating head injuries, skull fractures and severe facial fractures may produce air in the cranium, causing increased ICP. The potential for ear block exists in those patients who have a decreased level of consciousness, inability to follow directions or a physical disability. Valsalva increases ICP. **NOTE:** An altitude restriction minimizes the stresses of barometric pressure changes and decreased partial pressure of oxygen.

9.1.3. Vibration: May cause motion sickness and vomiting, thus increasing ICP.

9.1.4. Thermal Changes: A consideration for patients with hypothalamus involvement.

9.1.5. Decreased Humidity: Will dry the corneas of patients with decreased corneal/blink reflex, and increase dehydration and headaches.

9.1.6. G-Forces: Takeoff may increase ICP and bleeding for litter patients or decrease cerebral blood flow to ambulatory patients. Litter patients are secured and padded on a backrest (if not contraindicated) with the head mid-line. **NOTE:** Physician determines head aft or forward litter positioning for flight.

9.2. Types of Head Injuries/Degenerative Diseases

9.2.1. **Traumatic Brain Injury (TBI).** Mechanism of Injury: Acceleration/deceleration, penetrating/non-penetrating forces from an explosion/over pressurized blast wave (the speed of sound), fall, direct impact, or motor vehicle/aircraft crash. For more detailed information see: <http://www.pdhealth.mil/TBI.asp#cg>.

9.2.1.1. Penetrating TBI is typically identified and cared for immediately. TBI does not cause "shock."

9.2.1.2. The treatment goals are to prevent the secondary brain injury and progressive damage from hypoxemia, hypotension, cerebral hypoxia and edema, and to recognize and to treat the early signs of intracranial hypertension or increasing ICP by maintaining an adequate airway, monitoring pupils, LOC and the GCS for sudden or subtle changes. (Refer to 3.3.7 and Table 3.1) **NOTE:** Baseline preflight assessment, including pulse oximetry is essential.

9.2.1.2.1. Mean Arterial Pressure (MAP) reflects the degree of systemic tissue hypoperfusion; maintain ≥ 70 mm Hg (BP 90/60):

$$\text{MAP} = \frac{(\text{Systolic BP} - \text{Diasystolic BP})}{3} + \text{Diasystolic BP}$$

9.2.1.2.2. Cerebral Perfusion Pressure (CPP) is the pressure gradient that drives blood and nutrients into the brain. Normal range: ≥ 70 mmHg.

CPP = MAP - ICP

9.2.1.2.2.1. CPP is dependent upon:

9.2.1.2.2.1.1. Automatic/autoregulation dilation and constriction of the cerebral blood vessels to maintain constant blood flow despite fluctuations in the systemic blood pressure.

9.2.1.2.2.1.2. Systolic BP ≥ 90 mmHg.

9.2.1.2.2.1.3. ICP ≤ 20 mmHg.

NOTE: When ICP increases, the body attempts to perfuse the compressed brain tissue at all cost. Hypotension in head injured patients can be catastrophic because cerebral blood vessels cannot autoregulate and therefore cannot constrict to preserve cerebral blood flow during hypotension. When autoregulation is lost, massive cerebral vasodilation occurs, and secondarily increases ICP

Table 9.1. Head Trauma Outcomes

ICP (mmHg)	CPP (mmHg) = MAP - ICP
0-10 Normal	80-100 Average
> 15-18 Treat	60 Possible Brain Ischemia
> 40 Poor Prognosis	40 Irreversible Brain Ischemia
> 60 Probably Fatal	30 Neuronal Cell Death

9.2.1.2.2.1.4. GCS Indicators

9.2.1.2.2.1.5. Moderate TBI = 9-13

9.2.1.2.2.1.6. Severe TBI = 3-8

9.2.2. Immediate TBI Signs/Symptoms: alteration in mental status typically resulting in the tempo- rally related onset of: headache, nausea, vomiting, dizziness/balance, fatigue, insomnia/sleep disturbances, drowsiness, sensitivity to light/ noise, blurred vision, difficulty remembering, and/or difficulty concentrating.

WARNING: mTBI may be missed, especially in the presence of other more obvious injuries such as heat or toxic injury, hypovolemic shock/dehydration, eye and spinal injury, and acute stress reactions.

9.2.3. **Military Acute Concussion Evaluation (MACE)** Mandatory during the first 48 hours for all individuals involved in an explosion/blast, fall, blow to the head and/or motor vehicle/aircraft crash who were dazed, confused, “saw stars” or lost consciousness (even momentarily) should be considered to have suffered a concussion. See **Table 9.3** Military Acute Concussion Evaluation (MACE), and refer to http://www-nehc.med.navy.mil/Postdep/docs/Web_TBI%20clinical%20practice%20guideline%20and%20MACE1.pdf.

9.2.3.1. Casualties displaying any of the “red flags” in [Table 9.3](#) MACE “Red Flags” should be referred for additional medical evaluation as soon as operationally possible. If new symptoms occur before takeoff, the patient is not stable for flight, and needs to be cleared by a flight surgeon. Notify Theater PMRC, ASAP.

9.2.3.2. If symptoms occur in-flight, start high flow O₂; contact TACC/AMOCC/AOC/PMRC for guidance.

Table 9.2. MACE “Red Flags”

Double vision	Seizures
Breathing Difficulties	Slurred Speech
Headache that worsens	Unsteady on feet
Can’t recognize people or places/Disorientation	Repeated vomiting
Can’t be awakened easily	Weakness or numbness in arms/legs
Behaves unusually or seems confused/irritable	Progressively declining neurological exam

Table 9.3. Military Acute Concussion Evaluation (MACE) Note: Will be completed prior to flight. Not an in-flight requirement.

Evaluation	Description	Score
History	Mechanism of injury, amnesia, loss of consciousness, and symptoms	None
Neurological Screening	Eyes: pupil response and tracking Verbal: speech fluency and word finding Motor: pronator drift (both arms extended shoulder level, palms upwards, eyes closed), gait/	None
Immediate Memory	A brief repeated list learning test. A list of five words is read once and then the patient is asked then to repeat the list back, as many words as as they can recall in any order. Repeat two more times for a total of three trials, even if the patient scores perfectly on the first trial. (one word = one point)	<u> </u> /15

Orientation	One point for each: Month, Date Time Day of Week Year	____/5
Concentration	Reverse Digits: Patient restates a string of numbers (lengths of 3, 4, 5, 6 digits) , in reverse order. Two attempts allowed per string; successful string = one point Reverse Months: Patient states the months of the year in reverse order (one point if correct)	____/5
Delayed Recall	Patient is asked to repeat back the original list of five words, as many words as they can recall in any order. One point for each recalled word	____/5
TOTAL SCORE		____/30

NOTE: MACE Scores below 25 may represent clinically neuro-cognitive impairment requiring further evaluation for a more serious brain injury. When operationally feasible, the scoring system can be used to document either a decline or an improvement in cognitive functioning.

9.2.4. TBI: Closed Head Injury.

9.2.4.1. Concussion: injuries resulting in transient alterations of consciousness.

9.2.4.2. Cerebral Contusion: focal brain injury may be associated with cerebral tissue injury and hemorrhage.

9.2.5. TBI: Skull Fractures.

9.2.5.1. Basilar: may be associated with a displaced fracture of the mandibular condyle or blow- out fracture of the orbit. The patient may exhibit Battle Sign (oval-shaped bruise over the mastoid) or raccoon eyes (ecchymotic areas around the eyes).

9.2.5.2. Depressed: associated with lacerations of the dura.

9.2.5.2.1. Complications: intracranial infection, hematomas, menigeal and brain tissue damage, pneumocephalus, and cerebral spinal fluid (CSF) rhinorrhea and CSF from ears.

9.2.5.3. Penetrating Injuries: associated with blast injuries, gunshot wounds, and impaled objects (rocks, metal, bone).

9.2.5.3.1. Risk of cerebral hemorrhage, hematoma, diffuse brain injury, infection and pneumocephalus is high.

9.2.5.3.2. Survival is dependent on the extent of injury.

9.2.6. TBI: Hemorrhage.

9.2.6.1. **Subdural Hematoma:** Results from a contusion or laceration of the brain with bleeding into the subdural space; may be associated with skull fractures. Classifications: acute (within 24 hours), subacute (2-10 days), and chronic (after 2 weeks).

9.2.6.2. **Epidural Hematoma:** Associated with skull fractures and blunt injuries without a fracture may be acute or delayed. Classic symptoms are a transient loss of consciousness, return to normal neurological status, and the onset of headache and decreasing level of consciousness, and a dilated ipsilateral pupil.

9.2.7. **Signs of Increasing ICP.**

9.2.7.1. LOC is the most important indicator of brain function.

9.2.7.2. Elevated BP with a widening pulse pressure.

9.2.7.3. Change in pupil size.

9.2.7.4. Tachycardic initially, followed by bradycardia as ICP increases.

9.2.7.5. Tachypnea (early) and then slowing with lengthening period of apnea.

9.2.7.6. Headache: increasing intensity and may be aggravated with movement.

9.2.7.7. Vomiting with or without nausea may become projectile.

9.2.8. **Treatment/Management.** Also refer to **Attachment 20**, Management of Severe Adult Head Injury.

9.2.8.1. Headache management -use Acetaminophen.

9.2.8.1.1. Avoid tramadol, narcotics, NSAID's, ASA, or other platelet inhibitors until CT is confirmed negative.

9.2.8.2. Elevate head to increase cerebral venous return. **NOTE:** concomitant thoracic or lumbar fractures should be transported flat.

9.2.8.3. Minimize cerebral venous blood volume by preventing ET tube struggle, valsalva and over hydrating.

9.2.8.4. Maintain IV of isotonic solution not greater than 100cc/hour, if not hypovolemic.

9.2.8.5. May be in a drug-induced coma and on a ventilator.

9.2.8.6. May receive IV Mannitol.

9.2.8.7. **WARNING:** The Politzer Bag will not be used on patients with a skull fracture.

9.2.8.8. Document I & O.

9.2.8.9. If "Red Flags" or signs of increasing ICP occur, administer high flow O2 and rule out hypoxia. **NOTE:** Maintain an open airway, adequate breathing and circulation, and a pulse oximeter reading greater than 91%.

9.2.8.9.1. If intubated, maintain EtCO2 IAW **Attachment 20**.

WARNING: Excessive hyperventilation/hyperoxygenation to control ICP without ICP internal cranial pressure monitoring may have adverse results. Keep assisted breathing rate < 20/min. If situation occurs in-flight, consider lower cabin altitude, if operationally feasible. Notify

TACC/AMOCC/AOC/ PMRC for guidance and possible diversion to a MTF capable of handling the situation, as required.

9.3. Spinal Cord Injuries. NOTE: Rule out TBI

9.3.1. The goal is to maintain spine stability and prevent further deterioration of the patient's neuro- logical condition during transport with a C-Collar, backboard, head blocks or other non-shifting medium, Stryker Frame with Collins traction or HALO fixation.

9.3.2. May exhibit signs of shock. Refer to Shock Management for more in-depth information.

9.3.3. May be respiratory compromised on ventilator support.

9.3.3.1. "C 3, 4 , and 5 keep the diaphragm alive," T2-8 innervates the intercostal muscles. Refer to Breathing and Respiratory Management for more in-depth information.

9.3.4. Disability and dependency is determined by level of injury. **WARNING:** EMI from hand held and stationary surveillance systems interferes with implanted spinal cord stimulators causing shocks, pain, and possibly falls. Use alternate antihijacking procedures for patients and passengers with these medical devices.

9.4. Cerebral Vascular Accident (CVA). The disruption of cerebral blood supply from ischemia, thrombosis, embolism, or hemorrhage. Refer to current ACLS guidelines for detailed assessment and treatment.

9.4.1. Assessment.

9.4.1.1. Obtain vital signs, GCS, pulse oximetry., cardiac rhythm, and temperature.

9.4.1.2. Signs and symptoms: sudden, severe headache; numbness, facial droop, weakness or ple- gia on one side of the body; slurred speech, dysphagia, aphasia, visual disturbance, and altered cognitive abilities.

9.4.1.3. Check blood sugar if on the ground or if CCATT is on board, and treat if indicated.

9.4.2. Treatment/Management.

9.4.2.1. Administer O2 at 4 lpm via nasal cannula and maintain pulse oximetry above 91%.

9.4.2.2. Protect airway and C-Spine if comatose/history of trauma.

9.4.2.3. If onset of symptoms is sudden, immediately notify TACC/AMOCC/AOC/PMRC and request nearest MTF with a neurologist, computerized tomography (CT) scanner, and throm- bolytic therapy. **NOTE:** Window of opportunity from symptom onset to beginning thrombolytic treatment is less than 3 hours.

9.4.2.4. Physician may direct treatment to control hypertension with nitrates or other medication.

9.5. Special Considerations for the CNS Injured/Neurologic Disease/Comatose Patient:

9.5.1. Protect airway if gag reflex is diminished.

9.5.2. Talk to the patient (hearing is the last sense to go) and orient to surroundings. Explain procedures prior to starting; touch the patient while you are talking to them. May need to repeat information several times.

9.5.3. Prevent corneal abrasions with Artificial Tears. Steri-strip eyelids closed if corneal reflex is absent.

9.5.4. Reposition every two hours. Use occipital “donut” to prevent skin breakdown

9.5.5. Perform passive range of motion (ROM) every 4 hours (if not contraindicated).

9.5.6. Oral hygiene every 2 hours.

9.5.7. Assist with meals and toileting.

9.5.8. May have tube feedings, Foley or external catheter.

9.5.9. Maintain current level of activities of daily living (ADL). A medical attendant may be required en route.

9.5.10. Monitor vital signs, pulse oximetry, GCS, pupils, I & O, and temperature.

9.6. Seizure Precautions/Treatment.

9.6.1. Open airway, and maintain adequate breathing and circulation. Maintain pulse oximeter greater than 91%.

9.6.2. Maintain therapeutic medication levels.

9.6.3. Position near oxygen/suction, and away from windows near propellers to avoid rhythmic flashes of light.

9.6.4. Precautions During Seizures.

9.6.4.1. Protect from injury; assist to floor, recline the seat, and do not restrain. If possible, position on side to prevent aspiration.

9.6.4.2. Prepare to use suction, administer high flow O₂, and assist respirations as required. Do not attempt to place a bite block while seizing.

9.6.4.3. Observations to record during seizure: Any aura? Was rigidity superseded by jerks or convulsions; when did this occur? What part of the body started moving first? To what areas did the convulsion spread? In what order? Did the body change position during the seizure? Was there a chewing of the mouth and rolling of the eyes present? If the eyes were open, what did the pupils look like? Did they change in size? Together or individually? What was the respiratory pattern? What was the skin appearance? Flushed, ashen, and clammy? If unconscious, how much time elapsed before the patient regained consciousness? Did sleep follow? If so, how long? Incontinent of urine or feces?

9.6.5. Treatment After a seizure (Post-Ictal).

9.6.5.1. Maintain airway. Rule out hypoxia.

9.6.5.2. Litter if needed.

9.6.5.3. Obtain vital signs and pulse oximetry. Perform a detailed neuro assessment.

9.6.5.4. Post Ictal (improving): Maintain seizure precautions and O2. Decrease stimuli as much as possible. Minimize the situation if there is a long-term history of seizures. Provide support, reassurance and comfort.

9.6.5.5. If Seizure Continues for More than Three Minutes or Restarts Without Regaining Consciousness. This is considered status epilepticus, a medical emergency. Medicate as directed and notify TACC/AMOC/AOC/ PMRC for guidance and possible diversion to a MTF capable of handling the situation, as required. Refer to Attachment 9.

Chapter 10

MUSCULO-SKELETAL SYSTEM AND WOUND MANAGEMENT

10.1. Stresses Of Flight.

10.1.1. Decreased Partial Pressure of Oxygen: Exacerbates the effects of hemorrhage, shock and low hemoglobin and hematocrit (H & H).

10.1.2. Barometric Pressure Changes: May cause compartment syndrome if patient is in a cast or has recent internal injuries.

10.1.3. Vibration: May affect alignment and/or positioning of set fractures, and increase pain.

10.1.4. Humidity: May lead to dehydration predisposing individuals to deep vein thrombosis (DVT) and may also cause skin dryness over time, leading to itching under cast.

10.1.5. Thermal: Changes of temperature may compromise circulation and increase pain; patient can sweat under cast on the flight line and then become cold at altitude.

10.2. Preflight/In-Flight Considerations.

10.2.1. Assess and maintain ABCs.

10.2.2. Neurovascular Assessment: Compare to unaffected extremity.

10.2.2.1. Peripheral pulse qualities (proximal/distal to injury). Presence does not rule out injury; re-assess frequently and compare to unaffected extremity.

10.2.2.2. Capillary refill less than 2 seconds is normal.

10.2.2.3. Presence of edema. Remove constricting items above and below the injury (rings and watches).

10.2.2.4. Color and temperature.

10.2.2.5. Motor function.

10.2.2.6. Sensation: compare to unaffected anatomical site.

10.2.2.7. Reassess after position change and immobilization.

10.2.2.8. Instruct the patient to report any pain and motor sensory changes (tingling, numbness, and pain).

WARNING: Sitting in cramped conditions for a long period of time, and/or injury and infection may lead to a DVT or a blood clot deep in the tissues of the calves or groin. DVT may lead to a pulmonary embolus and even death. Symptoms include pain in the calf or behind the knee that may increase with standing or ambulating, the feeling of being on pins and needles, swelling, and warmth or skin discoloration. Encourage fluids, ambulating, as well as stretching and flexing of calf muscles. If symptoms appear, refer to paragraph 4.6.7. Pulmonary Embolism.

10.2.2.9. **Compartment Syndrome:** The compromise of neurovascular viability due to swelling of, or bleeding into tissues encased within the fascial sheath of extremity.

Caused by open/closed fractures, external fixation/skeletal devices, compression/crushing injuries or constrictive bandages/casts.

10.2.2.9.1. Assess for Signs and Symptoms: edema, pulseless, pallor, paresthesia, paralysis, pain, firmness, and cyanosis.

10.2.2.9.2. Treatment/Management.

10.2.2.9.2.1. Remove constrictive dressings, bivalve cast, bandage and re-apply.

10.2.2.9.2.2. Elevate the extremity.

10.2.2.9.2.3. Administer pain medication after assessment. **NOTE:** Frequently assess adequacy of pain control measures.

10.3. Disability/Immobilization.

10.3.1. Spinal Cord Injuries: Refer to Neurological Management.

10.3.2. Amputation: control bleeding and pain.

10.3.3. Pelvic Fractures: complete bedrest. May have external fixation devices. Refer to paragraph 4.8.7. Pulmonary/Fat Embolism.

10.3.4. Application of Splints/Aces/Kerlix:

10.3.4.1. Proper splint placement: the joint above and the joint below the injury.

10.3.4.2. Proper alignment: in the position of function.

10.3.4.3. Security of splint/ace. Re-wrap if too tight or too loose. **NOTE:** Air Splints: air expands at altitude. Requires close observation and adjustments during ascent, at altitude and descent, and should not be used in-flight if alternate splinting devices are available.

10.4. Wound Management.

10.4.1. All combat wounds are considered contaminated and will not be closed initially.

10.4.2. Obvious injuries associated with air pressure changes of severe blasts may also have myocardial, pulmonary, and intestinal contusions or shearing injuries.

10.4.3. Note type and amount of drainage on dressings. On the aircraft, dressings will not be changed; reinforce only.

10.4.4. Any wound associated with a fracture must be managed as if it were an open fracture and treatment should be started within eight hours. This includes debridement and IV antibiotics prior to flight.

10.4.5. Observe for increased temperature, erythema (redness) at wound site, swelling, and presence of drains (note amount, color and location).

10.4.6. Do not remove impaled objects - stabilize.

10.4.7. Do not attempt to replace eviscerated bowel. Cover with a moist sterile occlusive saline dressing and insulate to prevent hypothermia.

10.4.8. Control bleeding with direct pressure, elevation, and pressure points.

10.4.9. The use of tourniquets to control bleeding is not recommended unless there are no other options.

10.4.10. Pain medication as ordered after assessment. **NOTE:** Frequently assess adequacy of pain control measures.

10.5. Casts.

10.5.1. Ideally, plaster casts should be at least 48 hours old to allow for possible soft tissue expansion after an acute injury.

10.5.2. Plaster casts should be bivalved if swelling is expected or if the cast restricts emergency egress, i.e; Spica. **NOTE:** If bivalving jeopardizes alignment of the fracture, the physician must be informed there may not be cast cutters available in-flight, and then write the order "Do Not Bi-Valve" on the appropriate patient treatment form.

10.5.3. If the cast is over a surgical wound site, "window" the cast to allow for tissue expansion.

10.5.4. Assess cast for: proper drying, cracks, rough edges, drainage and bleeding (outline, date and time site), foul odor, and pressure points.

10.5.5. Perform circulation and neurological checks prior to flight. If abnormal, contact the MTF to bivalve the cast or loosen the bivalved cast.

10.6. Preflight/In-Flight Considerations for Orthopedic and Soft Tissue Injuries.

10.6.1. Ensure skin integrity remains intact.

10.6.2. Maintain immobility to control bleeding, maintain circulation, and to prevent fat embolism.

10.6.3. Maintain traction.

10.6.3.1. Ensure stability when using the following equipment:

10.6.3.2. Stryker frame with or without Collins traction.

10.6.3.3. HALO/external fixation/skeletal traction: pin care, as ordered.

10.6.3.4. C-Collar, backboard or other non-shifting medium.

10.6.3.5. HARE, SAGER, KENDRICK Traction devices and Thomas splints.

10.6.3.6. NATO traction. **WARNING:** Do not use free hanging weights in-flight.

10.6.4. Positioning & Alignment.

10.6.4.1. Reposition every 2 hours with pillows.

10.6.4.2. Pad and elevate extremities. **WARNING:** Do not tie extremities to any portion of the air- craft in order to maintain elevation

10.6.4.3. Range of motion (ROM) exercises.

10.6.4.4. Avoid resting extremities on the bulkhead or the interior of the aircraft due to effects of vibration.

10.6.4.5. Litter patients should be positioned away from the bulkhead.

10.6.4.6. Spica casts require two litter spaces.

10.6.4.7. Mobility impaired ambulatory patients should not be near emergency exits. A “break- down” seat closest to the bulkhead may be used to elevate lower extremities.

10.6.4.8. Hemovac/Jackson-Pratt (JP) drains may be present post-op: note placement and amount.

10.6.4.9. N/G tube may be indicated to relieve abdominal pressure for patients in full body casts.

10.6.4.10. Patients with complex injuries should be evaluated for calf tenderness and possible pulmonary/fat embolism. Refer to paragraph [4.6.7](#)

10.7. Wound Drainage Tubes (Jackson-Pratt, T-Tube, Hemovac etc.).

10.7.1. Assess insertion site and assure suction is maintained at altitude, if indicated.

10.7.2. Document I & O.

10.7.3. Use standard precautions for disposal of blood and body fluids.

10.8. Negative-Pressure Wound Therapy (NPWT).

10.8.1. NPWT systems are generally indicated for the management of wounds, burns, ulcers, flaps and grafts. They apply negative pressure, using suction, to the wound in order to remove fluids, including wound exudates, irrigation fluids, and infectious materials. Benefits of NPWT include augmented wound granulation, wound contraction, improved control of wound exudates, decreased wound edema, reduced skin maceration, and improved pain management.

NOTE: Extra wound vacuum canisters should be available in the event current ones become full or cracked.

CAUTION: KCI® NPWT is only compatible with KCI® equipment.

10.8.2. NPWT is contraindicated in the presence of exposed anastomotic sites, exposed vasculature, exposed nerves, exposed organs, necrotic tissue with eschar present, untreated osteomyelitis, non-enteric and unexplored fistulas, and malignancy in the wound. Also, carefully consider the use of this therapy in patients with certain risk factors, including those with a high risk for bleeding and hemorrhage, and those receiving anticoagulants or platelet aggregation inhibitors.

10.8.3. Assess patient comfort and system function every 2 hours inflight.

10.8.3.1. Be vigilant for potentially life-threatening bleeding complications that are rare, and be prepared to take prompt action if that occurs.

10.8.3.2. NPWT should not be interrupted for greater than two hours within a twenty-four hour period due to the potential for infection.

10.8.3.3. Assess proper function by examining for alarms on the pump unit and inspecting the dressing. The dressing for a properly functioning system should have a “raisin-skin” appearance.

10.8.3.4. The NPWT may cease effective pressure if the occlusive dressing is not sealed. Occlusive reinforcement may need to be applied.

10.8.3.5. For non-correctable wound vac system failures inflight, when the patient's destination is greater than 2 hours away, the overlying occlusive film should be opened by making 2-3 slits into the film to allow for wound drainage. DO NOT remove the occlusive film or the sponge inside the wound for risk of bleeding or wound contamination. A dry dressing should then be applied over the site and reinforced as needed. Report wound vac system failure and actions taken to receiving facility during handoff for follow-on care.

NOTE: The provided guidance at 10.8.3.4. is for use inflight should full system failure occur. If wound vac system failure occurs while on the ground at originating station or during en route stops contact the appropriate theater Patient Movement Requirements Center.

10.8.4. Document amount of drainage on I&O sheet.

Chapter 11

EYES, EARS, NOSE, AND THROAT (EENT) MANAGEMENT

11.1. Eyes.

11.1.1. Stresses of Flight.

11.1.1.1. Decreased Partial Pressure of Oxygen: May cause increased intraocular pressure and vasodilatation due to hypoxia and may aggravate retinal hemorrhage, detached retina and glaucoma.

11.1.1.2. Barometric Pressure Changes: Causes increased pressure with pain and reduced blood flow to the eye. Post-op eye surgery patients may have trapped air in the globe; certain gases used in surgery may persist three to nine weeks. A closed penetrating eye injury may also have trapped air in the globe; air normally is reabsorbed in three days. Expanding air at altitude may lead to increased pressure, pain and/or extrusion of eye contents.

11.1.1.3. Decreased Humidity: Excessive drying of the eyes leads to corneal irritation and abrasions of the sclera, especially in comatose patients or patients whose eyes do not completely close.

11.1.1.4. Vibration/Thermal/Turbulence: Leads to motion sickness, vomiting, and increased intraocular pressure and pain.

11.1.2. Preflight/In-Flight Considerations.

11.1.2.1. Assess Extent of Visual Impairment/In-flight Risks.

11.1.2.1.1. Treatment/Management: Suspect air in the globe with recent surgery, and penetrating eye injuries with documented air in the globe (may also have associated facial trauma/ burns and head and C-Spine injuries).

11.1.2.1.1.1. Post-op eye surgery patients will be cleared by an ophthalmologist prior to flight.

11.1.2.1.1.2. Successful outcomes for penetrating eye injuries with documented air in the globe are highly dependent on rapid transportation to specialized care. Maintain a maximum cabin altitude of 2000 feet if operationally feasible. *NOTE:* The VFS considers the following prior to ordering a cabin altitude: Flying at lower altitudes decreases speed and increases fuel consumption; rapid transportation to definitive care takes precedence.

11.1.2.1.1.2.1. All penetrating eye injury patients will be on O₂ at 4 LPM via nasal cannula or mask while in-flight.

11.1.2.1.2. Hyphema or blood in the anterior chamber may re-bleed 2-7 days post injury. Re-bleeding may cause pain and substantial visual disability or blindness. *WARNING:* Val-salva is contraindicated in these patients.

11.1.2.1.3. Medication: Must be ordered on the appropriate patient treatment form and provided by the originating MTF.

11.1.2.1.3.1. Mydriatic drops (gtts): Dilates the pupil, impairs close vision, and increases sensitivity to light.

11.1.2.1.3.2. Miotics gtts: Constricts iris; may be ordered q 15 mins.

11.1.2.1.3.3. Ophthethic or Ophthaine gtts: Topical anesthetic with a potential loss of corneal/blink reflex, for diagnostic use only.

11.1.2.1.4. Do not patch eyes if bacterial or viral infections are suspected.

11.1.2.1.5. Patients with a severe detached retina or penetrating injury may have a physician's order for complete bedrest on a litter with the head immobilized, bilateral eye patches, and O₂ in-flight. **NOTE:** Place a protective metal eye shield or Styrofoam cup (trim to fit) over the affected eye.

11.1.2.1.5.1. Signs and symptoms of detached retina: light flashes, floating black spots, curtain like narrowing of peripheral vision.

11.1.2.1.5.2. If severe symptoms or injury are present, administer O₂ at 4 liters/min.

11.1.2.1.5.3. If MCA is greater than 4000 feet, O₂ may be ordered.

11.1.2.1.6. If vision worsens or pain and drowsiness develops en route:

11.1.2.1.6.1. Assess oxygenation. Administer high flow O₂.

11.1.2.1.6.2. Consider an altitude restriction if operationally feasible.

11.1.2.1.6.3. Contact TACC/AMOC/AOC/PMRC for guidance and possible diversion to a MTF capable of handling the situation, as required.

11.1.2.2. Other Factors for Patients with Eye Injuries.

11.1.2.2.1. May have diminished corneal/blink reflex: Use artificial tears as often as needed.

11.1.2.2.2. Consider a preflight anti-emetic for motion sickness.

11.1.2.2.3. May ambulate during enplaning/deplaning with assistance, if not contraindicated.

11.1.2.2.4. Position in seats away from emergency exits, near an able bodied individual, inboard, with the good eye toward the aisle. Positioning is the same for the blind patient.

11.1.2.2.5. Consider administering preflight nasal decongestant to prevent ear block.

11.1.2.3. Information for Patients with Vision Impairment.

11.1.2.3.1. Noise may be excessive and unfamiliar.

11.1.2.3.2. Clearing of ears on descent (swallowing and/or valsalva: squeeze nose closed, with the mouth closed, gently "blowing nose" on descent), if not contraindicated. **WARNING:** Valsalva is not performed by patients with acute eye injuries, post-op eye surgery, glaucoma or detached retina. These patients should be evaluated by a flight surgeon prior to flight and have decongestants available.

11.1.2.3.3. How to obtain assistance.

11.1.2.3.3.1. Emergency assistance from assigned able-bodied individual or AECM.

11.1.2.3.3.2. Meal/restroom assistance from assigned able-bodied individual or AECM.

11.1.2.4. **Seeing Eye Dogs.**

11.1.2.4.1. Must be trained and officially identified to accompany a visually impaired patient.

11.1.2.4.2. Must be harnessed, muzzled for safety, and remain at the master's feet.

11.1.2.4.3. Will not occupy a seat or be allowed in the galley area.

11.1.2.4.4. Position the dog inboard of the owner.

11.2. **Ears.**

11.2.1. **Stresses of Flight.**

11.2.1.1. Barometric Pressure Changes: Gas expansion or contraction affects the middle ear when pressure in the air filled cavities does not equalize with the cabin pressure. Equalization depends on the patency of the eustachian tube. During ascent, pressure is normally passively vented. During descent, the eustachian tube needs active "opening" as the pressure becomes negative.

11.2.1.2. Noise: Exposure for even a short period of time can lead to tinnitus, mild to severe pain, fatigue, and temporary to permanent hearing loss. Position away from high noise areas of aircraft and provide ear protection.

11.2.2. **Ear Block.** Potential patients at risk are: upper respiratory infections (URI), sinus infections, allergies, otitis media, on high-flow O₂, facial injury, nasal packing, infants, inability to use hands, post-eyes-nose-throat (ENT) surgery, difficulty swallowing, language barriers, unconscious/comatose patients. **WARNING:** Valsalva is contraindicated in patients with: glaucoma, recent eye surgery or injury, nasal/facial fractures, history of aneurysm, severe hypertension, cardiac disease and arrhythmias, and neurological disease with ICP. These patients should be evaluated by a flight surgeon prior to flight.

11.2.2.1. **Preflight Considerations.**

11.2.2.1.1. Prevention at originating MTF: Evaluate risk for ear block. Brief patient on signs and symptoms, as well as techniques to prevent potential ear block (if not contraindicated), and to notify AECM immediately if difficulty in clearing ears occurs. **NOTE:** Blast victims should be evaluated and treated for possible infection and trapped air following ruptured tympanic membranes; tape dressing to absorb blood and fluid from the external ear canal, and assure it does not block or enter the external canal.

11.2.2.1.2. Prevention techniques. The following may help prevent ear blocks on descent: swallowing; yawning, moving jaw from side to side; chewing gum (avoid on ascent); Toynbee maneuver (swallowing water with the nostrils closed); Valsalva; turn head away from the blocked ear while stretching the opposite ear to the shoulder

(stretches the Eustachian tube of the blocked ear), and while in this position, have the patient valsalva.

11.2.2.1.3. Assess for signs/symptoms: fullness, pain (mild to severe), pressure in ear(s), decreased hearing (mild to acute), vertigo, tinnitus, and severe pain (indicates possible rupture of the eardrum that provides relief, but may lead to shock).

11.2.2.1.4. Treatment/Management: Pre-medicate with oral or nasal decongestants unless contraindicated.

11.2.2.1.5. FN may delay transport if patient is unable to “clear” ears or if an altitude restriction is required but operationally unrealistic. Notify TACC/AMOC/AOC/PMRC.

11.2.3. In-flight Considerations.

11.2.3.1. Ensure parents of infants/children have full bottle or glass with straw to aid in clearing of ears.

11.2.3.2. Assist any patient/passenger with clearing ears using the above techniques.

11.2.3.3. Use warm moist cloth to neck just below the ear or massage area just below the ear (near the jaw).

11.2.3.4. If unable to clear ears during descent, have the AC re-ascend and slow the rate of cabin descent, if operationally possible.

11.2.3.5. **The FN May Administer in Conjunction with Above Interventions.** Refer to [7.4](#)

11.2.3.5.1. **Afrin Nasal Spray (oxymetazoline) x 2 sprays to each nare every 12 hours.**

11.2.3.5.1.1. Use cautiously in cardiac disease, diabetes mellitus, and hyperthyroidism, as systemic absorption may occur. **NOTE:** Pregnancy risk is unknown.

11.2.3.5.1.2. Onset is usually within 20-30 minutes.

11.2.3.5.2. **Sudafed (pseudoephedrine) 60 mg PO, for adults only.**

11.2.3.5.2.1. Contraindicated in severe hypertension or severe coronary artery disease, and lactating women. Use caution in hypertension, cardiac disease, diabetes, glaucoma, and the elderly. **NOTE:** Pregnancy risk is unknown.

11.2.3.5.2.2. Onset is usually within 20-30 minutes.

11.2.3.5.3. **Neo-synephrine (phenylephrine) 0. 24% nasal drops x 1-2, for pregnant women and children (6-12).** Use caution, as above.

11.2.3.5.3.1. Onset is usually within 20-30 minutes.

11.2.3.5.4. **Neosynephrine (phenylephrine) 0. 124% nasal drops x 2 (dilute the 0.24 neo- synephrine 1:1 with normal saline, for Pediatrics (under 6)).** Use caution, as above.

11.2.3.5.4.1. Onset is usually within 20-30 minutes.

11.2.3.5.5. **Meclizine 25 mg PO once daily.**

11.2.3.5.5.1. Onset is usually within 60 minutes.

11.2.3.6. Use Politzer Bag to clear the ears if the above is unsuccessful. Refer to AFI 41-309. **WARNING:** Contraindicated for post-operative nasal surgery, mid-face fractures and acute head injuries.

11.2.3.7. Document and reassess patient after landing. Requires on going evaluation if there are other en route stops.

11.2.3.7.1. Assess if the patient able to continue flight and if an evaluation by a flight surgeon is required: Able to clear ears and is pain free.

11.2.3.8. Direct patient and MTF representative to seek medical follow up at mission destination medical facility.

11.3. Nose.

11.3.1. Stresses of Flight.

11.3.1.1. Barometric Pressure Changes: Any obstruction of the nasal passage can result in an ear/sinus block (i.e. facial fractures, nasal packing, nasopharyngeal tube and/or nasogastric tube).

11.3.1.2. Decreased Humidity: Can cause drying of mucous membranes, thickening of secretions and increased risk of epistaxis (nosebleed).

11.3.1.3. Vibration: May cause pain and increased bleeding in facial fracture patients.

11.3.2. **Preflight/In-Flight Considerations.** **WARNING:** Valsalva is contraindicated in post-operative nasal surgery, mid-face fractures and acute head injuries. The Politzer bag will be not used on these patients.

11.3.2.1. Assess for active bleeding in upper airways (epistaxis or facial fractures).

11.3.2.2. Treatment/Management.

11.3.2.2.1. **Anterior Bleeding (Most common).**

11.3.2.2.1.1. Lean forward in a sitting position and encourage mouth breathing.

11.3.2.2.1.2. Pinch nostrils 4-10 minutes, and place cold packs to the posterior neck and bridge of nose, if available.

11.3.2.2.2. **Posterior Bleeding.**

11.3.2.2.2.1. Sit up to allow drainage.

11.3.2.2.2.2. Monitor vital signs; may be hypertensive.

11.3.2.3. Initiate IV for blood loss greater than 240cc.

NOTE: If nasal packing is present, leave in place. If a Foley is being used for nasal packing, have the physician fill it with normal saline prior to flight.

11.3.2.4. Premedicate with a decongestant prior to flight (if not contraindicated).

11.3.2.5. May require an altitude restriction.

11.3.2.6. Force fluids en route.

11.4. Maxillofacial/Sinus Block/Teeth.

11.4.1. Stresses Of Flight.

11.4.1.1. Barometric Pressure Changes: Gas may become trapped or partially trapped in sinuses and teeth, increasing pain.

11.4.1.2. Decreased Humidity: Causes mucous membranes to dry out leading to pain and/or discomfort.

11.4.1.3. Vibration: May increase pain and exacerbate underlying condition.

11.4.2. Preflight/In-flight Considerations.

11.4.2.1. Maxillofacial Assessment/Treatment/Management.

11.4.2.1.1. Jaw Immobilization: Assess for type of immobilizer and release mechanisms. Have suction setup and available.

11.4.2.1.1.1. Wired Jaw - ensure wire cutters or scissors are attached to the patient.

11.4.2.1.1.2. Quick Release Mechanism - ensure the patient and AECMs know how to operate.

11.4.2.1.1.3. Antiemetics to prevent vomiting.

11.4.2.1.1.4. Release the jaws when vomiting is likely. Re-stabilize with cravat or Kerlix.

11.4.2.1.1.5. Liquid diet.

11.4.2.1.1.6. Elevate head of litter or sit in seat.

11.4.2.1.1.7. Mouth care.

11.4.2.2. Pharyngeal injuries less than 72 hours old should have a tracheostomy prior to flight.

11.4.3. **Sinus Block.** Sinuses normally equalize and vent during ascent. On descent, individuals who are at risk for problems and sinus blocks are more likely to have colds, allergies, and chronic or acute sinus conditions.

11.4.3.1. Preflight/In-Flight Considerations.

11.4.3.1.1. Prior to flight, brief patients on signs and symptoms, and how to notify AECMs.

11.4.3.1.2. Assess for Signs/Symptoms: include pain (mild to severe), burning sensation, tenderness over the affected sinus, bloody/mucopurulent discharge, teary eyes, and a sucking/ crackling noise in the sinus area.

11.4.3.1.3. Treatment/Management.

11.4.3.1.3.1. Premedicate with oral analgesic or mild vasoconstrictors. Refer to paragraph [11.2.3.5](#)

11.4.3.1.3.2. Position in a seat or with head of litter elevated.

11.4.3.1.3.3. Provide humidification; force fluids.

11.4.3.1.3.4. If sinus block occurs, treatment includes:

11.4.3.1.3.4.1. Re-ascend and slow the rate of cabin descent, if possible.

11.4.3.1.3.4.2. Administer mild vasoconstrictors. Refer to paragraph [11.2.3.5](#)

11.4.3.1.3.4.3. Observe for relief of pain and pressure, and for bleeding/drainage.

11.4.3.1.3.5. Evaluation by a flight surgeon at en route stop or RON to assess whether the patient may continue with the mission.

11.4.3.1.3.6. If the patient continues on the mission, coordinate slower descents and provide patient with vasoconstrictor for the subsequent descents; may require an altitude restriction. Observe for bleeding/drainage. **NOTE:** Valsalva and using the Politzer Bag may not be effective because of the very small openings and passageways into the sinuses. With irritation and inflammation these openings and passages swell quickly. Valsalva and using the Politzer bag may actually increase the patient's pain.

11.4.4. **Teeth.** Tooth pain may be associated with trapped gas in a decayed tooth or pressure on the tooth below the blocked sinus.

11.4.4.1. May require an altitude restriction until tooth is evaluated and treated. Have a flight surgeon evaluate the patient prior to flight.

11.4.4.2. If pain occurs at altitude, descend until pain is diminished, if operationally possible.

11.4.4.2.1. Document and communicate with receiving MTF for further evaluation.

11.4.4.2.2. Instruct patient/passenger to seek medical attention at final destination.

Chapter 12

GASTROINTESTINAL/GENITOURINARY/TUBE MANAGEMENT

12.1. Gastrointestinal (GI) Considerations.

12.1.1. Stresses of Flight.

12.1.1.1. Barometric Pressure Changes: Gas expansion may cause abdominal discomfort, decreased lung expansion and volume, nausea and vomiting, and may require nasogastric tube decompression preflight or in-flight. If on a continuous feeding, allow for venting.

12.1.1.2. Vibration: May exacerbate patient's underlying condition or diagnosis.

12.1.1.3. Thermal: Underlying condition or diagnosis may make the patient more sensitive to thermal changes and more susceptible to motion sickness.

12.1.1.4. Fatigue: May exacerbate the patient's condition due to the overall effect of the previously mentioned stresses of flight and length of time the patient has been in the AE system.

12.1.2. Motion Sickness.

12.1.2.1. Organic Motion Sickness.

12.1.2.1.1. Caused by disease processes affecting the inner ear that result in sensitivity to labyrinth stimulation.

12.1.2.2. Non-Organic Motion Sickness.

12.1.2.2.1. Caused by turbulence, hypoxia, fear, emotional stress, odor, heat, visual stimuli, reactive hypoglycemia, an empty stomach, self-imposed stresses, dehydration, caffeine, and carbonated drinks.

12.1.2.2.2. Assess for signs and symptoms: Headache, apathy, pallor, diaphoresis, nausea, and vomiting.

12.1.2.3. Preflight/In-flight Considerations for Motion Sickness.

12.1.2.3.1. Administer Preflight antiemetics 30-60 minutes prior to Flight.

12.1.2.3.1.1. The FN may administer Dramamine (**dimenhydrinate**) **50 mg**.

12.1.2.3.1.1.1. An antihistamine that may affect the neural pathways originating in the labyrinth, thus inhibiting nausea and vomiting.

12.1.2.3.1.1.2. Side effects: CNS depression, headache, dizziness, palpitations, hypotension, dry mouth and respiratory passages, drowsiness, and blurred vision.

12.1.2.3.1.1.3. Avoid use with other CNS depressants. Use caution in seizures, glaucoma and enlargement of the prostate. **NOTE:** Use extreme discretion in pregnancy.

12.1.2.3.1.2. Instruct patient to take slow, deep, and relaxing breaths to decrease anxiety and sympathetic tone.

12.1.2.3.1.3. Restrict head movements.

12.1.2.3.1.4. Have patient visually fixate on a stationary object.

12.1.2.3.1.5. Cool the cabin and/or the patient (cool compresses, open airvents).

NOTE: If patient is vomiting, keep NPO, and consider starting an IV of RL or NS. Contact the TACC/ AMOCC/AOC/PMRC for IM or rectal suppository medication and an IV, if symptoms are severe.

12.1.3. GI Conditions.

12.1.3.1. **Acute Abdomen.** Current and past disease processes may present or exacerbate in-flight. History includes but is not limited to previous abdominal surgeries, adhesions, intestinal obstruction, neoplasms, ulcerative colitis, kidney disease, cardio-pulmonary disease, pregnancy, and stroke.

12.1.3.1.1. Assess for signs and symptoms: fever, chills, abdominal pain, nausea, vomiting (bilious, feculent, blood, and/or coffee-ground appearance), dysuria, and hematuria. There may also be fluctuations in blood pressure.

12.1.3.1.2. Preflight/In-flight Considerations for the Acute Abdomen.

12.1.3.1.2.1. Assesses vital signs, bowel sounds and percuss the abdomen preflight; assessment is limited in-flight.

12.1.3.1.2.2. Treatment/Management.

12.1.3.1.2.2.1. NPO. Monitor I&O.

12.1.3.1.2.2.2. Insert a nasogastric tube if gastric distention, and nausea and vomiting are severe, and/or if the airway may be compromised. **NOTE:** If symptoms occur pre- flight – the patient is not stable, notify TACC/AMOCC/AOC/PMRC. If symptoms occur in-flight, initiate treatment and notify TACC/AMOCC/AOC/PMRC for guidance and possible diversion to a MTF capable of handling the situation.

12.1.3.2. **GI Bleeding.** Seen in trauma to the GI tract; inflammatory and ulcerative disease; response to stress; varices; alcohol and aspirin compounds; anticoagulants for coagulation abnormalities, DVT, and heart valve replacement; neoplasms; and hemorrhoids or fissures.

12.1.3.2.1. Assess for signs and symptoms: bright red or “coffee ground” emesis, tarry stool or coating of stool.

12.1.3.2.2. Preflight/In-flight Considerations for GI Bleeding.

12.1.3.2.2.1. Usually will not be airlifted less than 3 days post GI bleed. Should not have orthostatic postural changes (measure BP and Pulse: supine-to-sitting-to-standing; a twenty-point pulse increase or a systolic 10% decrease is positive).

12.1.3.2.2.2. Treatment/Management.

12.1.3.2.2.2.1. NPO. Monitor I&O.

12.1.3.2.2.2.2. NG tube will not have active bleeding or coffee ground material pre- flight.

12.1.3.2.2.2.3. IV access for medications and fluid replacement.

12.1.3.2.2.2.4. Should have a preflight H&H (Hgb 10 and HCT 30) and O2 at 2-4 LPM in-flight. Patients with a HCT below 24% should receive blood product replacement prior to flight.

12.1.3.2.2.2.5. Obtain pre-flight vital signs, including pulse oximetry.

12.1.3.2.2.2.6. **Onset of Upper GI Bleeding In-Flight.** Refer to Signs and Symptoms above. Initiate treatment and notify TACC/AMOC/AOC/PMRC for guidance and possible diversion to a MTF capable of handling the situation.

12.1.3.2.2.2.6.1. Maintain Airway, Breathing and Circulation. Assess vital signs and pulse oximetry.

12.1.3.2.2.2.6.2. Administer high flow O2 to maintain pulse oximetry at or above 91%.

12.1.3.2.2.2.6.3. Start Ringers Lactate or Normal Saline with large bore IV access to maintain blood pressure, heart rate and urine output. Consider using blood infusion tubing.

12.1.3.2.2.2.6.4. Litter for comfort.

12.1.3.2.2.2.6.5. NPO. Monitor I&O.

12.1.3.2.2.2.6.6. Assess and address the underlying cause.

12.1.3.2.2.2.6.7. Consider NG tube insertion.

12.1.3.2.2.2.6.8. Divert as needed.

12.1.4. **Chronic GI Conditions.**

12.1.4.1. Bowel Inflammation.

12.1.4.2. Diarrhea and Enteritis (Crohn's Disease and Ulcerative Colitis).

12.1.4.2.1. Consider proximity to bathroom, medications, hydration, and diet restrictions.

12.1.4.3. Peptic Ulcer: monitor H&H and observe for signs of acute GI Conditions.

12.1.4.4. **Preflight/In-flight Considerations for Chronic GI Conditions.**

12.1.4.4.1. Special diet; make certain the diets are onboard.

12.1.4.4.2. Ostomy patients may have more bowel movements due to gas expansion.

12.1.4.4.2.1. Ensure patient has extra bags, wafers and stoma adhesive.

12.1.4.4.2.2. Empty contents preflight.

12.1.4.4.2.3. Advise patient to expect an increase in flatus and stool during ascent and in-flight.

12.1.4.4.2.4. **NOTE:** Vent collection bag to avoid excess gas from dislodging the bag from the stoma wafer. Using a straight pin, puncture two holes in the

ostomy bag, above the wafer ring. Patient may be self conscious about the odor emanating from the vented bag.

12.1.4.4.3. Observe for abdominal distention.

12.1.4.4.3.1. Actions to relieve symptoms of abdominal distention.

12.1.4.4.3.1.1. Ambulate or change positions.

12.1.4.4.3.1.2. If lower abdominal area, have patient roll fist from RUQ to LUQ of abdomen to move flatus.

12.1.4.4.3.1.3. Insert a catheter no more than 2 inches into stoma to relieve gas buildup. Do not irrigate the colostomy in-flight. **NOTE:** Follow surgeon's orders for fresh post-op stoma care.

12.1.5. DELETE

12.1.5.1. DELETE

12.1.5.2. DELETE

12.1.5.3. DELETE

12.1.5.4. DELETE

12.1.5.5. DELETE

12.1.5.6. DELETE

12.1.5.6.1. DELETE

12.1.5.6.2. DELETE

12.1.5.6.3. DELETE

12.1.5.7. DELETE

12.1.5.7.1. DELETE

12.1.5.7.2. DELETE

12.1.5.7.2.1. DELETE

12.1.5.7.3. DELETE

12.2. Urinary Disorders.

12.2.1. Stresses of Flight.

12.2.1.1. Decreased Partial Pressure of Oxygen: May compromise underlying anemia.

12.2.1.2. Barometric Pressure Changes: May increase nausea and pain from gastric distention.

12.2.1.3. Decreased Humidity: Leads to dehydration.

12.2.1.4. Fatigue: Exaggerates underlying condition.

12.2.2. Nephrolithiasis (renal stone disease)/Urolithiasis (stones in the urinary system).

12.2.2.1. Preflight/In-flight Considerations.

12.2.2.1.1. Pain management.

12.2.2.1.2. Antiemetics.

12.2.2.1.3. IV fluids as needed.

12.2.2.1.4. Avoid milk products and force fluids.

12.2.2.1.5. Observe for anuria, hematuria, dysuria, oliguria, and signs and symptoms of urinary tract infection (UTI).

12.2.3. Renal Failure.

12.2.3.1. Preflight/in-flight Considerations.

12.2.3.1.1. O2 available.

12.2.3.1.2. Special diet and fluid restriction as ordered.

12.2.3.1.3. Document intake and output.

12.2.3.1.4. Peritoneal dialysis-cycling as directed. Refer to Lippincott. Assess site for signs of infection.

12.2.3.1.5. Hemodialysis- vascular access is present with internal and external shunts. A bruit or a “thrill” may be felt over the blood vessel or tubing and/or auscultated with a stethoscope. Assess site for infection. Assess distal circulation and neurological status.

12.2.3.1.6. Protect access site from cold, pressure, venipunctures, disconnection, and infection. **WARNING:** Do not flush or use for IV access. Do not take BP on same extremity as the shunt.

12.2.3.1.7. Have clamps available for external shunts to control bleeding if disconnected.

12.2.4. Foley Catheter/Suprapubic Catheters/Ile conduit.

12.2.4.1. Empty and measure prior to flight.

12.2.4.2. Drainage bag needs to be lower than the site in order to drain properly and not on floor. Consider covering drainage bags.

12.2.4.3. Document I & O.

12.3. DELETED.

Chapter 13

MANAGEMENT OF OBSTETRICS/ IN-FLIGHT CHILD BIRTH

13.1. Stresses Of Flight.

13.1.1. Decreased Partial Pressure of Oxygen: May cause an increase in cardiac workload with a decrease in diaphragmatic excursion. Lower concentration of O₂ to the placenta results in fetal hypoxia.

13.1.2. Barometric Pressure Changes: Gas expansion may cause pain and uterine irritability and decrease capacity for lung expansion.

13.1.3. Noise/Vibration: May increase seizure risk in preeclamptic and eclamptic patients, and may cause uterine irritability and excessive stimulation and movement of the fetus.

13.1.4. Decreased Humidity: Dehydration may induce or complicate pre-term labor.

13.1.5. Fatigue: Excess weight, physiological changes, overall affects of the previously mentioned stresses, and the length of time in the AE system fatigues the patient.

13.1.6. G-Forces: May result in pushing fetus onto the maternal vena cava or the placenta.

13.2. General Considerations.

13.2.1. Patients who are beyond the 34th week of pregnancy are not routinely accepted for AE, but will be moved if determined necessary by a physician. **NOTE:** An incubator will be carried and ready to use on board the aircraft.

13.2.2. Patients in premature labor or with prematurely ruptured membranes may be airlifted after labor is controlled on a case-by-case basis.

13.2.3. A physician or a competent obstetrical nurse may be required to accompany a high-risk OB patient.

13.2.4. **Patient Positioning** : Strict bedrest, as directed, in the left lateral recumbent (LLR) position. Ambulatory, place a small pillow between the seatbelt and the lower abdomen, across the hips. Should have a litter available.

13.2.5. Supplies and Equipment.

13.2.5.1. Universal OB pack/bulb syringe.

13.2.5.2. ALSS, (Refer to AFI 41-309).

13.2.5.3. Oxygen and suction available.

13.2.5.4. Doppler/Doptone.

13.2.5.5. Pulse Oximeter.

13.2.5.6. Privacy curtain.

13.2.5.7. IV Infusion Pump.

13.2.5.8. Cardiac Monitor.

13.2.6. A post partum mother may accompany an infant to more definitive care. Assure medication and supplies accompany the patient. If determined to be unstable, notify TACC/AMOC/AOC/ PMRC for guidance and possible diversion to a MTF capable of handling the situation.

13.3. Preflight Assessment and Documentation: Includes the following:

13.3.1. Maternal vital signs, to include preflight pulse-oximetry, temperature, and breath sounds if indicated. Note any presence of edema.

13.3.2. Expected Date of Confinement (EDC)/Gestational age; current OB history (gravida, parity, and abortions) and previous OB history (previous complications, vaginal or cesarean section).

13.3.3. Onset, duration, frequency and intensity of contractions, if present. The presence of back, pel- vic and/or rectal pain.

13.3.4. Membranes intact; if not, note time of rupture, amount, color and odor.

13.3.5. Assess for active bleeding; estimate the amount.

13.3.6. Presentation, last vaginal exam/cervical status, if indicated. **NOTE:** Do not attempt a vaginal exam.

13.3.7. Preflight urinalysis (protein and sugar). **13.3.8 Fetal Heart Tones (FHTs;** Normal range for FHTs: 120-160/minute): Obtained prior to flight, reassess at cruise altitude, and every 12 hours there- after. Documentation of FHTs and fetal movement will be accomplished starting at the 20th week of gestation.

13.3.8. Other significant medical history: age, diabetes, headache, epigastric pain, cardiac disease, seizures, hypertension, smoking, and alcohol and drug abuse.

13.4. Treatment/Management Priorities, Preflight, and In-flight Considerations for High-Risk OB. A qualified medical attendant will usually accompany these types of patients.

13.4.1. Maintain adequate oxygen transport across the placenta to the fetus.

13.4.1.1. Keep on litter, off back and in the LLR position. If mother must be on back, use pillow to promote uterine displacement and relieve pressure on the superior vena cava, which can lead to hypotension and decreased oxygen flow to the fetus.

13.4.2. Vital signs appropriate to stage of labor, to include FHT via doppler/doptone. Assess FHT for one full minute during and after contractions; note location and character, and any slowing or irregu- larities. **NOTE:** Assess FHTs immediately after rupture of membranes.

13.4.3. **Management of Magnesium Sulfate (MgSO₄) Infusion** (for preterm labor or pregnancy induced hypertension).

13.4.3.1. Monitor maternal blood pressure, respirations, accurate intake and output, and deep ten- don reflexes (DTRs). **NOTE:** Obtain during preflight assessment and hourly or as ordered to iden- tify early congestive heart failure (CHF), pulmonary edema, sepsis, seizures, and adult respiratory disorder.

13.4.3.2. Pre-flight H and H, urinalysis (protein and sugar) and serum MgSO₄.

13.4.3.3. Oxygen, Ambu/Laerdal bag, and intubation equipment/supplies available.

13.4.3.4. IV access - central line (preferably) and arterial line/Swan Ganz (SG) may be present (insure balloon is deflated in SG prior to take-off).

13.4.3.4.1. Infusion Pumps: Mainline/MgSO₄ infusion.

13.4.3.5. Foley catheter should be in place to monitor strict I & O. **NOTE:** Consider LLR position when monitoring Foley output.

13.4.3.6. Calcium gluconate for MgSO₄ toxicity. **NOTE 1:** Must be ordered on the patient treatment form and provided by the originating MTF. **NOTE 2:** Not a part of the in-flight medical kit.

13.4.4. MgSO₄ Toxicity.

13.4.4.1. Be vigilant for loss of DTRs, pulse less than 60/min; BP less than 90 mmHg/systolic; urine output less than 30cc/hour.

13.4.4.2. Treatment/Management. Notify TACC/AMOC/AOC/PMRC for guidance and possible diversion to a MTF capable of handling the situation and concurrently:

13.4.4.2.1. Discontinue the MgSO₄ infusion for severe CNS depression (lethargy, slurred speech) or respirations less than 12 bpm.

13.4.4.2.2. Place on cardiac monitor.

13.4.4.2.3. Administer calcium gluconate 10% solution, per physician's order (usually 1 gram), slow IVP over 3 minutes. **WARNING:** May produce cardiac arrhythmia, bradycardia or cardiac arrest. Stop infusion if chest pain occurs. If treatment is initiated, concurrently contact TACC/AMOC/AOC/PMRC for guidance and possible diversion to a MTF capable of handling the situation, as required. **NOTE:** This is not an AE Drug Protocol.

13.4.5. **Seizure Precautions.** Refer to Neurological Management. **NOTE:** Management of the maternal airway and adequate oxygenation of the fetus across the placenta takes precedence as soon as an airway is established.

13.4.5.1. Anticonvulsant drug therapy as ordered by the accompanying physician.

13.5. Gestational Diabetes (Insulin dependent): Labor increases metabolic needs, be aware of the signs and symptoms of hyper/hypoglycemia. Refer to Medical Management.

13.5.1. Treatment/Management (If in labor).

13.5.1.1. Continuous insulin or glucose infusions with mainline Lactated Ringers will stabilize maternal glucose levels and may reduce neonatal hyperglycemia (Insulin is discontinued at delivery).

13.5.1.2. Maintain NPO.

13.5.1.3. Evaluate glucose levels prior to take off and as ordered at en route stops; maintain levels at 80 to 120 mg. **NOTE:** Terbutaline is contraindicated for an insulin-dependent diabetic because of its transient hyperglycemic effects.

13.6. Pregnancy Induced Hypertension (PIH). Complications include decreased placental perfusion. In-patient record and/or narrative summary is essential.

13.6.1. Treatment/Management Priorities.

13.6.1.1. Assess Signs and Symptoms:

13.6.1.1.1. BP greater than 140/90mm Hg.

13.6.1.1.1.1. 30mm rise in systolic over baseline.

13.6.1.1.1.2. 15 mm rise in diastolic over baseline.

13.6.1.2. Positive proteinuria.

13.6.1.3. Weight gain greater than 2 lbs per wk/plus edema.

13.6.1.4. Epigastric pain.

13.6.1.5. Subjective complaint of headache.

13.6.1.6. Visual disturbances (seeing “spots”).

13.6.1.7. Oliguria (less than 30 cc/hr).

13.6.1.8. **HELLP Syndrome** - extension of PIH diagnosed in third trimester.

13.6.1.8.1. H - hemolysis, decreased hematocrit

13.6.1.8.2. EL - elevated liver enzymes (SGOT/SGPT)

13.6.1.8.3. LP - low platelets (less than 100,000)

13.6.1.9. Hyper-reflexia

13.7. Preterm Premature Rupture of Membranes (PPROM): Occurs before 36 weeks gestational age; (premature rupture of membranes occur after 36 weeks gestational age and before desired onset of labor).

13.7.1. Treatment/Management: **NOTE:** Sterile Vaginal Exams should not be performed in-flight, **except** if it is deemed necessary to check for prolapsed umbilical cord and is it performed by a experienced obstetric provider.

13.7.1.1. Place a dry pad under the patient’s hips and observe for leakage.

13.7.1.2. Keep patient on the litter in LLR position and monitor and document hourly vital signs pulse oximetry, temperatures and FHTs.

13.7.1.3. If patient complains of ruptured membranes in flight, visually check for prolapsed umbilical cord.

13.7.1.3.1. Place patient on litter in LLR position.

13.7.1.4. Should have IV infusing to keep open (TKO).

13.8. Abruptio Placenta: Premature separation of the normally implanted placenta. Primary cause is unknown, possible etiologies include history of hypertension, rapid decompression of the uterine cavity; short umbilical cord, presence of a uterine anomaly, and/or trauma. There are two types:

13.8.1. Concealed Hemorrhage: The placenta separates centrally and a large amount of blood accumulates under the placenta.

13.8.1.1. Signs and Symptoms: Change in maternal vital signs; no visible signs of hemorrhage are present.

13.8.2. External Hemorrhage: The placenta separates along the placental margin, and blood flows under the membranes and through the cervix.

13.8.2.1. Signs and Symptoms: Abdominal pain is often present along with maternal hemorrhage and change in vital signs. The fetal heart rate may vary with the degree of hemorrhage.

13.8.3. Assessment.

13.8.3.1. Determine the amount and type, color of bleeding and the presence or absence of pain.

13.8.3.2. Monitor maternal and fetal vital signs.

13.8.3.3. If contractions are present: Palpate the abdomen, noting the presence and strength of contractions and relaxation between contractions.

13.8.3.4. If contractions are NOT present: Assess the abdomen for firmness.

13.8.3.5. Measure and record fundal height to evaluate presence of concealed bleeding.

13.8.4. Treatment/Management. In-Flight Medical Emergency. Notify TACC/AMOC/AOC/PMRC for guidance and possible diversion to a MTF capable of handling the situation.

13.8.4.1. Depends on extent of maternal hemorrhage; the goal is to preserve the maternal life and fetus. Refer to Shock Management.

13.8.4.2. Monitor vaginal bleeding and evaluate fundal height to detect an increase in bleeding.

13.9. Placenta Previa: Is the development of the placenta in the lower uterine segment, partially or completely covering the internal cervical os.

13.9.1. Assess Signs and Symptoms:

13.9.1.1. Painless vaginal bleeding (usually appears near the end of the second trimester).

13.9.1.2. Initial episode usually stops spontaneously.

13.9.1.3. Subsequent bleeding episodes are more profuse than the previous one.

13.9.2. Assessment.

13.9.2.1. Determine the amount and type of bleeding. Obtain vital signs and pulse oximetry.

13.9.2.2. Review history of bleeding throughout this pregnancy.

13.9.2.3. Ascertain the presence/absence of pain associated with bleeding.

13.9.2.4. Palpate for the presence of uterine contractions.

13.9.2.5. Evaluate lab data on H& H (if available).

13.9.3. Treatment/Management. In-Flight Medical Emergency. Notify TACC/AMOC/AOC/PMRC for guidance and possible diversion to a MTF capable of handling the situation.

13.9.3.1. Maintain **strict** bed rest.

13.9.3.2. Assess odor of all vaginal discharge. **WARNING:** Do not perform vaginal examinations on an OB patient who is bleeding. This patient may be at high risk for hemorrhage.

13.10. Preterm Labor (PTL): Defined as: Regular and rhythmic contractions (more than 6 per hour) producing cervical changes after the 20th week of gestation and prior to the 37th week. Suspect PTL if contractions are 10 minutes apart or less for a period of one hour or longer.

13.10.1. Assess Signs and Symptoms:

13.10.1.1. Uterine contractions.

13.10.1.2. Menstrual-like cramps.

13.10.1.3. Abdominal or intestinal cramps (with or without diarrhea).

13.10.1.4. Pelvic pain or pressure.

13.10.1.5. Suprapubic pressure.

13.10.1.6. Increased vaginal discharge.

13.10.1.7. Backache unresponsive to postural changes.

13.10.1.8. Ruptured membranes “Bloody show” (pink or red vaginal bleeding). **NOTE:** Cervical exams should not be performed by untrained personnel or if there is a question if the membranes have ruptured.

13.10.2. Treatment/Management: Coordinate with the aircraft commander and TACC/AMOC/ AOC/PMRC for guidance and possible diversion to the nearest MTF with Level II or Level III nursery (MTFs equipped with the medical staff and equipment to care for the delivery of a preterm infant).

13.10.2.1. Place patient in a LLR position.

13.10.2.2. Start IV with large bore catheter (Lactated Ringers at 125 cc/hr).

13.10.2.3. Tocolytic therapy, as ordered, if PTL progresses. Examples of tocolytics include PO, IV or SC Terbutaline Sulfate and Magnesium Sulfate IV or IM.

13.11. In-Flight Considerations & Care for Unexpected Labor & Delivery.

13.11.1. Patient Positioning.

13.11.1.1. If a litter patient: Secure privacy curtain. If another patient is underneath the expectant mother; try to move the lower patient to facilitate care and privacy.

13.11.1.2. If ambulatory. Move patient to a litter.

13.11.2. Set up supplies and equipment.

13.11.3. Start coaching the mother: Coach should be a medical or non-medical attendant accompany- ing patient or an AECM.

13.11.4. Start Flowchart: Obtain maternal vital signs and FHTs q 15 mins.

13.11.5. If the patient or the fetus is determined to be unstable or if active labor starts en route:

13.11.5.1. Place mother on a litter in the LLR position; keep litter space below open if possible.

13.11.5.2. Start an IV of Ringer's at 125cc/hour depending on hydration and renal, cardiac, and pulmonary status.

13.11.5.3. Administer high flow O2 to maintain pulse oximetry at 98%.

13.11.5.4. Coordinate with AC and contact TACC/AMOC/AOC/PMRC for guidance and possible diversion to a MTF capable of handling the situation. Request the receiving facility send qualified medical personnel to the aircraft.

13.11.5.5. **Actual Delivery and Childbirth.** Follow Lippincott.

13.11.5.5.1. **Immediate Care of the Newborn.** Refer to paragraph, [13.13](#)

13.11.5.5.2. Place the placenta in towel/chux pad and then into a red biohazard bag with label. The placenta will offloaded with the patient and will not be discarded.

13.11.5.5.3. **Documentation.** Start a new DD Form 602/DD Form 1380/AF Form 3899, AE Patient Record, for the infant, and annotate the following:

13.11.5.5.3.1. Time of birth (local and Zulu time).

13.11.5.5.3.2. Geographical location (obtain latitude and longitude at the time of birth from aircraft commander).

13.11.5.5.3.3. APGAR Score at one and five minutes post birth (Refer to [Table 13.1](#)).

13.11.5.5.3.4. Document "no vitamin K or ophthalmic ointment was given."

13.11.5.5.3.5. Add infant to the AF Form 3830, **Patient Manifest**.

13.11.5.5.3.6. On mothers DD Form 602/DD Form 1380/AF Form 3899, annotate the following:

13.11.5.5.3.6.1. Course of Labor.

13.11.5.5.3.6.1.1. Time of birth (local and Zulu time).

13.11.5.5.3.6.1.2. Time of placenta delivery (local and Zulu time).

13.11.5.5.3.6.1.3. Fundal and lochia checks, and vital signs q 15 mins x 4, then hourly as needed.

13.11.5.5.3.7. Annotate events on AF Form 3829.

13.12. Delivery Complications.

13.12.1. **Breech Presentation.** This involves the bony pelvis area and extremities (one or both feet or knees may be present). There is a high incidence in multiple birth deliveries and hydrocephalus. Breech presentation is likely to have cord prolapse, entanglement and compression. Labor is usually slower in breech presentation.

13.12.1.1. Treatment/Management.

13.12.1.1.1. Aggressive coaching to prevent pushing.

13.12.1.1.2. Check for presence of cord and palpate for pulse.

13.12.1.1.3. If Delivery is Imminent:

13.12.1.1.3.1. Do not touch fetus until umbilicus is delivered then disentangle the cord.

13.12.2. **Postpartum Hemorrhage.**

13.12.2.1. Assess Signs and Symptoms. Refer to Shock Management.

13.12.2.1.1. Normal physiologic changes in pregnancy may mask hypovolemia.

13.12.2.1.2. Greater than 4 - 6 pads per hour indicates a high volume of blood loss.

13.12.2.1.3. Increase in fundal height and a non-palpable bladder.

13.12.2.1.4. Boggy fundus.

13.12.2.2. Treatment/Management.

13.12.2.2.1. Massage fundus.

13.12.2.2.2. Put baby to breast.

13.12.2.2.3. **Do not** place anything in vagina.

13.12.3. **Prolapsed Cord.** Cord slips in front of or alongside the presenting fetal part. May occur when there is inadequate room between the fetal parts and the maternal pelvis. Predisposing factors: rupture of membranes when the fetus is not engaged in the pelvis; shoulder and foot presentations; prematurity and hydramnios. **NOTE:** Suspect with FHT deceleration/bradycardia after rupture of the membranes.

13.12.3.1. Assessment Signs/Symptoms: Cord visualized or palpated in the vagina, variable deceleration/bradycardia of FHTs with contractions or between contractions, and cord is exposed to cold room air resulting in a reflex constriction and a decrease of O₂ to the fetus.

13.12.3.2. Management/Treatment:

13.12.3.2.1. If the Cord Is **NOT** Visualized or Palpated:

13.12.3.2.1.1. Place patient in LLR or LLR Trendelenberg.

13.12.3.2.1.2. Monitor vital signs, O₂ saturation and FHTs.

13.12.3.2.2. If the Cord **IS** Visible:

13.12.3.2.2.1. Don sterile gloves and apply upward manual pressure to presenting part to lift off the cord. **WARNING:** Do not discontinue upward manual pressure unless directed by a physician.

13.12.3.2.2.2. Place patient in knee chest or deep Trendelenberg position (latter preferred for aircraft landing).

13.12.3.2.2.3. Have MA or AECM remain with patient during descent and landing.

13.12.4. **Uterine Inversion.** Uterus turns inside out (may be complete, extending through the cervix and into the vagina, and could be visible). May be a result of over aggressive third stage management or spontaneously after a contraction or high pressure in the abdomen, i.e., sneezing, valsalva.

13.12.4.1. Assess Signs and Symptoms:

13.12.4.1.1. Sudden and severe abdominal pain.

13.12.4.1.2. Profuse vaginal bleeding after delivery.

13.12.4.1.3. Defect in the fundus or inability to palpate the fundus.

13.12.4.1.4. **Hypovolemic shock.**

13.12.4.2. Treatment/Management. Refer to Shock Management.

13.12.4.2.1. Allow for spontaneous delivery of the placenta to decrease the risk of the hemor- rhage.

13.12.5. **Uterine Rupture.** Location and extent influences the degree of hemorrhage and complica- tion (most bleeding is into the peritoneal cavity). Life threatening in-flight medical emergency. Notify TACC/AMOC/AOC/PMRC for guidance and possible diversion to a MTF capable of handling the situation.

13.12.5.1. Predisposing factors include scarred uterus/prior C-section, vigorous fundal pressure, and external pressure during delivery and direct trauma.

13.12.5.1.1. Assess Signs and Symptoms:

13.12.5.1.1.1. Sudden, severe, and continuous abdominal pain.

13.12.5.1.1.2. May have shoulder and chest pain.

13.12.5.1.1.3. Contractions may be absent or increase in frequency and intensity.

13.12.5.1.1.4. Hypovolemic shock.

13.12.5.2. Treatment/Management: Refer to Shock Management.

13.12.6. **Shoulder Dystocia.** Exists when the head is delivered and the shoulder does not follow with gentle traction; the shoulders are pushed against the symphysis preventing torso delivery.

13.12.6.1. Treatment/Management. Refer to Lippincott.

13.12.7. **Trauma in Pregnancy.** May be categorized as, but not limited to, blunt injury (commonly from automobile accidents), thermal injury, or penetrating injury. Refer to Shock Management

13.12.7.1. General treatment/management focuses on the mother and includes:

13.12.7.1.1. Monitor VS, FHTs, and contractions.

13.12.7.1.2. Obtain baseline O2 saturation prior to flight, then in-flight (PRN), and prior to deplaning.

13.12.7.1.3. Administer supplemental O2 if oxygen saturation drops below 91%.

13.12.7.1.4. Measure/record I & O to include all fluids.

13.12.7.1.5. Observe for signs and symptoms of abruptio placenta.

13.12.7.2. Treatment of Penetrating Wounds: Directed first towards the pregnant patient, emergency resuscitation, fractures, bleeding, and then the fetus. Follow emergency resuscitation and stabilization then evaluate fractures, uterine bleeding, and fetus status.

13.13. Immediate Care Of the Newborn. Refer to Lippincott and to Pediatric/Neonate Management.

13.13.1. Clear the airway through suctioning (either with a bulb syringe or 5 - 60 mmHg suctioning), suction mouth first, then the nose. Visualization of the vocal chords and possible tracheal suctioning may be required if meconium staining is present.

13.13.2. Dry newborn using vigorous stimulation; however, if meconium staining is present, avoid stimulation until airway is clear.

13.13.3. Assess vital signs and APGAR score at one and five minutes. Refer to [Table 13.1](#)

13.13.4. Ensure the cord remains clamped to avoid bleeding.

13.13.5. Placed in warmed ALSS, if available, or wrap infant in a blanket. Have mother hold infant for body warmth if ALSS is unavailable.

13.13.6. Use blow-by O₂.

13.13.7. Prevent heat loss from radiation (between body and surrounding objects), convection (air- flow over the body), evaporation (wet infant), and conduction (between body and contact with objects).

Table 13.1. APGAR Chart.

APGAR			
SCORE	0	1	2
Appearance, color	Blue, pale	Centrally pink	Completely pink
Pulse, heart rate	None	Less than 100/min	Greater than 100/min
Grimace, reflex	No response	Grimace	Cough, gag, cry
Activity/attitude	Flaccid/limp muscle tone	Some flexion	Well-flexed/active motion
Respiratory, effort	None, irritability	Weak/irregular	Good, crying

Chapter 14

PEDIATRIC/NEONATAL MANAGEMENT

14.1. Stresses Of Flight.

14.1.1. Decreased Partial Pressure of Oxygen: Infants and younger children are more reactive to hypoxia, and will become hypoxic earlier than adults.

14.1.2. Barometric Pressure Changes: Encourage the use of a pacifier/bottle on descent to help the infant/child clear their ears. Gastric compression may restrict diaphragmatic movement, especially if supine; elevate head and consider decompression with an oral or nasogastric tube.

14.1.3. Thermal: Thermal changes have the greatest impact on infants and young children who have a very sensitive thermoregulating system. Increase the cabin temperature, if necessary.

14.1.4. Decreased Humidity: Infants and children are more susceptible to dehydration. If infant is in an Airborne Life Support System (ALSS), ensure that the proper amount of distilled sterile water is present in the humidification sponge. If not NPO or receiving IVs or tube feedings, give fluids at least every two hours. **NOTE:** Assess for infant dehydration: palpate for depressed anterior fontanel.

14.1.5. Noise: Infants/children are sensitive to excessive noise. Earplugs should be cut in half (vertically) to fit the smaller ear canals. Infants in ALSS should also wear earplugs, even though the double paned construction muffles aircraft noise.

14.1.6. Vibration: Ensure infants are padded when in car seats or the ALSS.

14.1.7. Fatigue: Fatigue has the greatest impact on pediatric patients of any age (newborn to 12 years old). The result of fatigue is an uncooperative child.

14.2. Preflight/In-flight Considerations.

14.2.1. Assess airway and breathing.

14.2.1.1. Respiratory dysfunction is the most common cause of cardiac arrest so stabilization of the airway is of primary concern.

14.2.1.2. A child's trachea is narrow, tongue is large, intercostal muscles are weak; proper positioning is essential.

14.2.1.3. Use Head Tilt, Chin Lift to open the airway.

14.2.1.4. For spinal immobilization use Jaw Thrust. **WARNING:** Hyperextension or flexion of the neck will cause airway compression. A rolled towel placed under the shoulders of the infant or child aids in maximizing airway size and reducing resistance. For neutral alignment of the C-Spine, align the external auditory meatus with the shoulders.

14.2.2. If intubated, there should be a medical attendant accompanying the patient capable of managing the airway and a ventilator.

14.2.2.1. Use cuffless endotracheal tubes up to age eight.

14.2.2.2. Have on hand one size larger and one size smaller endotracheal tube.

14.2.2.3. Right-mainstem bronchus intubation is more common in children. Evaluate prior to takeoff.

14.2.2.4. Monitor pulse oximetry and titrate O₂ to maintain SaO₂ greater than 91%.

14.2.2.5. Ensure adequate humidification of the O₂ delivery systems.

14.2.3. **Vital Signs: Normal Heart Rate.** Count apical pulse for a full minute. **WARNING:** brady- cardia is life threatening and is associated with hypoxemia; CPR is indicated if the child is bradycardic with poor perfusion or is pulseless.

14.2.3.1. Infant: 120-160/min.

14.2.3.2. Toddler: 90 – 140/ min.

14.2.3.3. Preschool: 80 - 110/min.

14.2.3.4. School age: 75 - 110/min.

14.2.3.5. Adolescent: 60 – 90/min.

14.2.4. **Normal Respiratory Rate.** Count for a full minute. **NOTE:** a respiratory rate greater than 60/min is abnormal for any child.

14.2.4.1. Infant: 30 - 60/min.

14.2.4.2. Toddler: 20– 40/min.

14.2.4.3. Preschool: 20 - 30/min.

14.2.4.4. School age: 18 - 30/min.

14.2.4.5. Adolescent: 12 – 16/min.

14.2.5. **Blood Pressure.** Average systolic pressure for children one year old and over: (Age in years X 2) + 90mm Hg; lower limit: (Age in years X 2) + 70mm Hg indicates hypotension.

14.2.6. **Skin Color.** Cyanosis is a late sign of hypoxia.

14.2.7. **Mental Status/Level of Activity.** Active and alert? Lethargic or unresponsive?

14.2.8. **Urine Output.**

14.2.8.1. Infant: 2 ml/kg/hr.

14.2.8.2. Child over 2 yr: 1 ml/kg/hr.

14.2.9. Offer fluids every one to two hours (unless contraindicated).

NOTE: IV infusion pumps will be used for all neonatal/pediatric patients.

14.3. Rapid Cardiopulmonary Assessment.

14.3.1. Early recognition of the symptoms of progressive deterioration in respiratory and circulatory function and prompt initiation of therapy can often prevent cardiac arrest.

WARNING: Bradycardia is life threatening and is associated with hypoxia; CPR is indicated if the child is bradycardic with poor perfusion or is pulseless. Notify

TACC/AMOC/AOC/PMRC for guidance and possible diversion to a MTF capable of handling the situation.

14.3.2. Assess Airway Patency.

14.3.2.1. Able to maintain independently.

14.3.2.2. Requires adjuncts/assistance to maintain patency.

14.3.3. Assess Breathing.

14.3.3.1. Rate.

14.3.3.2. Mechanics: retractions, grunting, accessory muscles, and nasal flaring.

14.3.3.3. Air Entry: chest expansion, breath sounds, stridor, wheezing, and paradoxical chest movement.

14.3.3.4. **Assess Color** (pale, cyanosis).

14.3.4. Assess Circulation.

14.3.4.1. Heart rate.

14.3.4.2. Blood pressure: volume/strength of central pulses.

14.3.4.3. Peripheral pulses: present/absent, volume/strength.

14.3.4.4. Skin perfusion: capillary refill time, temperature, color, and presence of mottling.

14.3.5. CNS perfusion: responsiveness and recognizes parents.

14.3.5.1. Muscle tone.

14.3.5.2. Pupil size, posturing.

14.4. Assessment of Signs/Symptoms of Severe Respiratory Distress. Notify TACC/AMOC/AOC/ PMRC for guidance and possible diversion to a MTF capable of handling the situation.

14.4.1. Respiratory Distress: Respiratory rate over 60 per minute, grunting or forced expiration, and head bobbing.

14.4.1.1. Retractions: Use of accessory muscles: sternal retractions, chest muscles visibly pulling and prolonged expiratory time.

14.4.1.2. Nasal Flaring. Obligated nose breathers for the first four months of life. Keep nares clear of secretions.

14.4.1.3. Cardiovascular: poor peripheral perfusion, tachycardia.

14.4.1.4. Neurological: decreased muscle tone, altered mental status.

14.4.1.5. Pallor precedes cyanosis. Assess capillary refill (<2 seconds).

14.5. Assessment of Signs/Symptoms Respiratory Failure.

14.5.1. Respiratory: Respiratory rate less than 10 per minute and/or irregular respirations.

14.5.2. Cardiovascular: Slower than normal or absent heart rate, weak or absent peripheral pulses, hypotension.

14.5.3. Neurological: unresponsiveness, limp muscle tone.

14.6. Treatment/Management of Respiratory Distress/Respiratory Failure.

14.6.1. Airway.

14.6.1.1. Assessment: open airway head tilt/chin lift maneuver. If neck injury is suspected, use the jaw thrust. Rule out foreign body, anatomic or other obstruction.

14.6.1.2. Treatment/Management: Place on 100% oxygen via non- rebreather mask, blow-by if mask is not tolerated. Consider oral airway, nasopharyngeal airway, and intubation per PALS guide- lines when operationally feasible. **WARNING:** Performed by specially trained healthcare profes- sionals working within their AFSC scope of practice.

14.6.1.3. Breathing.

14.6.1.3.1. Assessment: Is breathing ineffective.

14.6.1.3.2. Treatment/Management: Rescue breathing: mouth to mouth or nose to mouth, bag mask, and endotracheal intubation per PALS guidelines when operationally feasible. Place on pulse oximetry.

14.6.2. Circulation.

14.6.2.1. Assessment: Heart rate, pulses (central and peripheral), place on cardiac monitor, capil- lary refill, and blood pressure.

14.6.2.2. Treatment/Management: Cardiac compressions, fluid resuscitation.

14.6.2.2.1. Intravenous access: During CPR in children 6 years old and younger, intraosseous access should be established if reliable venous access cannot be achieved within three attempts or 90 seconds, whichever comes first, per PALS guidelines when operationally feasible. **WARNING:** Performed by specially trained healthcare professionals working within their AFSC scope of practice.

14.6.3. Neurological.

14.6.3.1. Minimize anxiety.

14.6.3.2. Involve parents.

14.7. Special Pediatric Conditions Predisposing a Patient to Cardiopulmonary Arrest. WARNING: Assess ABC's, mental status, and the possible causes of symptoms. All patients suspected to be symptomatic, a high risk, or unstable will be placed on high flow oxygen, have IV access, placed on cardiac monitor and a pulse oximetry. Notify TACC/AMOC/AOC/PMRC for guidance and possible diversion to a MTF capable of handling the situation.

14.7.1. **Epiglottitis** – a rapidly progressing bacterial infection of the epiglottis and surrounding soft tissue. Usually effects children between the ages of 3 and 7 years.

14.7.1.1. Assess Signs and Symptoms: Illness or sudden onset (usually 6 to 8 hours of presenta- tion), dysphasia, “barking” cough, inspiratory stridor, hoarse or muffled voice, fever or drooling. Child may prefer sitting up or leaning forward.

14.7.1.2. Treatment/Management.

14.7.1.2.1. Do not attempt to visualize or place anything in the airway.

14.7.1.2.2. Minimize anxiety and allow child to choose position of comfort.

14.7.1.2.3. Cool mist, blow-by oxygen.

14.7.1.2.4. Consider deferring IV access if child is severely agitated. Extreme agitation and anxiety may result in complete upper airway obstruction.

14.7.1.2.5. If IV access is in place, administer fluids and antibiotics as ordered.

14.7.1.2.6. Tylenol (acetaminophen) for fever. Refer to manufacturer's recommendations for dosages.

14.7.2. Foreign Body Aspiration. Children between the ages of 6 months and 4 years are at high risk.

14.7.2.1. Assess Signs and Symptoms: Sudden onset of coughing or wheezing associated with an episode of choking.

14.7.2.2. Treatment/Management.

14.7.2.2.1. Severe Distress: Infants – back blows and chest thrusts.

14.7.2.2.2. Children – abdominal thrusts.

14.7.2.2.3. Minimal to moderate distress – Oxygen with cool mist and IV fluids.

14.7.3. Allergic Reaction – An immediate life-threatening situation. See [Attachment 2](#).

14.8. Descent.

14.8.1. Infants/children should be given fluids during descent to assist in naturally clearing their ears.

14.8.2. Monitor infant/child closely during actual descent. Encourage the use of a pacifier/bottle. If crying during descent, this will usually clear the ears.

14.8.3. Instruct nose-blowing technique for valsalva.

14.8.4. FN May Administer the Following if Child is Unable to Clear Ears in Conjunction with the Above Interventions:

14.8.4.1. Neo-synephrine (phenylephrine) 0.25% nasal gtts. x 1-2, for children (6-12). Use caution in hypertension, cardiac disease, diabetes, and glaucoma.

14.8.4.2. Under age 6: Neo-synephrine (phenylephrine) 0.125% nasal gtts x 2 (dilute the 0.25 Neo-synephrine 1:1 with normal saline). Use caution, as above.

14.8.4.2.1. Onset is usually within 20-30 minutes.

14.8.4.3. Document findings, interventions, and results.

14.8.4.4. Direct patient's attendant and MTF representative to seek medical follow up at destination MTF.

14.9. DELETED.

GEORGE PEACH TAYLOR, JR., Lt General,
USAF
Surgeon General

Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

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Prescribed Forms

AF Form 3829 *Summary of Patients Evacuated by Air*

AF Form 3830 *Patient Manifest*

AF Form 3835 *Aeromedical Mission Management Part 1*

AF Form 3836 *Aeromedical Evacuation Manifest Part 2*

AF Form 3838 *Do Not Resuscitate (DNR) Certification for Aeromedical Evacuation*

AF Form 3841 *Certification of Release*

AF Form 3851 *Patient Baggage Data*

AF Form 3854 *Receipt of Valuables*

AF Form 3859 *Turn-In of Unaccompanied Narcotics*

AF Form 3860 *Aeromedical Patient Record Data*

AF Form 3891 *Patients Report for Aeromedical Airlift Movement*

AF Form 3892 *Patients Holding for Aeromedical Airlift Movement*

AF Form 3894 *Aeromedical Mission Inbound Notification*

AF IMT 3899, *Patient Movement Record*

AF IMT 3899A, *Patient Movement Record Progress Note*

AF 3899B, *Patient Movement Record Physician Orders*

AF 3899C, *Patient Movement Record Physical Assessment*

AF 3899D, *Patient Movement Record Hemodynamic/Respiratory Flow sheet*

AF 3899E, *Patient Movement Intake/Output*

AF 3899F, *Patient Movement Physician Orders for Behavior Management and Restraints*

AF 3899G, *Patient Movement Restraint Observation Flow sheet*

AF 3899H, *Patient Movement Neurological Assessment*

AF 3899I, *Patient Movement Medication Record*

AF 3899J, *Patient Movement Rhythm/Hemodynamic Strip*

AF 3899K, *Patient Movement In-Flight Resuscitation Flow sheet*

AF 3899L, *Patient Movement Record Enroute Critical Care*

AF 3899M, *Patient Movement Record PCA/PNB/Epidural Hand-Off Form*

AF 3899N, *Patient Movement Pain Adjunct Flow sheet*

Adopted Forms

AF Form 847 *Recommendation for Change of Publication*

AF Form 1053 *Record of Patient Storing Valuables*

AF Form 1225 *Informed Consent for Blood Transfusion*

AF Form 3066 *Doctor's Orders*

AF IMT 579, *Controlled Substance Register*

DD Form 602, *Patient Evacuation Tag*

DD Form 1380, *US Field Medical Card*

DD Form 1502, *Frozen Medical Material Shipment*

DD Form 1502-I, *Chilled Medical Material Shipment*

DD Form 2239, *Consent for Medical Care and Transportation*

DD Form 2852 *Aeromedical Evacuation Event/Near Miss Report*

SF 514, *Blood Administration*

SF 518, *Blood or Blood Component Transfusion Record*

SF 600, *Health Record - Chronological Record of Medical Care*

Abbreviations and Acronyms

>—Greater than

<—Less than

ABC's—Airway, breathing, and circulation

AC—Aircraft commander

ACLS—Advanced cardiac life support

ADL—Activities of daily living

AE—Aeromedical evacuation

AEC—Aeromedical evacuation crew

AECM—Aeromedical evacuation crewmember

AEOO—Aeromedical evacuation operations officer

AET—Aeromedical evacuation technician

AF—Air Force (forms and publications only)

AFH—Air Force Handbook

AFI—Air Force Instruction

AFJMAN—Air Force Joint Manual

AFPD—Air Force Policy Directive

AFRC—Air Force Reserve Command

AMC—Air Mobility Command

AMCSP—Air Mobility Command Special Publication

AMI—Acute Myocardial Infarction

AMOCC—Air Mobility Operations Control Center

ANC—Absolute neutrophil count

ANG—Air National Guard

AOC—Air Operations Center

ASAP—As soon as possible

ASF—Aeromedical staging facility

ASTNA—Air and Surface Transport Nurses Association

ASTS—Aeromedical staging squadron

ATLS—Advanced trauma life support

BBF—Blood and body fluids

BLS—Basic life support

BP—Blood pressure

BPM—Beats per minute

C—Celsius
CASF—Contingency Air Staging Facility
CCATT—Critical care aeromedical transport team
C-Collar—Cervical collar
CDC—Center for disease control
cGy—Measurement of radiation exposure
CHF—Congestive heart failure
CMT—Charge medical technician
CNS—Central nervous system
CO—Carbon monoxide
CO₂—Carbon dioxide
CONUS—Continental united states
COPD—Chronic obstructive pulmonary disease
CPR—Cardio-pulmonary respiration
C-Spine—Cervical spine
CT—Computerized tomography
CVA—Cerebral vascular accident
DoD—Department of Defense
DTR—Deep tendon reflex
DVT—Deep vein thrombosis
EENT—Ears-eyes-nose-throat
EKG—Electrocardiogram (also ECG)
EMI—Electromagnetic interference
ENT—Ears nose and throat
EPI—Epinephrine
EPS—Extrapyramidal symptoms
ET—Endotracheal tube
F—Fahrenheit
FiO₂—Fraction of inspired oxygen
FE—Flight evaluator
FHT—Fetal heart tone
FI—Flight instructor

FN—Flight nurse
GCS—Glasgow coma scale
GI—Gastrointestinal
gtts—Drops (pharmacology)
GU—Genitourinary
H&H—Hemoglobin and Hematocrit
HCT/H—Hematocrit
HCW—Healthcare worker
Hg—Mercury
Hgb/H—Hemoglobin
HIV—Human immunodeficiency virus
HQ—Headquarters
I&O—Intake and output
IAW—In accordance with
ICD—Implantable cardioverter-defibrillator
ICP—Intracranial pressure
IV—Intravenous
IVP—Intravenous push
J—Joules
JP—Jackson-Pratt
KCI®—Kinetic Concepts Inc
Kg—Kilograms
KVO—Keep vein open
Lippincott—The Lippincott Manual of Nursing Practice
LLR—Left Lateral Recumbent
LOC—Level of consciousness
LPM—Liters per minute
LR—Lactated ringers
MA—Medical attendant
MASF—Mobile aeromedical staging facility
MCA—Maximum cabin altitude
MCD—Medical crew director

MCI—Multi-command instruction
MDR—Multi-drug resistant
mg—Milligrams
MgSO₄—Magnesium Sulfate
Min—Minute
ml—Millimeters
MTF—Medical treatment facility
NBC—Nuclear, chemical, biological
NC—Nasal cannula
NFNA—National Flight Nurse Association
NG—Nasogastric
NPO—Nothing by mouth
NPWT—Negative Pressure Wound Therapy
NS—Normal saline
O₂—Oxygen
OB—Obstetrics
OTC—Over-the-counter
PaCO₂—Pressure of arterial carbon dioxide
PALS—Pediatric advanced life support
PaO₂—Pressure of arterial oxygen
PEA—Pulsesless electrical activity
PEEP—Positive end expiratory pressure
PEP—Post exposure protocol
PIH—Pregnancy induced hypertension
PMCC—Patient Movement Clinical Coordinator
PMRC—Patient Movement Requirements Center
PO—By mouth (orally)
PPA—Personal protection attire
PRN—As needed
PTL—Preterm labor
Pulse ox—Pulse oximetry
PVC—Premature ventricular contractions

Q (q)—Every
RBC—Red blood cells
ROM—Range of motion
RON—Remaining over night
SaO₂—Arterial blood saturated with
oxygen—pulse oximetry reading
SG—Surgeon general
SOB—Shortness of breath
SOC—Standards of care
SSN—Social Security Number
TACC—Tanker Airlift Control Center
TB—Tuberculosis
TCP—Transcutaneous pacing
TKO—To keep open
TNCC—Trauma nurse core course
TPR—Temperature, pulse, respiration
URI—Upper respiratory infection
UTI—Urinary tract infection
VF—Ventricular fibrillation
VFS—Validating Flight Surgeon
VT—Ventricular Tachycardia
WBC—White blood Count
X—Times

Attachment 2

ANAPHYLACTIC SHOCK

A2.1. Anaphylactic Shock: An acute systemic allergic reaction as a result of the release of chemical mediators after an antigen-antibody reaction. An immediate, life-threatening reaction.

A2.1.1. Caused by injection (such as tetanus antitoxin, penicillin), ingestion (foods such as shellfish), inhalation, stings and bites.

A2.1.2. Assess Signs and Symptoms: May occur within minutes after exposure to allergic substances. Release of chemical mediators causes vasodilation, increased capillary permeability, constriction of the bronchus, and decreased peristalsis.

A2.1.2.1. Skin: Flushed, itching, with or without hives; edema of face and tongue may be present.

A2.1.2.2. Respiratory: Laryngeal edema, bronchospasm, cough, wheezing, tightness or pain in chest. Stridorous breathing and retractions.

A2.1.2.3. Circulatory: Hypotension, tachycardia, arrhythmia, palpitations, pallor, dizziness and syncope.

A2.1.2.4. Neurological: Anxiety, fatigue, lethargy and coma; sudden loss of consciousness and seizures.

A2.1.3. Preflight/In-flight Considerations and Care for Anaphylactic Shock.

A2.1.3.1. Maintain ABC's. Start high flow O2 (Refer to [Table 4.1](#)). Monitor pulse oximetry.

A2.1.3.2. Establish an IV and administer fluids if hypotensive.

A2.1.3.3. Remove the causative agent, if known.

A2.1.3.4. **Treatment/Management:** Notify TACC/AMOCC/AOC/ PMRC for guidance and possible diversion to a MTF capable of handling the situation, and concurrently initiate:

A2.1.3.4.1. **Epinephrine (1: 1000) 0.3ml subcutaneous (SC) every 15 mins. for adults.** Repeat up to 3 times (x) for moderate bronchospasm, facial and laryngeal edema. **NOTE: Pediatrics: Epinephrine 0.01cc/kg (1:1000) SC, one dose only** for moderate-severe bronchospasm, facial and laryngeal edema.

A2.1.3.4.1.1. Stimulates both alpha and beta receptors of the sympathetic nervous system.

A2.1.3.4.1.2. Side effects: nervousness, tremor, headache, palpitations, hypertension, tachycardia, and ventricular fibrillation. May exacerbate severe congenital heart defects and congestive heart failure.

A2.1.3.4.2. **Administer Benadryl (diphenhydramine) 50mg IVP x 1 if unresponsive to SC EPI.**

A2.1.3.4.2.1. Contraindicated in acute asthma and lactating women.

A2.1.3.4.2.1.1. Use caution in glaucoma, asthma, hypertension, and cardiac disease.

A2.1.3.4.2.1.2. Side effects: drowsiness, nausea, dry mouth and urinary retention.

A2.1.3.5. Administer EPI (1: 10,000) 0.5-1 mg IVP per physician's order every 5-10 minutes for severe allergic symptoms and unresponsive to SC EPI and IV Benadryl.

A2.1.3.6. If situation occurs on the ground, the patient is not stable for flight. Notify TACC/ AMOCC/AOC/PMRC, and the contact local MTF.

A2.1.3.7. Documentation: Refer to paragraph [7.4.1](#) Complete DD Form 2852.

Attachment 3

HEALTHCARE WORKER (HCW) BLOOD BORNE PATHOGEN EXPOSURE PLAN

A3.1. The risk of acquiring an infection depends upon the type of injury, the volume of material, and the patient's virus titer. Refer to Centers for Disease Control, **Figure A3.1** "Determining the Need for HIV Post-exposure Prophylaxis (PEP) After an Occupational Exposure."

WARNING: HCWs will have access to an immediate 24-hour rapid response system that includes adequate communication to a medical team trained to triage all exposures and assess the need for PEP therapy. HCWs will have PEP medication readily available.

A3.1.1. Types of Exposure. Refer to **Figure A3.1** "Step 1: Determine the Exposure Code (EC)"

A3.1.1.1. Percutaneous injury: needlestick or cut with sharp object.

A3.1.1.2. Contact of mucous membrane or non-intact skin (e.g. dermatitis, chapped skin).

A3.1.1.3. Contact with intact skin when duration is prolonged or extensive.

A3.1.2. Initial Treatment.

A3.1.2.1. Immediately wash wound and skin sites that have been in contact with human blood and body fluids (BBF) with soap and water or with AE approved waterless hand cleaners/antiseptics when handwashing facilities are inadequate, inaccessible, or when there is an interruption in the water supply.

A3.1.2.2. Mucous membranes should be flushed with water or normal saline.

A3.1.2.3. Topical antiseptics are not contraindicated; the application of caustic agents (e.g. bleach) or the injection of antiseptics or disinfectants into the wound is not recommended.

A3.2. Assessment of HCW Exposure Risk. Refer to "Step 1."

A3.2.1. Immediately notify the PMRC Validating Flight Surgeon (VFS) or local MTF physician of the following:

A3.2.1.1. Name, SSN, Date/Time of Injury/Exposure, Unit of Assignment/Phone, Home Phone.

NOTE: Reporting of name and SSN is limited to land line telephones.

A3.2.1.2. Date of last hepatitis B vaccine and results of last antibody/titer screening, if known.

A3.2.1.3. Current medication, allergies and past history including possibility of pregnancy.

A3.2.1.4. How the exposure occurred.

A3.2.1.5. Protective items worn.

A3.2.2. In conjunction with the PMRC/VFS or local MTF physician determine the EC (Step 1.)

A3.2.2.1. The BBF source, type of exposure (mucous membrane; compromised integrity of skin and percutaneous).

A3.2.2.2. The volume, duration, and severity of exposure.

A3.2.2.3. **Determine Source Patient Demographics and the HIV Status Code (HIV SC).** (Figure A3.1, Step 2).

A3.2.2.3.1. Source Patient Name, Cite Number, Diagnosis, and HIV Status, if known. **NOTE:** Reporting of name is limited to land line telephones.

A3.2.2.3.2. Determine the source patient's Hepatitis history.

A3.2.2.3.3. The PMRC/VFS or local physician will review the above factors and determine the course of treatment for the exposed HCW. (Figure A3.1, "Step 3: Determine the PEP Recommendation")

A3.2.2.4. **If the Exposure is Considered to be High.** The physician will order a STAT dose of Combivir [zidovudine (AZT) and lamivudine (3TC)] one tablet P.O., one dose only, to be administered within two hours of exposure.

WARNING: The HCW's local flight surgeon, public health physician or the receiving MTF prescribes additional Combivir after a complete physical assessment and laboratory studies are accomplished.

A3.2.2.4.1. The HCW will require baseline HIV, Hepatitis B and Hepatitis C screening before receiving additional Combivir. Once prophylaxis is started, a baseline and weekly CBC, BUN, Creatinine, AST, ALT, Bilirubin and CK is required. Follow up IAW local directives.

NOTE: The source patient should be screened for HIV, Hepatitis B and Hepatitis C at the same MTF as the HCW. If this is not possible, obtain accepting physician name and phone number.

A3.2.2.4.2. If the situation occurs in-flight or the HCW is away from home station, the PMRC/VFS determines if a waiver for continued performance in a duty status is appropriate, and if the mission and the source patient will be diverted to a MTF capable of handling the situation.

A3.2.2.4.2.1. The PMRC/VFS will determine fitness for continued performance in a duty status in coordination with the MAJCOM/SGP to assure HCW returns to the duty station, and will initiate reporting IAW current clinical performance management guidelines.

A3.2.2.4.3. **Combivir Side Effects:** Nausea, vomiting, diarrhea, headache and fatigue should be reported to a physician immediately. **WARNING:** Do not consume alcoholic beverages.

A3.2.2.4.4. **When the Two-Hour Treatment Window is Nearing.** If the EC and the HIV SC is considered high, and the PMRC/VFS or another physician cannot be contacted, a HCW may take Combivir one tablet P.O., one dose only. Notify PMRC as soon as possible.

A3.2.2.4.4.1. The aircraft commander, the MCD and AECMs will assess the situation and the condition of the HCW to determine if the mission will continue

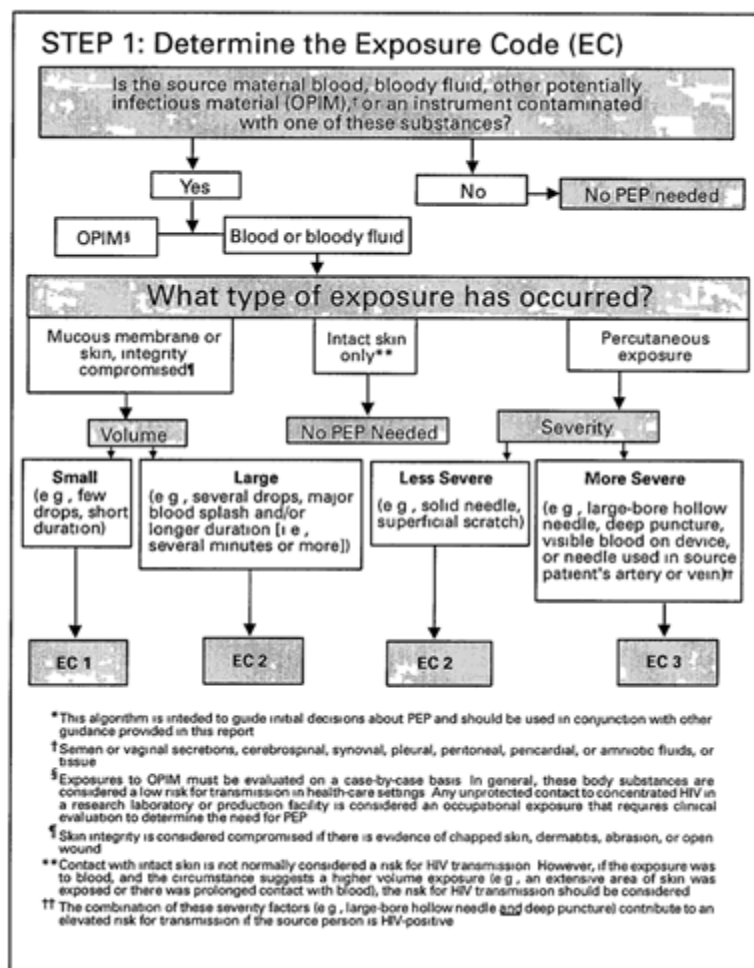
or divert to a MTF capable of handling the situation.

A3.2.2.5. **Documentation:** Refer to paragraph 7.4.1 Complete DD Form 2852, SF Form 600 and document the information found in paragraph A3.2.1 and paragraph A3.2.2.3.2

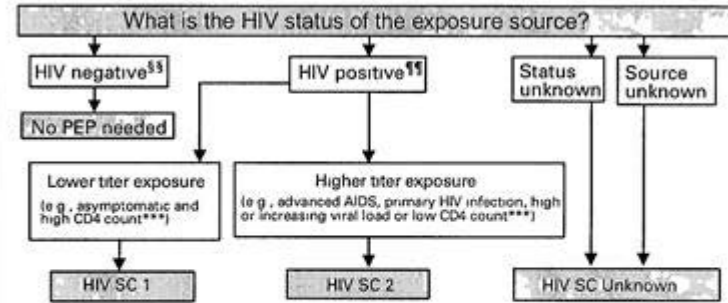
A3.2.2.5.1. Submit DD Form 2852 to PMRC and AE unit. The HCW will maintain a copy of all paperwork.

A3.2.2.6. The HCW will follow up with their local or home base military MTF.

Figure A3.1. Determining the need for HIV Postexposure Prophylaxis (PEP) After An Occupational Exposure.



STEP 2: Determine the HIV Status Code (HIV SC)



^{§§} A source is considered negative for HIV infection if there is laboratory documentation of a negative HIV antibody, HIV polymerase chain reaction (PCR), or HIV p24 antigen test result from a specimen collected at or near the time of exposure and there is no clinical evidence of recent retroviral-like illness.

^{¶¶} A source is considered infected with HIV (HIV positive) if there has been a positive laboratory result for HIV antibody, HIV PCR, or HIV p24 antigen or physician-diagnosed AIDS.

^{***} Examples are used as surrogates to estimate the HIV titer in an exposure source for purposes of considering PEP regimens and do not reflect all clinical situations that may be observed. Although a high HIV titer (HIV SC 2) in an exposure source has been associated with an increased risk for transmission, the possibility of transmission from a source with a low HIV titer also must be considered.

STEP 3: Determine the PEP Recommendation

EC HIV SC PEP recommendation

1	1	PEP may not be warranted. Exposure type does not pose a known risk for HIV transmission. Whether the risk for drug toxicity outweighs the benefit of PEP should be decided by the exposed HCW and treating clinician.
1	2	Consider basic regimen^{†††} Exposure type poses a negligible risk for HIV transmission. A high HIV titer in the source may justify consideration of PEP. Whether the risk for drug toxicity outweighs the benefit of PEP should be decided by the exposed HCW and treating clinician.
2	1	Recommend basic regimen. Most HIV exposures are in this category, no increased risk for HIV transmission has been observed but use of PEP is appropriate.
2	2	Recommend expanded regimen^{§§§} Exposure type represents an increased HIV transmission risk.
3	1 or 2	Recommend expanded regimen. Exposure type represents an increased HIV transmission risk.
Unknown		If the source or, in the case of an unknown source, the setting where the exposure occurred suggests a possible risk for HIV exposure and the EC is 2 or 3, consider PEP basic regimen.

^{†††} Basic regimen is four weeks of zidovudine, 600 mg per day in two or three divided doses, and lamivudine, 150 mg twice daily.

^{§§§} Expanded regimen is the basic regimen plus either indinavir, 800 mg every 8 hours, or nelfinavir, 750 mg three times a day.

Attachment 4

ISCHEMIC CHEST PAIN (REFER TO THE CURRENT ACLS ALGORITHM)

A4.1. Ischemic Chest Pain. Patients with coronary atherosclerosis may develop chest pain that may be indicative of various degrees of coronary artery occlusion. Rapid recognition, treatment, and communication to the TACC/AMOC/AOC/PMRC for guidance and possible diversion to a MTF capable of handling the situation may improve clinical outcomes for these patients.

A4.1.1. Assessment.

A4.1.1.1. Complains of an uncomfortable pressure, fullness, squeezing or pain in the center of the chest lasting several minutes. Pain may spread to shoulders, neck, arms, the jaw, back or between the shoulder blades.

A4.1.1.2. Chest pain may be accompanied by lightheadedness, fainting, sweating, nausea or shortness of breath.

A4.1.1.3. Feeling of distress, anxiety or impending doom.

A4.1.1.4. Obtain vital signs every 5 - 15 minutes. Place on cardiac monitor and pulse oximeter. Listen to heart and lung sounds – significantly diminished in the AE environment.

A4.1.1.5. Ask the following: What precipitated the episode and when did it start? Is this pain different from previous episodes, if so, how? Have patient rate pain on a numerical scale 1-10, with one being the least and 10 being the worse. How does patient obtain relief from chest pain episodes?

A4.2. Treatment/Management. Notify TACC/AMOC/AOC/PMRC for guidance and possible diversion to a MTF capable of handling the situation, and concurrently initiate:

A4.2.1. Administer high flow O₂ (refer to **Table 4.1**) until chest pain is relieved. Then administer O₂ at 2-4 lpm by nasal cannula.

A4.2.2. Administer Nitroglycerin SL one 0.3 to 0.4 mg tablet or spray every five minutes x 3 doses for suspected cardiac chest pain.

A4.2.2.1. Action: Decreases venous blood return to the heart; decreases preload and oxygen consumption; dilates coronary arteries; increases cardiac collateral flow; decreases the pain of cardiac ischemia.

A4.2.2.2. Monitor BP after each dose. Do not administer additional doses if BP is below 90 systolic.

A4.2.2.3. Side effects: headache, hypotension, dizziness, flushing, palpitations, nausea and vomiting. **NOTE:** Notify a physician ASAP if chest pain is unrelieved.

A4.2.3. Move to litter with a backrest if in a seat, if indicated.

A4.2.4. Cool cabin if diaphoretic and nauseous.

A4.2.5. If chest pain is unrelieved, contact a physician.

A4.2.6. Administer ASA 160mg to 325 mg PO if chest pain is unrelieved by Nitroglycerin.

A4.2.6.1. Reduces platelet aggregation.

A4.2.6.2. Contraindicated in patients with known hypersensitivity and active ulcer disease or asthma.

A4.2.6.3. If pain subsides, but the medical crew feels uncomfortable about the patient's condition or if the chest pain was unexpected, have a flight surgeon evaluate the patient to determine if the patient should continue flight.

A4.3. Documentation: Refer to paragraph [7.4.1](#) Complete DD Form 2852.

Attachment 5

MANAGEMENT/ADMINISTRATION OF BLOOD AND BLOOD PRODUCTS

A5.1. Blood and Blood Components: Whole blood, packed red blood cells, fresh frozen plasma, plate-let concentrate, granulocyte concentrate and cryoprecipitate. **NOTE:** Use standard precautions when handling blood and blood products (Refer to [A12.2](#)).

A5.2. Storage and Transportation.

A5.2.1. All blood products carried in the aeromedical evacuation (AE) system will be transported as rapidly as possible in standard blood shipping boxes consisting of an outer cardboard box with a Styrofoam insert. **NOTE:** Do not store blood products in aircraft refrigerators.

A5.2.2. Blood shipping containers will not be exposed to extreme temperatures below 1 degree C or over 27 degrees C. **NOTE:** Do not place blood shipping boxes in the aircraft's exterior cargo compartment.

A5.2.3. Either a DD Form 1502, **Frozen Medical Material Shipment** or DD Form 1502-I, **Chilled Medical Material Shipment** will be posted on the front of all blood shipping boxes.

A5.2.3.1. Do not accept a container of blood with a broken seal unless the DD Form 1502 or 1502-I is properly annotated. Do not accept leaking containers. All discrepancies will be brought to the immediate attention of the person(s) shipping the container. If the discrepancies are not resolved, the Medical Crew Director (MCD) may refuse to transport the blood products. Notify the Patient Movement Requirements Center (PMRC).

A5.2.3.2. Do not open any sealed blood boxes unless blood is to be administered during flight.

A5.2.4. All liquid Red Blood Cells and Whole Blood will be packed with 14 pounds of wet glistening ice inside the Styrofoam insert regardless of the number of units of blood being transported in one shipping container. **NOTE 1:** Dry ice, salted wet ice, water frozen in polyurethane bags, supercooled canned ice and commercial "blue ice" containers will not be used for re-icing liquid blood product shipments. **NOTE 2:** Dry ice is only used for frozen blood products because of the danger of freezing liquid blood.

A5.2.4.1. The ice should have a wet, glistening surface indicative of melting (2-3 degrees C) and should not be supercooled in a low temperature freezer before using.

A5.2.4.2. Properly packed containers will maintain the required temperature for blood products for up to 48 hours.

A5.2.4.3. Do not accept a container of blood with little or no visible ice, and/or if re-icing will be required during extended ground or air operations.

A5.2.4.4. Re-icing is the responsibility of the originating and Remain Overnight (RON) Medical Treatment Facility (MTF). If there is an en route delay of more than 48 hours, the MCD or the carrier agent will assure the re-icing of the blood products. The re-icing is annotated on DD Form 1502 or DD Form 1502-I.

A5.2.5. The PMRC should be informed of any blood product transfer so arrangements can be made with any en route MTF(s) for re-icing.

A5.2.6. Maximum Capacities for Blood Product Shipments.

A5.2.6.1. Pallet: 120 insulated blood containers stacked 4 x 5 x 6 high.

A5.2.6.2. Insulated blood shipping containers:

A5.2.6.2.1. Non-frozen human blood products and 14 pounds of cubed and glistening wet water ice.

A5.2.6.2.1.1. 20 units of whole blood (shipping code WBZ).

A5.2.6.2.1.2. 30 units of red blood cells (human) (shipping code RCZ).

A5.2.6.2.2. Frozen human blood products and 20-40 pounds of coarsely broken dry ice (solid state CO₂).

A5.2.6.2.2.1. 24 units of Fresh Frozen Plasma (shipping code PFF).

A5.2.6.2.2.2. 48 units of Cryoprecipitated Antihemophilic Factor (Human) (shipping code AHF).

A5.2.6.2.2.3. 12 units of Red Blood Cells Frozen (Human) (shipping code RCF).

A5.3. Blood and Blood Product Administration Guidelines.

A5.3.1. Blood products will be left in the shipping container until needed for transfusion.

A5.3.1.1. Whole blood, Red Blood Cells, and Fresh Frozen Plasma will be hung within 30 minutes of removal from the blood shipping container.

A5.3.1.2. Whole blood and Red Blood Cells must be transfused within 4 hours.

A5.3.1.3. Fresh frozen plasma infused at the rate prescribed. The infusion may be completed within 15 to 30 minutes depending on total volume.

A5.3.1.4. Cryoprecipitate, once thawed, must be infused immediately. Run over 3 - 15 minutes.

A5.3.1.5. Platelets may be transported at room temperature between 20-24 degrees C or 68 -75.2 degrees Fahrenheit. The transfusion may be completed within 20 - 60 minutes depending on total volume.

A5.3.2. Blood and blood components may be administered during emergent contingency and war- time ground and in-flight operations, and consent for transfusion is implied. **WARNING:** Always filter blood and blood components. **NOTE:** Currently there are no blood warmers approved for use in the AE environment.

A5.3.2.1. **O Negative is the Universal Donor:** Every blood group can accept O Negative cells. AB Positive is the universal recipient because any blood type is accepted. In an emergency, O Negative blood may be administered to an unknown blood type. **NOTE:** Second Level MTFs will provide Rh Negative packed red cells to Rh Negative male and female patients. Third Level and higher MTFs have the capability and are expected to group, type and crossmatch blood prior to transfusion of O Negative patients.

In the event of shortages of Rh Negative blood, priority will be given to Rh Negative female recipients.

A5.3.2.2. A physician must order the administration of blood or blood components. **NOTE:** Only physicians will initiate/order blood product therapy.

A5.3.2.3. A nurse and/or the medical attendant (physician and nurse) are primarily responsible for the proper administration of blood and blood components. A trained and competent medical technician may act as the second verifier.

A5.3.2.4. Obtain and record pre-infusion vital signs, including temperature.

A5.3.2.5. Prior to starting the transfusion, two medical personnel, one who will be a nurse or physician, will verify the physician order, cross verify and compare the blood unit Form/Tag SF 518, **Blood or Blood Component Transfusion Record** and the Patient Identification Card. In the absence of a patient ID band, the patient's military identification card, passport or dog tag will be used.

A5.3.2.6. At the bedside, cross-verify and compare the blood unit Form/Tag SF 518, the Patient Identification Card, and the patient's identification bracelet/tag. Each verifier will sign Section 3 of SF 518. **WARNING:** Always wear gloves and goggles when handling and hanging blood products.

A5.3.2.7. All blood and blood products will be administered through a dedicated line of Normal Saline (NS). Flush the entire IV line with NS prior to starting the infusion. **WARNING:** Do not add any other medications or IV fluid to the line or unit of blood.

A5.3.2.8. Start the transfusion at a slow rate and administer approximately 50 cc over 15 minutes. Document date and start/end time on SF 518, DD Form 602, and AF Forms 3829/3899.

A5.3.2.9. Continually monitor the patient during the first 15 minutes. Check vital signs and temperature after the first 15 minutes of infusion, repeat in 15 minutes, then every 30 minutes (twice) and then hourly until one hour post-transfusion.

A5.3.2.10. Educate patient regarding possible adverse reaction signs and symptoms (chills, back or chest pain, hives, rash, and/or wheezing). Refer to **Attachment 7**, Reaction to Blood Products

A5.3.2.11. Infuse at a rate of 200 cc per hour or for no longer than four hours to minimize hemolysis and bacterial contamination.

Attachment 6

MENTAL HEALTH/BEHAVIOR MANAGEMENT

A6.1. The acute exacerbation of psychiatric or behavioral disorders in-flight may place the aircraft, crew, and other patients and passengers at risk. Some patients who present a clear flight safety risk and qualify for in-flight restraints may not qualify for the use of restraints in a ground-based medical facility. Use of restraints must not be for the convenience of the medical staff, ground transportation crew or the AE crew. There must be a clear indication of need, based on the risk to flight safety, to the patient, or others on board. Higher acuity psychiatric patients judged a high risk by the originating physician and PMRC/VFS will be pre-medicated for flight and have PRN drug orders from the originating physician. Use of restraints requires clear physician orders. Patients require special consideration and attention in all phases of the AE environment to safeguard personal dignity and respect for cultural, psychological and spiritual values, and to ultimately ensure personal safety and the safety of others. The goal is to use the safest and least restrictive measures to control behavior within the AE environment, utilizing physicians, nurses, medical attendants (MA), and family members.

WARNING: Maintain strict patient confidentiality and release medical records and information only on a need-to-know basis. This is particularly for individuals with legal, financial or domestic difficulties.

A6.1.1. Stresses of Flight.

A6.1.1.1. Decreased partial pressure of oxygen and low humidity exacerbates effects of medication.

A6.1.1.2. Noise, fatigue, prolonged confinement in the aircraft, and vibration may increase irritability and the occurrence of agitation and hallucinations.

A6.2. General Patient Considerations.

A6.2.1. Psychiatric patients typically are physically healthy, and therefore capable of independent actions that could directly threaten the crew and other patients. Patients with severe or moderately severe behavior problems will be on a litter or have a litter available while in-flight. All psychiatric litter patients should wear hospital pajamas and a robe (without a belt), unless otherwise ordered.

A6.2.2. The requirement for an MA should be determined by the originating physician in consultation with the PMRC/VFS IAW AFI 41-306. All severe psychiatric patients requiring ongoing supervision will have a MA of the same gender, and when necessary a MA of commensurate rank during movement between the originating and the destination facility, unless otherwise ordered.

NOTE: All MAs are responsible for planning and coordinating care with the MCD/FN, including assessing the environment for safety, administering medications, and charting. MAs will maintain one-to-one contact with the patient, and coordinate breaks with the medical crew.

A6.2.3. Position litter patients in the lowest litter space, away from the flight deck, emergency exits, and O2 shutoff valves. Assign ambulatory patients a seat near the bulkhead, away from the flight deck, emergency exits and O2 shut off valves. Assess potential safety risks of nearby objects and cargo.

A6.2.4. Litter patients are allowed to carry eyeglasses, toothbrush, and a small amount of money (not to exceed \$25.00), wedding band, rings, wristwatch, ID card, and wallet.

A6.2.5. The patient and their hand-carried bags will be searched for sharps, matches, lighters and cig- arettes prior to enplaning; items not allowed will be inventoried, secured, and deplaned to the receiv- ing MTF. Use AF Form 3854, **Receipt of Valuables**.

A6.2.6. Disposable eating utensils do not need to be removed for high-risk patients but should be inventoried when trays are collected.

A6.2.7. Bed availability for meeting psychiatric in-patients' Remaining Overnight (RON) require- ments in the AE system has greatly diminished. Higher acuity psychiatric patients, i.e., 1A or 1B, or alcohol abuse patients may require RON bed-down in off-base psychiatric facilities. Notify PMRC personnel of requirements in the event of unscheduled RON's.

A6.3. Patient Classifications. Diagnosis, past history of extreme behavior, ability to cooperate and understand direction, the potential for unannounced violent outbursts and the assessed risk to flight safety, self and/or others, determines the patient's classification.

A6.3.1. **1A:** Severe psychiatric litter patients requiring the use of physical restraints, sedation, and close supervision. See paragraph **A6.5.2.1.6** for time-limited restraint guidelines.

A6.3.1.1. The referring physician, the PMRC, the MA, and the MCD may determine the patient's behavior is a high risk to flight safety.

A6.3.1.2. The patient will be stabilized prior to AE movement based on the originating provider's capabilities with appropriate psychiatric medications that will effectively control symptoms of extreme agitation and/or anxiety.

A6.3.1.3. The originating physician will write orders for routine medication, as well as, PRN medication for breakthrough behavior while the patient is in the AE system.

A6.3.1.4. Extremely high-risk psychiatric patients that may require advanced sedation manage- ment skills en route should travel with a physician.

A6.3.1.5. Should travel in hospital garments.

A6.3.1.6. Should travel with a MA.

A6.3.2. **1B:** Moderately severe psychiatric litter patient requiring tranquilizing medication or seda- tion for flight. Keep restraints available and secured on the litter or with the MA. **NOTE:** There are no written PRN orders for restraints. Follow paragraph **A6.5**

A6.3.2.1. Patients should travel in hospital garments.

A6.3.3. **1C:** Ambulatory psychiatric patient who is cooperative, reliable and not a threat to self or others requiring minimal observation.

A6.3.3.1. May be dressed in civilian or military clothing.

A6.3.3.2. May carry and self-administer own medication if determined to be competent by the MD or FN; requires ongoing re-evaluation by the medical team.

A6.3.3.3. Will not be seated next to an emergency exit or O2 shut off valve.

A6.3.4. **3C:** Ambulatory, going for treatment of alcohol, drug or substance dependence or abuse.

A6.3.4.1. Individuals who have relatively recent alcohol consumption and may still exhibit signs or symptoms of withdrawal. Signs and symptoms may include restlessness, agitation, anxiety and fear, nausea, vomiting, malaise, weakness, tachycardia, diaphoresis, elevated temperature, and dilated but reactive pupils. Major symptoms include the “shakes,” seizures and hallucinations.

A6.3.4.2. Will have 3-5 days of detoxification prior to being accepted for flight. **NOTE:** May exhibit symptoms of withdrawal 5-7 days after last drink, and should have an order for Librium or Vistaril.

A6.3.4.3. May exhibit symptoms of organic brain syndrome, cerebral degeneration, cirrhosis, liver failure, and esophageal varices.

A6.3.4.4. Managed as a 1C but may sit next to exits and O2 shut off valves, if determined to be competent by a FN.

A6.3.5. **5B:** Outpatient ambulatory, going for treatment of drug, alcohol, or substance abuse.

A6.3.6. **5C:** Outpatient psychiatric patient going for treatment or evaluation.

NOTE: The MCD/FN may upgrade a patient’s classification. The MCD may refuse a patient for AE transport if the patient’s behavior is determined to be detrimental to self and others, the patient has not been adequately prepared for AE movement, and therapeutic interventions are ineffective. Document on AF Forms 3829/3830/3899 and DD Form 602. Notify TACC/AMOC/AOC/PMRC at time of refusal.

A6.4. Preflight/in-flight Considerations for Patients with Mental health/Behavior Management Disorders.

A6.4.1. **Physical Factors:** Age, cognitive level, sleep patterns, nutrition/hydration, elimination, touch, comfort, and physical activity.

A6.4.1.1. Offer fluids and nutrition frequently, allow ambulation, sitting in “get up” seats, “stretch breaks” at en route stops, and comfort breaks.

A6.4.2. **Pathophysiological Factors:** Drug interactions, substance abuses, dehydration, poor nutrition, underlying disease/illness, and metabolic and endocrine disturbances.

A6.4.2.1. Correct underlying pathology (dehydration; alcohol and drug detoxification).

A6.4.2.2. Observe for and treat hypoxia.

A6.4.2.3. Sedated patients may be more susceptible to dehydration and/or hypoxia, and aspiration during patient movement.

WARNING 1: Body temperature of 102° and above along with increased agitation while on antipsychotic medication may indicate neuroleptic malignant syndrome (NMS). If symptoms appear preflight, the patient is not stable; notify TACC/AMOC/AOC/PMRC. If symptoms appear in-flight, hold medication, document, and notify TACC/AMOC/AOC/PMRC.

WARNING 2: High potency neuroleptics, such as Haldol, may cause extrapyramidal symptoms (EPS) within hours or a few days after starting medication (See paragraph A6.6.7.2.1.). Medication side effects may also include cardiac irregularities, hypotension, respiratory suppression, and over-sedation. If symptoms appear in-flight, hold medication, document, and notify TACC/AMOC/AOC/PMRC for guidance and possible diversion to a MTF capable of handling the situation.

WARNING 3: If previously untreated EPS symptoms are present preflight, the patient is not stable for flight. Notify TACC/AMOC/AOC/PMRC.

A6.4.2.4. Assure hydration and adequate nutrition.

A6.4.2.5. Record intake and output if in restraints for more than 24 hours.

A6.4.3. **Psychological Factors:** Anxiety/fear, fatigue, depression/grief, denial, boredom, communication barriers, stress, post-traumatic stress, relocation/PCS, and socialization.

NOTE: History of physical or sexual abuse may affect individual reactions to physical contact and place the individual at greater psychological risk.

A6.4.3.1. Maintain line-of-sight or one-to-one observation for patients in restraints and/or with suicidal, homicidal or elopement precautions.

A6.4.3.2. Use neutral or passive language.

A6.4.3.3. Assign one AECM, preferably the same gender to act as the team leader. This caregiver will coordinate with the MCD and the MA should further interventions be required.

A6.4.3.4. Give clear behavioral expectations and establish a verbal contract, including when medication or restraints will be used. Examples: Seatbelts, no smoking, "stretch breaks," no access to the flight deck, and use of the lavatory.

A6.4.3.5. Provide updated mission information.

A6.4.3.6. Determine whether medication is effective or excessive. Document and communicate findings.

A6.4.3.7. Facilitate feelings in a nonjudgmental manner and explore ways to help the individual to cope while in the AE system.

A6.4.3.8. Offer fluids every two hours.

A6.4.3.9. Use a language interpreter as needed.

A6.4.4. **Environmental Factors:** Confined space, noise, lighting, positioning, temperature, aircraft systems, and personal items.

A6.4.4.1. 1A patients will have line-of-sight observation when restraints are on.

A6.4.4.2. All psychiatric patients should be identified to the medical crew.

A6.4.4.3. Maintain cabin coverage, especially for suicidal and elopement risks.

A6.5. Management of Patients Requiring Restraints In the AE Environment.

A6.5.1. **Purpose:** The application of restraints is a response to emergent and dangerous behavior of the patient who is an immediate danger to self and others within the AE environment. The goal is to provide the safest, least restrictive, and most effective method for the patient while maintaining the safety of everyone in the airborne environment. Restraints will not be applied as punishment or for crew convenience. Whenever possible, use behavioral measures and medication first.

WARNING: When applying physical restraint, there is a potential to produce serious consequences, such as physical and psychological harm, loss of dignity, violation of an individual's rights, and even death.

A6.5.2. Preflight/In-flight Restraint Requirements.

A6.5.2.1. Physicians will annotate orders on AF IMT 3899F, *Patient Movement Physician Orders for Behavior Management and Restraints*

A6.5.2.1.1. Date and time order, and state when restraints will begin (i.e., prior to leaving for the flightline or boarding the aircraft).

A6.5.2.1.2. Type of Restraint: 4 point or other; leather or soft; Posey belt; padded mitts. Restraints must accompany the patient and be provided by the originating facility.

A6.5.2.1.3. Position: supine, prone, or lateral (left or right).

A6.5.2.1.4. Justification for placement:

A6.5.2.1.4.1. Danger to flight safety, self or others.

A6.5.2.1.4.2. Too agitated/violent to administer sedatives.

A6.5.2.1.4.3. Danger of dislodging vital therapeutic devices.

A6.5.2.1.4.4. Other reasons determined by the physician.

A6.5.2.1.5. The least restrictive means for providers to attempt: medication, education/counseling, and family involvement.

A6.5.2.1.6. Physician Written Time-Limited Orders for Restraints.

A6.5.2.1.6.1. Within 24 hours, restraints are limited to:

A6.5.2.1.6.1.1. Four (4) hours for adults.

A6.5.2.1.6.1.2. Two (2) hours for children and adolescents age 9 to 17.

A6.5.2.1.6.1.3. One (1) hour for patients under age 9.

NOTE: A physician will renew AE restraint orders every 24 hours. Refer to **A6.7.**

A6.5.2.1.6.2. As a minimum, the MCD/FN caring for a patient during AE movement must observe a restrained patient for the initial period of the time-limited restraints described by age in paragraph **A6.5.2.1.6.1** before considering any modification in the restraint plan. During these time limits, the MCD/FN may remove wrist restraints but not the ankle restraints. This is consistent with maintaining flight safety and facilitates patient feeding and other personal activities while the patient adapts to the AE environment. See paragraph

A6.5.2.1.9 for early release criteria.

NOTE: The MCD/FN may determine a patient requires restraints or the patient requires the continuation of restraints in the AE environment beyond the above time limits (Refer to paragraph **A6.6.5.1.**). In either situation, the use of restraints will not exceed 24 hours. Notify TACC/AMOC/AOC/PMRC of the application of restraints within one hour. Document application and continuation of restraints on AF Forms 3899/3829 and DD Form 602. Include assessment, alternative measures taken, the reasons for application or continuation, and the length of time restraints were on during the mission, including minimal level of observation described below.

A6.5.2.1.7. Level of Observation Required for Patients in Restraints. (See Paragraph **A6.6.9** for managing patients at risk for dislodging vital therapeutic devices).

A6.5.2.1.7.1. Every 15-minute circulation and neurological assessments of all extremities with devices, and safety checks. *Minimal requirement.*

A6.5.2.1.7.2. Line-of-sight. *Minimal requirement.*

A6.5.2.1.7.3. Other, as ordered per physician: One-to-One (the originating MTF will provide a medical attendant to stay with the patient at all times).

A6.5.2.1.8. Expected outcome for a patient in restraints (i.e., regains control, verbal contract or adequately sedated).

A6.5.2.1.9. Early release and wrist restraint removal criteria for the FN, in conjunction with the medical attendant, includes, but is not limited to orientation to time, person and place, follows and/or reads commands, ability to recall, calm affect, and no signs of agitation. Additionally, the individual reliably contracts for safety, accepts limits and is adequately sedated.

A6.5.2.1.9.1. If the MCD's reassessment concludes restraints are no longer needed, remove one extremity restraint at a time to check skin integrity and perform skin care to the area. Document findings and decision on AF Forms 3899/3829 and DD Form 602.

NOTE: When restraint is terminated and the same behavior reoccurs, the original order may be reapplied if alternative measures remain ineffective.

A6.5.2.1.10. Medication to be given preflight, and PRN if behavior becomes unmanageable.

A6.5.2.1.11. Intake and output for individuals in 4-point restraints more than 24 hours.

A6.5.2.1.12. Request for patient care team assessment at en route MTF for individuals in restraints more than 72 hours.

A6.6. Preflight/In-flight Considerations for the Application of Restraints.

A6.6.1. **1A** patients will have restraints on prior to boarding the aircraft; **1B** patients will have restraints available on the litter or with the MA.

A6.6.2. Inspect short and long belts, and the wrist and ankle cuffs for cuts, tears, and excessive wear.

WARNING: Prior to flight, assure there are compatible/operable restraint keys available and caregivers know placement; prior to take-off, ensure the restraint key is not bent and opens the locking device.

A6.6.3. An AECM formally trained and competent in the application of restraints, will coordinate with the MCD and the MA and act as the team leader. The team leader establishes and is responsible for patient interaction while en route.

A6.6.4. The safest and least restrictive alternative methods for controlling violent and uncontrollable behavior in the AE environment will be utilized. These include but are not limited to:

A6.6.4.1. Verbal de-escalation, verbal contract, explanation of consequences for not changing behavior, family intervention, and medication as ordered.

A6.6.5. Perform a brief neurological exam. Rule out and treat hypoxia.

A6.6.5.1. Assessment includes but is not limited to orientation to time, person and place, ability to follow commands or recall directions, reliably contracts for safety, accepts limits and if a danger to flight safety, self or others, too agitated/violent to administer sedatives.

A6.6.6. When alternative measures are unsuccessful, the AECM team leader, in conjunction with the MCD and the MA, will:

A6.6.6.1. Ensure the patient, the crew, and others are not in immediate danger.

A6.6.6.2. Direct the notification of the flight crew to include securing access to the flight deck.

A6.6.6.3. Make every effort to maintain the patient's dignity and privacy.

A6.6.6.4. Inform the patient and family member (if present) he/she is out of control, and the crew is assuming control until he/she is able to regain control.

A6.6.7. Acute Exacerbation of Psychiatric or Behavior Disorders. If the patient is exhibiting aggressive and uncontrollable behavior, is extremely agitated and violent, and/or is determined to be a danger to flight safety, self or others on the aircraft, give PRN medication as ordered. If no PRN medication is ordered, give Haldol or Valium IAW the guidance below. Consult with the PMRC physician and TACC/AMOC/AOC/ PMRC for guidance and possible diversion to a MTF capable of handling the situation and for further medical direction within one hour, if operationally feasible.

WARNING: Give either Haldol or Valium, not both.

NOTE 1: When ever possible, give medication first. If the patient is extremely violent, out of control, and a threat to flight safety, follow paragraph **A6.6.8.** and then give medication.

NOTE 2: If this situation occurs prior to takeoff, the patient is not stable for flight. The patient will be stabilized with medication prior to take-off in coordination with the

TACC/AMOC/ AOC/PMRC and/or local physician. The mission should not be delayed in order to meet this requirement.

A6.6.7.1. Perform a brief neurological exam. Rule out and treat hypoxia.

A6.6.7.2. **Give Haldol 2-5 mg IM** to adults only if there is no known allergy or possibility of pregnancy. If severe behavior continues may repeat in 60 minutes for a total of 10 mg IM. Notify TACC/AMOC/ AOC/ PMRC for guidance and possible diversion to a MTF capable of handling the situation. Notify the PMRC physician within one hour of administration.

A6.6.7.2.1. Side Effects: Opisthotonos, laryngeal dystonia, Parkinson-like symptoms, leth- argy, confusion, and exacerbation of psychotic symptoms; hyperpyrexia and heat stroke; tachycardia, hypotension/hypertension; anorexia; dry mouth and urinary retention. **NOTE 1:** May appear within hours or a few days after starting medication. **NOTE 2:** Restlessness, jit- ters, nervous energy and motor agitation may present as psychotic agitation; a brief preflight and recurring neurological exam is essential (See paragraph [A6.6.5](#)).

A6.6.7.3. Use caution in pregnancy and if already receiving antipsychotic drugs.

A6.6.7.4. Parkinson-like symptoms of weakness, fatigue, and absence of movement place the patient as risk for deep vein thrombosis (DVT) and pressure sores.

WARNING: Do not give Haldol to patients who have NMS or EPS symptoms (see paragraph [A6.4.2.3](#)), Parkinson disease or a high fever along with severe agitation. If NMS or EPS symptoms appear after administration, contact a PMRC physician.

A6.6.7.5. **Give Valium 5-10 mg IM to adults, one time only** , if there is no known allergy or possibility of pregnancy. Notify TACC/AMOC/ AOC/ PMRC for guidance and possible diver- sion to a MTF capable of handling the situation. Notify the PMRC physician within one hour of administration.

A6.6.7.5.1. Side Effects: Respiratory depression, cardiovascular collapse, pain and phlebitis at injections site. Increased sedation when used with Phenobarbital.

A6.6.7.5.2. Contraindicated in shock, myasthenia gravis, and glaucoma.

A6.6.8. Application of Restraints to Control the Acute Exacerbation of Mental Health or Behavior Disorders.

A6.6.8.1. A trained and competent FN, in coordination with the MA, may apply restraints to con- trol behavior of a patient who is immediate danger to self and others in the AE environment when alternative measures are unsuccessful using guidelines in paragraph [A6.5](#) paragraph [A6.6](#) and succeeding paragraphs in these sections.

A6.6.8.2. At least two individuals current in AE restraint application will assist the team leader. These individuals work together to place the patient in restraints in a safe and timely manner and to reduce the patient's distress and prevent injury. Medical personnel must recognize when addi- tional manpower is needed to protect the patient, crew and passengers.

A6.6.8.3. Locking devices should be placed towards the aisle. Refer to AFI 41-309.
NOTE: Ankle restraints may not fit over bulky material and footwear above the ankle.
WARNING: Do not secure the restraint straps to or around the litter.

A6.6.8.4. When Leather Restraints are on.

A6.6.8.4.1. Perform observation/documentation described in paragraph [A6.5.2.1.7](#) every 15 minutes. Use AF IMT 3899G, *Patient Movement Restraint Observation Flowsheet*.

A6.6.8.4.2. Assess hydration, nutrition, skin integrity, and toileting needs every two hours.

A6.6.8.4.3. Every two hours change position, and remove one extremity restraint at a time to check skin integrity, perform skin care to the area and range of motion (ROM) exercises.

A6.6.8.4.4. Maintain continuous line-of-sight, including during take-off and landing.

A6.6.9. Other Types of Restraints for Managing Patients at Risk for Dislodging Vital Therapeutic Devices. **WARNING:** These types of restraints are not routinely used in-flight because they are secured to the litter. AECMs should be readily available to untie or cut the restraint.

A6.6.9.1. Mitten/Glove: Wash and dry patient's hands, roll up a wash cloth or gauze pad and place in palm; close hand over the pad and restrict arm movement as required. Remove every two hours to reassess and allow for Range of Motion (ROM).

A6.6.9.1.1. Perform every 60-minute circulation and neurological assessments of all extremities with devices. *Minimal requirement.*

A6.6.9.1.2. Line-of-sight. *Minimal requirement*

A6.6.9.2. Use of Vest and Soft Restraints. Refer to Lippincott Manual of Nursing Practice.

A6.6.9.2.1. Perform every 60-minute circulation and neurological assessments of all extremities with devices, and safety checks. *Minimal requirement.*

A6.6.9.2.2. Line-of-sight. *Minimal requirement.*

A6.6.10. Documentation Requirements for Medication Administration and Leather Restraint Application IAW this publication. Refer to paragraph 7.4.1.

A6.6.10.1. Patient assessment and behavior/justification for PRN medication or restraint application.

A6.6.10.2. When administering medication to women of childbearing age: Last menstrual period.

A6.6.10.3. Date/time of administration medication and/or application of restraints, and outcome.

A6.6.10.4. Date/time of notification of the physician.

A6.6.10.5. Measures taken to protect the rights, dignity, and well being including monitoring, reassessment, and attention to needs.

A6.6.10.6. Complete DD Form 2852.

A6.7. Post Mission RON Requirements for Patients in Restraints.

A6.7.1. The receiving MA will assume responsibility of the patient. In consultation with the MCD, this MA determines if restraints will be continued during transportation to the MTF. Restraints will not be placed for the convenience of the receiving facility. Continuity of care and patient dignity will be maintained en route to the receiving MTF.

A6.7.2. A physician will perform a face-to-face reassessment of the patient to determine if restraints are to be continued for the next 24 hours while in the AE environment.

A6.7.3. The physician at the RON site will review the FN's determination to apply restraints and/or administer Haldol or Valium en route.

A6.7.4. In extreme situations, restraints may be required for more than 72 hours in the AE environment. If restraints are in use for more than 72 hours, an assessment by a psychiatric patient care team will occur before restraints are reordered for flight. If this is not possible, contact the PMRC for guidance.

A6.8. Post Traumatic Stress syndrome/Combat Fatigue.

A6.8.1. Develops after experiencing a psychologically traumatic event outside the range of usual experience (combat, bombings, kidnapping); the individual re-experiences the event through recurrent dreams and flashbacks. Emotional numbness, detachment, and estrangement may be used to defend against anxiety. May experience sleep disturbances, hypervigilance, guilt about surviving, poor concentration, and avoidance of the activities that trigger memory of the event.

A6.8.2. Assess Signs and Symptoms (may be associated with other injuries: Tremors; profuse sweating; dry mouth; tachycardia; shortness of breath and hyperventilation (rule out hypoxia). Irritability. Flat affect, staring, crying, and insomnia. **NOTE:** May exhibit violent and aggressive behavior while in the AE environment.

A6.8.3. Treatment/Management:

A6.8.3.1. Begins as soon as symptoms are noticed.

A6.8.3.2. Keep victims together for mutual support and away from other patients, if feasible.

A6.8.3.3. Reaffirm that everyone expects them to recover.

A6.8.3.4. Treat only the stress reaction, and avoid medications unless needed.

A6.8.3.5. Move may be high profile.

A6.8.3.5.1. Maintain privacy.

A6.8.3.5.2. Coordinate with Public Affairs representative IAW local policy. Written consent is required for photographs.

Figure A6.1. DELETED

Figure A6.2. DELETED

Attachment 7

REACTION TO BLOOD PRODUCTS

A7.1. Initial Response for All Blood Reactions. Notify TACC/AMOCC/AOC/ PMRC for guidance and possible diversion to a MTF capable of handling the situation, and concurrently:

A7.1.1. Stop the infusion immediately if symptoms are present (see below). Disconnect and change the IV tubing or flush the IV tubing with NS. Keep the vein open with NS

A7.1.2. Start a large bore IV in another extremity. Keep the vein open with NS.

A7.1.3. Start oxygen 6 LMP via mask.

A7.1.4. Obtain temperature, and monitor vital signs and pulse oximetry every 15 minutes. Place on cardiac monitor

A7.1.5. Re-verify the blood unit and document.

A7.1.6. Save the blood bag. Draw 5 to 7cc of blood from extremity not receiving the blood product. **NOTE:** Using a syringe and carefully recapping the needle using the one-handed technique is acceptable if no blood tubes are available. Label the syringe with date, time, and patient's name and SSN #. Tape the needle cap in place. Place in a leak proof Biohazard container/bag and label with patient's name. Offload to receiving MTF. Refer to Infection Control.

A7.1.7. Monitor urine output hourly.

A7.1.8. Notify TACC/AMOCC/AOC/ PMRC for guidance and possible diversion to a MTF capable of handling the situation.

A7.2. Febrile Reaction: Most Common.

A7.2.1. Symptoms: temperature increase of 2 degrees F or more; chills; flushing; tachycardia and headache.

A7.2.2. Treatment/Management:

A7.2.2.1. **Administer Tylenol (acetaminophen) 650 mg PO.** Monitor vital signs every 15 minutes and observe for symptoms below. **NOTE:** Aspirin adversely affects platelet function and is not recommended.

A7.3. Allergic/Anaphylactic Reaction to Blood: Antigen/Antibody Reaction.

A7.3.1. Symptoms: Hives; itching; chills; flushing; nausea and vomiting; coughing and/or wheezing; laryngeal edema.

A7.3.2. **Treatment/Management.** Notify TACC/AMOCC/AOC/ PMRC for guidance and possible diversion to a MTF capable of handling the situation, and concurrently:

A7.3.2.1. **Administer Benadryl (diphenhydramine) 50 mg IVP.** Prepare to give Epinephrine (EPI) per physician's order (see below).

A7.4. Acute Hemolytic Reaction to Blood: Most Severe.

A7.4.1. Symptoms: Rapid onset of the above symptoms, dyspnea, hypotension, and hemoglobinuria; rise in venous pressure, distended neck veins, dyspnea, cough, and/or crackles at bases of lungs.

A7.4.2. **Treatment/Management:** Notify TACC/AMOCC/AOC/ PMRC for guidance and possible diversion to a MTF capable of handling the situation, and concurrently:

A7.4.2.1. **Administer Epinephrine (1:1000) 0.3ml Subcutaneous (SC) every 15 mins. For Adults Only.** Repeat up to 3 times for moderate bronchospasm, facial, and laryngeal edema.

A7.4.2.2. **Give Benadryl (diphenhydramine) 50mg IVP x 1 if Unresponsive to SC EPI.**

A7.4.2.3. **If unresponsive to above, give Epinephrine (1:10,000) 0.5-1 mg IVP per physician's order every 5-10 minutes.**

A7.4.2.4. Infuse Normal Saline IV 1000cc Over Two Hours.

A7.4.2.5. Prepare to give diuretics to maintain hourly urine.

A7.4.2.6. Document on the AF Forms 3829/3899/DD Form 602/DD Form 1380 and SF 518 the type and time of symptom onset, when the blood was stopped, vital signs and O2 saturation, drawing of blood, interventions and name of physician and time contacted. Repeat the administrative verification procedures listed in [A5.2.6](#) and record the results on the AF3899/DD Form 602, and SF 518. Complete DD Form 2852 (Refer to paragraph [7.4.1](#)).

Attachment 8

SEVERE HYPOGLYCEMIA

A8.1. Hypoglycemia (potentially life-threatening). Caused by an overdose of insulin, a reduction in diet or increased exercise without sufficient caloric intake.

A8.1.1. Assessment.

A8.1.1.1. Aggressive or unusual behavior; normal or rapid respirations; tachycardia; pale, diaphoresis, headache, dizziness, fainting, seizure, and coma.

A8.1.1.2. Rule out hypoxia. Obtain vital signs and pulse oximetry. Ascertain last meal.

A8.1.1.3. On the ground, use the patient's glucose monitor. If a CCATT is on board, utilize ISTAT monitor, if available.

A8.2. Treatment/Management.

A8.2.1. **If Conscious With Early Signs:** Give a high complex carbohydrate, such as milk. Other examples include giving 4-oz juice or 2 sugar packets or peanut butter and crackers. **NOTE:** Insulin dependent patients should be encouraged to hand carry in-flight snacks.

A8.2.2. **If Unconscious or Poor Gag Reflex.** Notify TACC/AMOCC/AOC/ PMRC for guidance and possible diversion to a MTF capable of handling the situation, and concurrently:

A8.2.2.1. Administer high flow O2. Refer to [Table 4.1](#)

A8.2.2.2. Establish an IV.

A8.2.2.3. Administer Dextrose 50% (one amp) IVP.

A8.3. Documentation: Refer to paragraph [7.4.1](#) Complete DD Form 2852.

Attachment 9

STATUS EPILEPTICUS

A9.1. Seizures Continuing for More than Three Minutes or Restarts Without Regaining Consciousness. This is considered status epilepticus and is a medical emergency. Medicate as directed and notify TACC/AMOC/AOC/ PMRC for guidance and possible diversion to a MTF capable of handling the situation, and concurrently:

A9.1.1. Rule out hypoxia, hypoglycemia (Refer to [Attachment 8](#)), and narcotic overdose (Refer to [Attachment 11](#).)

A9.2. Obtain vital signs and pulse oximetry.

A9.3. Treatment/Management. Notify TACC/AMOC/AOC/ PMRC for guidance and possible diversion to a MTF capable of handling the situation, and concurrently:

A9.3.1. Start high flow O2. Refer to [Table 4.1](#)

A9.3.2. Start an IV with RL or NS at KVO.

A9.3.3. If no Medication is Ordered, Administer Valium (diazepam) 2 to 10 mg IV Push for Adults Only. Notify TACC/AMOC/AOC/PMRC for guidance and possible diversion to a MTF capable of handling the situation, and concurrently:

A9.3.3.1. Administer 5 mg over one minute. Monitor respirations and be ready to assist respirations.

A9.3.3.2. Side Effects: Respiratory depression, cardiovascular collapse, pain and phlebitis at injection site. Increased sedation when used with Phenobarbital.

A9.3.3.3. Contraindicated in shock, myasthenia gravis, and glaucoma.

A9.3.3.4. Seizures may recur within 20-30 minutes after initial control due to redistribution of drug within the brain.

A9.3.3.5. Incompatible with most IV drugs.

A9.4. Documentation: See paragraph [7.4.1](#) Complete DD Form 2852.

Attachment 10

TRIAGE/CONTINGENCY OPERATIONS (WAR, MOOTW, HOMELAND DEFENSE, DISASTER RESPONSE)

A10.1. Triage.

A10.1.1. A process of prioritizing medical care, treatment, and transportation of patients.

A10.1.2. The purpose is to sort large numbers of victims, maximize limited resources, and do the most good for those able to survive and return to duty.

A10.1.3. Triage is a dynamic and continuous process of assessment. The patient's status can and does change after the initial triage.

A10.1.4. Triage is performed at different intervals throughout the casualty evacuation and treatment sequences, including within the AE environment.

A10.1.5. The process of triage is instituted when existing resources are overwhelmed and medical personnel are unable to render complete care to all of the victims, i.e. Mass Casualty Incident (MCI).

A10.2. Triage Categories.

A10.2.1. Immediate (RED): Treatable life threatening injuries and /or wounds requiring stabilizing procedures of moderate to short duration, "To save life and limb."

A10.2.2. Delayed (YELLOW): Significant injuries requiring treatment, but can wait a few hours before definitive care is begun.

A10.2.3. Minimal (GREEN): Minor injuries requiring cleaning, minimal debridement, tetanus tox- oid, and first aid. Some of these patients are treated and returned to duty, and often can help care for others. "Walking Wounded."

A10.2.4. Expectant: (Black/Blue). Extensive injuries where survival is unlikely even with medical interventions. Once the incident is controlled, medical care can then be considered for these patients.

A10.3. Factors Influencing Patient Transfer in Contingency Operations.

A10.3.1. Tactical/contingency situation.

A10.3.1.1. Availability of aircraft.

A10.3.1.2. Area is safe or hostile for aircraft operations. The likelihood of conventional, chemi- cal, and biological attack will influence patient loading times.

A10.3.1.3. Location of MTF and their capabilities may or may not be close to patients' originat- ing area.

A10.3.1.4. MTFs may be limited in number, bed capacity, and critical resources necessitating rapid transport to the next level of care. Patients may be minimally stabilized or may require sta- bilization prior to flight.

A10.3.1.4.1. Patients are Considered Stabilized for Flight When:

A10.3.1.4.1.1. The airway is patent.

A10.3.1.4.1.2. Breathing is adequate.

A10.3.1.4.1.3. Circulation is adequate with bleeding controlled and fluids replaced with large bore IVs.

A10.3.1.4.1.4. Fractures are immobilized.

NOTE: Historically, infectious disease processes are related to 90% of war casualties. Personal protection and heightened awareness of infection control principles are paramount in the tactical arena whether or not a biological threat exists.

A10.4. Chemical Wound Management. NOTE: See <http://www.nbc-med.org/SiteContent/HomePage/WhatsNew/MedAspects/contents.html> Medical Aspects of Chemical and Biological Warfare 1999.

A10.4.1. Definition of Chemical Agent. A solid, liquid, or gas producing lethal or incapacitating effects.

A10.4.1.1. Physiological Effects of Chemical Agents.

A10.4.1.1.1. Irritation of a short duration, temporary physical disability, and mental delirium.

A10.4.1.1.2. Serious injury, permanent physical or mental disability, or death.

A10.4.1.2. Prevention.

A10.4.1.2.1. Protective mask and clothing, early detection and treatment, and decontamination.

A10.4.2. Blister Agents. Vesicants: Cause vesicles or “blisters” (May be referred to as “Mustard Gas”).

A10.4.2.1. Action.

A10.4.2.1.1. Causes serious tissue damage both internally (respiratory) and externally (burn-like blisters).

A10.4.2.1.2. At times, the effects are irreversible, and result in death.

A10.4.2.1.3. The care of patients after decontamination is similar to respiratory and/or burns patients.

A10.4.2.2. Characteristics of Blister Agents: There are at least four different types of blister agents.

A10.4.2.2.1. Considered long-term incapacitants, and can be delivered in a liquid or solid form.

A10.4.2.2.2. Various odors: Garlic, fishy, musty, and geraniums. A10.4.2.3. **Assess Signs and Symptoms.**

A10.4.2.3.1. Immediate: No pain on contact; may cause eye, nose, and throat irritation.

A10.4.2.3.2. Delayed: Erythema (reddish skin) may be seen 4 to 12 hours after exposure; coughing; nausea/vomiting; edema (swelling, or blistering) may be seen 8 to 24 hours after exposure; eyes, and auxiliary areas of the body (arm pits, groin,

inner surfaces of elbow and knee); respiratory damage may be seen within 4 hours (edema of mucosal membranes), and most often results in death.

A10.4.2.4. Preflight/In-flight Considerations and Care of Chemical Casualties. Refer to Pre-flight, Airway, Breathing, Shock and Burn Management.

A10.4.2.4.1. Decontaminate prior to flight.

A10.4.2.4.2. Aspirate and debride blisters larger than one inch in diameter before flight.

A10.4.2.4.3. Treat as a chemical burn. Maintain ABCs.

A10.4.3. Blood Agents. Cyanogens: Produce cyanide. Absorbed primarily through breathing, and prevents the transfer of oxygen from the blood to body tissue.

A10.4.3.1. Characteristics.

A10.4.3.1.1. A fast action killer, causes death within minutes of exposure.

A10.4.3.1.2. There are at least two different types of blood agents dispersed in liquid or gas form.

A10.4.3.1.3. May have a slight odor of peach kernels or odorless.

A10.4.3.2. Assess Signs and Symptoms.

A10.4.3.2.1. Immediate: Severe headache; dizziness; confusion; labored/violent/increased respirations.

A10.4.3.2.2. Delayed: Reddish lips and skin; bulging, glassy eyes with dilated pupils; pulmo- nary edema (possibly); or shock.

A10.4.3.3. Preflight/In-flight Considerations and Care for Blood Agent Casualties.

A10.4.3.3.1. Decontaminate prior to flight. A10.4.3.3.2. Treatment/Management.

A10.4.3.4. Possible medication. **NOTE:** Will be provided by originating MTF.

A10.4.3.4.1. 10 ml of 3% solution Sodium Nitrate, IV over four minutes.

A10.4.3.4.2. 25 ml of 25% Sodium Thiosulfate, IV through the same site as above, over 10 minutes.

A10.4.3.4.3. Expect successful treatment 4 hours post exposure.

A10.4.3.5. Administer O₂ to treat histotoxic/hypemic hypoxia.

A10.4.4. Choking Agents (Phosgene, Chlorine).

A10.4.4.1. Characteristics.

A10.4.4.1.1. Is slow acting; 24 to 48 hours may pass between exposure and death.

A10.4.4.1.2. Agents are dispersed as either a gas or liquid and have the distinct odor of newly mowed hay.

A10.4.4.2. Mode of Action:

A10.4.4.2.1. Carbonyl radicals cause micro-lesions in the capillary walls of the lungs

A10.4.4.2.2. Plasma leaks from the circulatory system into the pulmonary system, leading to “dry land drowning” pulmonary edema, or Adult Respiratory Distress resulting in death.

A10.4.4.3. Assess Signs and Symptoms: Causes swelling of the nose, throat and the lungs.

A10.4.4.3.1. Immediate: May last for 20 to 30 minutes after protective mask is put on.

A10.4.4.3.1.1. Irritated/watering eyes, nose, and throat.

A10.4.4.3.2. Delayed: May not appear for 10 to 48 hours post exposure.

A10.4.4.3.2.1. Shortness of breath; choking; painful and productive cough; cyanosis; nau- sea and vomiting; shock.

A10.4.4.4. Preflight/In-flight Considerations and Care for Choking Agent Casualties.

A10.4.4.4.1. Decontaminate.

A10.4.4.4.2. Treatment/Management: Aminophylline for bronchospasms. Corticosteroids, as indicated and if available, and antibiotics PRN. Expect successful treatment 48 hours post exposure.

A10.4.4.4.3. Maintain ABCs.

A10.4.5. Nerve Agents. Inhibits enzyme cholinesterase: Anticholinergic.

A10.4.5.1. Characteristics: Fast acting killer. Agents enter the body through inhalation, absorption, or ingestion resulting in cessation of breathing and death. There are at least four different types of nerve agents dispersed in a liquid form. May have a slightly fruity or camphor odor or none at all.

A10.4.5.2. Assess Signs and Symptoms.

A10.4.5.2.1. Mild: Headache; dizziness; weakness; tremors of the tongue and eyelids; dim vision from constriction of pupils.

A10.4.5.2.2. Moderate: Nausea/vomiting; hypersalivation; tearing; abdominal cramps; bradycardia; tremors of the hands/arms and feet/legs.

A10.4.5.2.3. Severe: Involuntary urination and defecation; pinpoint and non-reactive pupils; shortness of breath; laryngeal spasm or edema; cyanosis; seizures; coma;

A10.4.5.3. Preflight/In-flight Considerations and Care for Nerve Agent Casualties. Refer to Airway, Breathing and Respiratory Management.

A10.4.5.3.1. Decontaminate. **WARNING:** Plastic airway equipment, including oxygen tubing, suction catheters and containers absorb sarin. Change this equipment prior to flight.

A10.4.5.3.2. Maintain airway.

A10.4.5.3.3. Ensure all auto injectors (3 Atropine and 3 Pralidoxime) have been given

A10.4.5.3.4. Start IV.

A10.4.5.3.5. Ensure Diazepam 2 ml (10 mg) has been given for seizures or severe fasciculations. If present, medicate as ordered.

A10.4.5.3.6. Atropine 1 ml (2 mg) IV every two-four minutes until full atropinization occurs (normal breathing, respiratory secretions controlled, heart rate > 90 BPM, and skin is dry). May have a continuous infusion of 1 to 2 mg/hr. **NOTE:** Originating MTF provides medication supplies.

A10.4.5.3.7. May have Atropine Ophthalmic ointment 1% O.U. every two-four hours PRN visual symptoms. **NOTE:** Do not use pupillary size to monitor patient.

A10.4.5.3.8. Will require aggressive pulmonary toileting and postural drainage for thick bronchial secretions.

A10.4.5.3.9. Avoid using respiratory depressant drugs.

A10.4.5.3.10. Consider urinary catheter.

A10.4.5.3.11. Monitor vital signs and expect symptoms to recur unpredictably.

A10.5. Biological Agents. **NOTE:** Refer to AFMAN 44-156 Treatment of Biological Warfare Agent Casualties for more in depth signs and symptoms, and treatment.

A10.5.1. General Considerations for Biological Casualties. Refer to **Attachment 12, Infection Control.**

A10.5.1.1. Main purpose is a terror effect, restraint of military operations, and to tie up medical resources. Bacterium, toxins, fungi, rickettsiae, chlamydiae, and viruses cause illnesses.

A10.5.1.2. May be delivered covertly or with other NBC or conventional weapons.

A10.5.1.3. Known infectious agents or toxins were successfully controlled in natural outbreaks in the past. However, they may be genetically altered making known treatments ineffective.

A10.5.1.4. May be difficult to differentiate between natural disease process and a biological agent. Suspect if there are numerous individuals experiencing similar symptoms.

A10.5.1.5. Infected patients may be moved before clinical signs are present.

A10.5.1.6. Epidemic outbreaks may occur 6-36 hours, even if decontaminated.

A10.5.1.7. Incubation period for inhaled Anthrax spores is one-six days, depending upon the dose.

A10.5.1.8. Separate victims of the attack from unexposed personnel.

A10.5.1.9. Standard and transmission-based precautions are mandatory when moving patients with known or suspected diagnoses.

A10.6. Nuclear. Casualties are subject to blast and thermal injuries, and radiation sickness.

A10.6.1. Blast Injuries: Primary or direct blast injuries; hemothorax; eardrum rupture; air embolism.

A10.6.1.1. Secondary or Indirect Blast Injuries: Missile and crushing injuries.

A10.6.2. **Thermal Injuries:** Skin burns; flash burns; heater transfer burns.

A10.6.3. **Eye Injuries:** Retinal burns; looking directly at the detonation may cause total permanent blindness. Looking off at an angle to the detonation may cause partial blindness or spotted vision. Flash blindness - caused by intense light on the rods and cones; the effect is temporary. Loss of night vision. Ocular opacities may appear years later from the effect of UV radiation

A10.6.4. Radiation Sickness.

A10.6.4.1. Early Effects: Exposure to < 100 c Gy (100 RAD). May experience nausea/vomiting, but seen only in a small percentage of those exposed.

A10.6.4.2. Exposure of 100 - 300 c Gy. Within first week post exposure (seen in a small percent- age of those exposed): Nausea/vomiting. Four weeks post exposure (symptoms are mild and recovery is likely): Hair loss, loss of appetite, listlessness, minor hemorrhaging, and diarrhea.

A10.6.4.3. Exposure of 400 c Gy (Mortality rate is about 50%). First 24 hours: nausea/vomiting. Three weeks post exposure: Hair loss, loss of appetite, hemorrhaging and diarrhea, rapid weight loss.

A10.6.4.4. Exposure of 600 c Gee (Mortality rate is nearly 100%, death occurring early in the second week). First 24 hours: Nausea/vomiting. Early first week: Rapid weight loss.

A10.6.5. Preflight and In-flight Treatment/Management for Nuclear Casualties.

A10.6.5.1. Radiation injuries - it is difficult to tell early on what level of radiation the patient may have been exposed to. Some patients are asymptomatic for days, weeks or months.

A10.6.5.2. Maintain Fluid and Electrolyte Balance.

A10.6.5.3. Vital signs, GCS and temperature.

A10.6.5.4. Cardiac monitor.

A10.6.5.5. Measure I&O.

A10.6.5.6. Requires at least 3 liters of fluid a day.

A10.6.5.7. Consider administering Colloids and crystalloids.

A10.6.5.8. Monitor electrolytes.

A10.6.5.9. Seizure Precautions.

A10.6.5.10. Prevent Infection: Reverse/protective isolation may be necessary. Consider antibiot- ics.

Attachment 11

UNCONSCIOUS/KNOWN OR SUSPECTED NARCOTIC OVERDOSE

A11.1. Unconscious/Known or Suspected Narcotic Overdose. Various factors may lead to an unsuspected unconscious state or narcotic overdose in the AE environment. These factors may include hypoxia, and medication self-administration and/or inadequate communication/documentation.

A11.1.1. Assessment.

A11.1.1.1. ABCs.

A11.1.1.2. Rule out hypoxia.

A11.1.1.3. Refer to paragraph 3.3.7 Neurological Assessment and Table 3.1 GCS.

A11.1.1.4. Identify possible causes.

A11.2. Treatment/Management. Notify TACC/AMOC/AOC/PMRC for guidance and possible diversion to a MTF capable of handling the situation, and concurrently:

A11.2.1. Maintain ABCs

A11.2.2. Give high flow O₂. Refer to Table 4.1

A11.2.3. **Administer Narcan (naloxone) 0.4 mg – 2.0 mg IVP (preferred), ET (2-2.5 times the normal dose in 10cc of Normal Saline), IM or subcutaneous (SC) for adults every 2 to 3 minutes for a total of 10 mg.**

A11.2.3.1. Administered to reverse the side effects of respiratory depression, unresponsiveness and hypotension associated with natural and synthetic opioids: Morphine, Demerol, Talwin, Methadone, Darvon, Nubain, Stadol and Lomotil.
WARNING: Use caution in patients with heart disease cardiotoxic drugs, neurological trauma and hypertension.

A11.2.3.2. Will induce withdrawal symptoms, including hyperactivity and combativeness.

A11.2.3.3. The duration of action of some narcotics may exceed that of Narcan, and repeat doses of Narcan may be necessary.

A11.2.3.4. Contraindicated in known sensitivity.

A11.2.3.5. **If unresponsive to Narcan, administer Dextrose 50% IVP one time only. Refer to Attachment 8.**

A11.3. Documentation: Refer to paragraph 7.4.1 Complete DD Form 2852.

Attachment 12

INFECTION CONTROL

A12.1. General Principles Of Infection Control.

A12.1.1. The guidelines for personnel technique and recommended standards of patient care are contained in the most current Center for Disease Control (CDC) guidelines carried on each mission, and in local cleaning directives. Enhance local protocols by monitoring the CDC's World Wide Web server at <http://www.cdc.gov/ncidod/dhqp/index.html>

A12.1.2. All medical personnel in the AE environment will implement Standard Precautions coupled with Transmission Based Precautions and will keep aircrews informed, as required.

A12.1.2.1. "Treatment of Biological Warfare Agent Casualties" is available for further guidance at https://kx.afms.mil/kxweb/dotmil/file/web/ctb_031091.pdf.

A12.1.3. Brief all infectious patients and their attendants on isolation procedures and precautions.

A12.1.4. Each aircraft and mission is unique. Environmental lighting in most cases will be poor, making the visualization and identification of blood in body fluids highly uncertain. The practice of infection control within the AE setting will adhere to the following principles:

A12.1.4.1. Standard Precautions will be used with every patient regardless of their diagnosis or presumed infection status (Refer to **A12.2**).

A12.1.4.2. Treat all human blood and body fluids (BBF) as if known to be infectious for HIV, Hepatitis B virus, Hepatitis C virus, or other bloodborne pathogens.

A12.1.4.3. The aircraft is considered a dirty environment. Do not change soiled dressings; reinforce only as needed.

A12.1.4.4. Medical personnel with exudative lesions or weeping dermatitis will refrain from direct patient care and from handling patient care equipment/supplies until the condition resolves.

A12.1.4.5. Artificial or long fingernails and chipped nail polish harbor bacteria and fungus, and are a risk to patient and personal safety. Individuals who chose to wear these items should be guided by professional conscience.

A12.1.4.6. NOMEX/leather gloves will not be worn while administering patient care.

A12.1.4.7. Eating, drinking, applying cosmetics, and handling contact lenses is prohibited in work areas where there is a likelihood of exposure to BBF.

A12.1.4.8. Food and drinks are prohibited on countertops where blood/other potentially infected material is stored/placed. (**EXCEPTION:** On cargo aircraft this may not be feasible. Ensure the loadmaster/boom operator is notified of the storage/placement of such items, so they may disseminate the information to the rest of the crew).

A12.1.5. **Patient Assignment and Placement of Patients.** **NOTE:** The airflow of each aircraft will govern litter and seat assignments. Refer to **Table A12.1**

A12.1.5.1. When feasible, assign a single caregiver to infectious patients or to those who are at high-risk for infection. Avoid mixing infectious patients and those at high-risk for infection, when- ever possible.

A12.1.5.2. High-risk patients, i.e., those particularly susceptible to infection (leukemia, cancer and post-op patients), must be located as far as possible from infectious patients. Consider the direction of airflow in the aircraft and having the high-risk patient wear the N-95 mask en route.

A12.1.5.3. Known or suspected infectious patients should be in the lowest litter position.

A12.1.5.4. Patients with known or suspected wound infections should not be placed in the same litter tier as patients with clean wounds.

A12.1.5.5. Infectious ambulatory patients will be seated away from other patients if possible.

A12.1.5.6. In the event of a large outbreak, patients who have active infections with the same dis-ease (e.g., TB, measles, tularemia, cholera, etc.) may be moved as groups (cohorted) in aircraft that meet safe ventilation and airflow requirements for Airborne Precautions. See paragraph [A12.3.1](#) Airborne Precautions.

A12.1.5.7. In austere ground operation settings with limited airflow (e.g., Ambus, Humvee, tent- age, etc.), the infectious patient will wear a N95 mask, if applicable (See paragraph [A12.3](#) Trans- mission Precautions). The patient will be placed to the greatest extent possible downwind, near the airflow exit and away from other patients.

NOTE: When in confined areas and/or in areas with poor air circulation, both the patient and the health care worker (HCW) will wear a N95 mask

A12.2. Standard Precautions.

A12.2.1. Hands.

A12.2.1.1. Handwashing is the single most important method for preventing the spread of infec- tion.

A12.2.1.1.1. Handwashing will be accomplished with soap and running water, if available.

A12.2.1.1.2. AE approved waterless hand cleaners/antiseptics may be used as an adjunct to routine handwashing or when handwashing facilities are inadequate, inaccessible, or when there is an interruption in the water supply. Waterless hand antiseptics may come in a foam, gel, or towelette. **NOTE:** If visible soiling is present on the hands, a towelette will offer the physical removal of the dirt and should be the first choice for hand antisepsis. Follow manu- facturer's directions for use.

A12.2.1.2. Wash hands before and after each patient contact; immediately after removing gloves or other personal protective attire (i.e., gowns, masks, goggles); before dispensing medications, performing invasive procedures, touching wounds or touching patients who are susceptible to infection; before serving meals; and after sneezing, coughing, eating, and performing personal hygiene.

A12.2.2. **Personal Protective Attire (PPA).** Worn appropriate for the task, whenever exposure to BBF is anticipated.

A12.2.2.1. **Gloves.**

A12.2.2.1.1. Use disposable, single-use gloves.

A12.2.2.1.2. Change gloves after contact with contaminated materials, even if care of that patient is not complete.

A12.2.2.1.3. Change gloves between each patient.

A12.2.2.1.4. Wear gloves while serving/handling unwrapped food.

A12.2.2.1.5. Remove gloves promptly after use and before touching noncontaminated items/surfaces. Wash hands after removing gloves. A12.2.2.2.

Gowns.

A12.2.2.2.1. Fluid-repellent gowns are worn to protect skin and prevent soiling of clothing during procedures and patient care activities likely to generate splashes or sprays of BBF. In the event the health care worker's (HCW) clothing is contaminated with BBF, a gown may be worn for a short duration to prevent cross-contamination.

A12.2.2.2.2. Promptly discard BBF contaminated disposable gowns after use in designated biohazard trash bags.

A12.2.2.3. **Goggles and Masks.**

A12.2.2.3.1. Goggles, safety glasses with side shields or mask with a visor will be worn any- time splashing of BBF is anticipated. Normal eyeglasses are not considered protective apparel. When worn for PPA, masks and goggles protect the wearer from splashes or sprays of BBF.

A12.2.2.3.2. Fluid resistant surgical masks are appropriate and will be changed when moist; as a general rule, change after two hours of wear or when wet.

A12.2.2.3.3. The N95 respirator is approved for in-flight wear and will be worn by all care- givers when providing immediate care to a patient with a suspected or actual airborne trans- missible infection. Additionally, the N95 is worn by the patient for whom the disease is suspected.

A12.2.2.3.3.1. The N95 mask will be fit-tested by a local Bioenvironmental Engineer or a certified fit-tester IAW AFOSHSTD 48-137, Respiratory Protection Program and local policy prior to wear by medical personnel. Accomplish fit testing for non-medical person- nel if it does not delay mission departure. **NOTE:** Per manufacturer's guidelines, patients, mission and ground personnel who wear this mask do not require an official fit-testing but the medical aircrew member will evaluate the "fit" of the mask to the patient's face, and assure there are no gaps or leaks.

A12.2.2.3.3.2. All personnel and patients will change the N95 mask whenever wet or con- taminated with BBF, if the straps are loose or if the mask is damaged, and by personnel after completing direct patient care. **NOTE:** The N95 mask will not be reused once it is removed.

A12.2.2.4. Use a resuscitation mask or bag-valve mask to avoid mouth-to-mouth contact.

A12.2.3. Needles and Syringes/Sharps.

A12.2.3.1. Do not recap used needles. **NOTE:** Recapping is acceptable, if blood is drawn and no blood tubes are available; use a one-handed scoop technique. Secure the cap with tape. Follow paragraph [A12.2.7](#)

A12.2.3.2. Do not bend or break needles.

A12.2.3.3. Place needles in a puncture resistant container maintained as close to the point of use as possible.

A12.2.3.4. After securing the sharps container in the closed position, off-load sharps container according to local policy.

A12.2.4. Biohazardous Waste.

A12.2.4.1. Biohazardous waste is defined as liquid or semi-liquid blood, or other potentially infectious materials; contaminated items that would release blood or other potentially infectious materials in a liquid or semi-liquid state if compressed; items that are caked with dried blood or other potentially infectious materials and are capable of releasing these materials during handling; contaminated sharps (see above for disposal of sharps); and pathological and microbiological wastes containing blood or other potentially infectious materials.

A12.2.4.2. Place a red biohazard bag at the end of the patient's litter, if BBF is expected. Biohazard bags will not be used for trash that is not contaminated with BBF waste.

A12.2.4.3. Double-bag waste, if there is a potential for leakage.

A12.2.4.4. Off-load with the patient for disposal at the local Medical Treatment Facility (MTF).

A12.2.5. Linen.

A12.2.5.1. All used linen will be handled as if potentially infectious.

A12.2.5.2. Handle used linen as little as possible, with a minimum agitation, to prevent the potential dissemination of microorganisms.

A12.2.5.3. Place soiled linen in a clear plastic bag for off loading with the patient unless contaminated with BBF, then follow paragraph [A12.2.4](#)

A12.2.6. Urine and Feces.

A12.2.6.1. Urine and feces from all patients, including those on isolation precautions, can be flushed down the aircraft toilet.

A12.2.6.2. Disposable urinals are used as needed and discarded in the proper waste bag (Refer to para. [A12.2.4](#)).

A12.2.6.3. The equipment table of allowances for bedpans is limited. Use of bedpans for several patients is accomplished by lining bedpans with a plastic bag and taping securely to prevent slip-page and spillage.

A12.2.6.3.1. Dispose of waste in aircraft toilet, then carefully remove bag, keeping the soiled portion of the bag to the inside, roll/gather bag closed and dispose in the proper waste bag (Refer to paragraph. [A12.2.4](#)).

A12.2.7. Laboratory/Human Specimens.

A12.2.7.1. Standard precautions will be used in the procurement and the handling of all BBF. A separate cooler will be available for storing blood products and specimens; follow packing instructions for temperature control.

NOTE: As a minimum, wear gloves. For suspected BW agents, wear full PPA (gown, gloves, mask, and goggles).

A12.2.7.2. Avoid contamination of the outside of the container. If contaminated, follow para- graph [A12.2.8](#)

A12.2.7.3. All blood/body fluid specimen containers will be labeled with patient information and placed in a small biohazard bag or a zip-lock bag that has a biohazard label on it.

A12.2.7.4. Do not place specimens in the refrigerator with medications or food.

A12.2.8. Cleaning/Disinfecting. NOTE: Performed by AECMs.

A12.2.8.1. Routine cleaning IAW CDC guidelines/recommendations of contaminated areas of the cabin that come in direct contact with patients will help prevent the spread of microorganisms.

A12.2.8.2. PPA will be worn appropriate for the task. As a minimum, gloves will be worn.

A12.2.8.3. Use AE approved detergent/disinfectant to clean and disinfect patient care areas IAW CDC guidelines/recommendations. Refer to current AE allowance standards.

A12.2.8.4. Clean/disinfect surfaces using a damp cloth/disposable washcloth or AE approved pre-package kits; allow to air dry.

A12.2.8.5. Areas used for medication and food preparation areas will be cleaned/disinfected prior to use.

A12.2.8.6. BBF Spill Clean-up.

A12.2.8.6.1. Place an absorbent material over spill.

A12.2.8.6.2. Blot up and dispose of in a red biohazard bag.

A12.2.8.6.3. Pour/spray/clean area with AE approved disinfectant/detergent. Refer to current AE allowance standards.

A12.2.8.6.4. Allow to air dry.

A12.2.8.7. BBF Contamination of Seats/Cushions.

A12.2.8.7.1. Remove web seat or seat cushion, and seat back and place in a red biohazard bag.

A12.2.8.7.2. Coordinate with loadmaster/crew chief IAW local policy.

A12.2.8.7.3. Label with suspected/known BBF source.

A12.2.8.8. Off-Loading Patients.

A12.2.8.8.1. Send all disposable patient care items with the patient (Refer to paragraph [A12.2.4](#))

A12.2.8.8.2. Bag and label all contaminated equipment, and return to home station for decontamination.

A12.2.8.8.3. There is no need to “decontaminate” the interior of the aircraft for routine transport of patients. If using transmission-based precautions, clean surfaces the patient had immediate contact with by wiping area off using a cloth containing the approved detergent/disinfectant. Seat cushions and litters may need cleaning depending on the level of contamination.

A12.2.8.9. Contaminated Reusable Patient Care Equipment.

A12.2.8.9.1. Place in biohazard bag and label with type of contaminants.

A12.2.8.9.2. Remove to the AE medical equipment section for cleaning.

A12.2.8.9.3. If mission RONS, remove to the staging facility or supporting MTF for decontamination or IAW local policy.

A12.2.8.9.4. Decontaminate equipment prior to servicing or shipping. When this is not feasible, equipment must be in a labeled **universal biohazard bag**. A listing of contaminated portions of equipment must be specified.

A12.2.8.9.5. In the staging facility, cleaning is accomplished using a germicidal/fungicidal liquid solution IAW local policy.

A12.2.8.10. Aircraft Decontamination. NOTE: Performed IAW Air Mobility Operations in a Chemical and Biological CONOPS. Not an AECM duty.

A12.2.8.10.1. In the event of suspected or known contamination, the aircraft commander and the MCD will notify the Tactical Airlift Control Center/Air Mobility Operations Control Center/Air Operations Center/Patient Movement Requirements Center (TACC/AMOCC/AOC/PMRC), and the theater surgeon for further guidance.

A12.2.9. Irrigation Fluids, Multi-dose Vials, Sterile Supplies.

A12.2.9.1. Irrigation fluids - open, label with date and time and use for only 24 hours; discard remainder after 24 hours.

A12.2.9.2. Multi-dose vials - open, and follow manufacturer's suggestion for disposal.

A12.2.9.2.1. Dispose of vials when any signs of contamination, color change or foreign particles are found or known contamination occurs.

A12.2.9.2.2. **NOTE:** Some vials may appear to be multi-dose when, in fact, they are single dose (example: Normal Saline).

A12.2.9.3. Sterile supplies - check prior to flight for expiration dates, tears, evidence of liquid spills, and/or color change.

A12.2.9.3.1. Expired disposable items are not reprocessed.

A12.2.9.3.2. Shelf life (sterility) is either event-related and/or time-related:

A12.2.9.3.2.1. Event-related sterility means that as long as an “event” has not occurred to compromise sterility, the item is considered sterile. An event may include any of the following: the package is torn, ripped open, dropped or compromised in a way that causes the healthcare worker to question the integrity of the contents.

A12.2.9.3.2.2. Date-related sterility is based on the type of packaging and will have a tag with an expiration date.

A12.2.9.4. Disposable items are not reused or reprocessed.

A12.3. Transmission Based Isolation Precautions. There are two tiers to isolation. The first is the use of Standard Precautions as noted above in paragraph [A12.2](#) for use with every patient contact. The second tier is the Transmissions Based Precautions for isolating known or suspected pathogenic microorganisms, communicable diseases, or colonized pathogenic microorganisms. For further guidance, refer to “Treatment of Biological Warfare Agent Casualties” (AFMAN 44-156). See paragraph [A12.1.1](#)

NOTES:

1. The following patient movements require coordination with the Theater Patient Movement Center (PMRC) and Global Patient Movement Center (GPMRC), and notification of AMC/SG and the CDC: Multi-drug resistant Mycobacterium Tuberculosis (MDR-TB), Congo Crimean Hemorrhagic Fever (CCHF), plague, smallpox, cholera, yellow fever, typhus, malaria, polio, influenza, and any other diseases under special surveillance by the CDC.
2. GPMRC will notify AMC/SG/USTRANSCOM/SG and when applicable, the CDC.
3. Plague, smallpox, hemorrhagic fevers require approval of the destination country, over-flight privileges, and approval of any country where the aircraft will land for servicing or where the patient will remain over night. This information is found in the DOD Foreign Clearance Guide. Coordination between the theater or USTRANSCOM commander/surgeon and the Department of State is required. Refer to AFMAN(I) 44-146, 1-21, and **A12.3.1.**

A12.3.1. **Airborne Precautions:** Used in known or suspected infected patients with microorganisms transmitted by airborne droplet nuclei, small particle residue, 5μ (microns) or smaller, of evaporated droplets containing microorganisms that can remain suspended in air and can be widely dispersed by air currents or over a long distance. This includes any patient with suspected or confirmed TB, chicken pox, measles and disseminated zoster, as well as smallpox and during biowarfare/bioterrorism events.

A12.3.1.1. Isolate to the greatest extent possible. Patient placement should be in a low traffic area, downwind in the airflow circulation cycle and near the aircraft’s airflow exit, if possible. The aircraft airflow (see [Table A12.1](#)) will determine patient placement. Minimum isolation requirements are to position no other patients within ten-feet of the patient. Litter is optional and will be placed in the lowest position in the tier. Ambulatory patients should be seated next to the sidewall.

Table A12.1. Aircraft Airflow.

Aircraft Type	Air Flow Direction	Ambient Air Intake and Exchange Rate (minutes)	Post-Mission Time Required to Obtain 99.9% Removal Efficiency*
C-130	Top to bottom/aft to forward. <i>NOTE 2</i>	4 (Sea level) - 8 (FL35)	1 Hour
C-17	Aft to forward***	16-30	3.5 hours
C-21	Aft to forward	2.2	15 minutes
KC-135	Top to bottom	4-5 <i>NOTE 3</i>	35 minutes
KC-10	Top to bottom/forward to aft	7.5	1 hour
B-767	Top to bottom/forward to aft****	2-3	21 minutes

Notes:

Cabin air in military aircraft usually does not recirculate or mix with flight deck air making HEPA filtering of air unnecessary. Cabin air in civilian aircraft may recirculate with flight deck air with or without HEPA filtering.

2. There is mixing of cargo compartment air and flight deck air.
3. Dependent on engine speed, altitude and pressurization.

*AE adapted CDC recommendations for removal of TB airborne contaminants from isolation rooms. Upon mission termination when indicated, all exits and doors are opened and the interior of the aircraft is aired for the prescribed time. The aircraft air conditioning will be running at maximum capacity during the airing out time period.

*** Recirculating fans in cargo compartment direct front to back when turned on, however the air-flow directed aft is at the compartment ceiling and will eventually flow forward along the cabin floor. In normal operations, cargo compartment air recirculates through a non-HEPA filter, and then mixes with flight deck air. 100% ambient air (RAM Air) is available if required when "hi-flow" is selected on the cockpit environmental control panel.

**** 50% of cabin air recirculates with ambient air through a HEPA filter and does not mix with flight deck air. 100% ambient air is available if required.

WARNING: Due to aircraft airflow characteristics (aft to forward) and the extreme risk of transmission of infectious airborne agents to all on board personnel, the C-17, C-21 and C-130 will not be used unless all the criteria for safe transport, based on agent, are met. **EXCEPTION:** in extreme instances, the theater surgeon and the director of theater airlift operations will determine the use of the above aircraft for AE intratheater operations. Theater surgeons will

receive approval from destination MAJCOM/CC and MAJCOM/SG, and the USTRANSCOM/CC and USTRANSCOM/SG to use these aircraft during AE intertheater operations. All passengers, patients, medical crew and other crewmembers on these missions will wear a N95 mask throughout the mission, and will receive the recommended post-exposure follow-up described in paragraph A12.3.1.5.4. **NOTE:** C-17 crewmembers in the flight deck and crew rest areas may remove the N95 mask as long as the door to the cargo compartment is closed and the environmental system is operating in the “high-flow” mode.

A12.3.1.2. The CDC recommends the use of filtering devices that have N, P, or R series filters with minimum filter efficiency of 95 percent, such as the N95 filtering facepiece (N95 mask). Required protective procedures are outlined below:

A12.3.1.2.1. The patient will wear a N95 mask at all times. This mask need not be fit tested but should not have noticeable gaps. Refer to paragraph A12.2.2.3.3.2

NOTE: Patients requiring airborne precautions and O2 may wear the N95 mask over the nasal cannula (1-4 LPM). Patients requiring higher levels of O2 may require a cabin altitude restriction or may wear a non-rebreather O2 mask.

WARNING: The lowest O2 percent of the non-rebreather mask is 60%, and the patient must be able to tolerate high levels of O2 for the duration of the flight. This mask does not have HEPA capability but has the smallest exhalation openings of the O2 masks. Patients using the non-rebreather will be placed as close as possible to the aircraft’s exhalation port during the flight.

A12.3.1.2.2. HCWs will wear a fit tested N95 mask while within ten feet of the patient and while providing direct patient care. Refer to paragraph A12.2.2.3.3.2

A12.3.1.3. Unless directed by the theater director of air operations and the theater surgeon and/or USTRANSCOM/CC and USTRANSCOM/SG, other crewmembers, attendants and passengers do not require respiratory protection unless they are within ten feet of the patient. When within 10’ of the patient, the N95 mask for these individuals does not need to be fit tested but should not have noticeable gaps. Refer to paragraph A12.2.2.3.3.2

A12.3.1.4. **Strict AE Airborne Precautions.** Some infectious agents and the patient’s overall clinical condition may require strict airborne precautions on a designated/devoted mission with limited crew and with no other patients or passengers on board. **EXCEPTION:** in extreme instances, the theater surgeon and the director of theater airlift operations will determine the use of the above aircraft for AE intratheater operations. Theater surgeons will receive approval from destination MAJCOM/CC and MAJCOM/SG, and the USTRANSCOM/CC and USTRANSCOM/SG to use these aircraft during AE intertheater operations. **WARNING:** MDR-TB and infectious ventilated patients pose the highest risk to the HCW, crew and passengers due to the potential for aerosolization of respiratory sections and droplet nuclei. **NOTE:** Consider regional medical intelligence reports and threats when validating and planning AE transport.

A12.3.1.4.1. Use Standard and Strict Airborne Precautions. Move on a designated/devoted mission with limited crew and with no other patients or passengers on board. Refer to Table A12.1 Aircraft Airflow, **WARNING.**

A12.3.1.4.1.1. The patient, medical attendants and all mission crewmembers (loadmaster, boom operator, etc.) in the cargo/passenger compartment will wear a N95 mask for the entire mission. HCWs will wear a fit tested N95 mask. The patient and crewmembers do not need to be fit tested for a N95 mask but the mask should not have noticeable gaps. Refer to paragraph [A12.2.2.3.3.2](#) **NOTE:** The N95 mask will not be removed to eat or drink while in the cargo/passenger compartment. Mission planning should incorporate this requirement.

A12.3.1.4.1.2. The flight deck crew in aircraft with forward to aft airflow do not require N95 masks unless in the cargo/passenger compartment; the N95 mask does not need to be fit tested but should not have noticeable gaps. Refer [Table A12.1](#) and Refer to paragraph [A12.2.2.3.3.2](#)

A12.3.1.4.1.3. The flight deck crew in aircraft with aft to forward airflow and aircraft with mixing of cargo/passenger compartment air and flight deck air will wear a N95 mask for the entire mission; the N95 mask does not need to be fit tested but should not have noticeable gaps. Refer to [Table A12.1](#) and to paragraph [A12.2.2.3.3.2](#) **NOTE 1:** The N95 mask will not be removed to eat or drink. Mission planning should incorporate this requirement. **NOTE 2:** C-17 crewmembers in the flight deck and crew rest areas can remove the N95 mask as long as the door to the cargo compartment is closed and the environmental system is operating in the “high-flow” mode.

A12.3.1.4.1.3.1. The flight deck crew may optionally use the aircraft O2 supply and wear the aviator mask with the regulator set at 100%.

A12.3.1.4.1.4. Ventilators will have a HEPA filter connected to the ventilator’s expiratory port. **NOTE:** High PEEP settings may not be possible using a HEPA filter. Refer to AMC AE Equipment Standards Guide.

A12.3.1.4.1.4.1. Secure ventilation tubing connections and use in-line suctioning.

A12.3.1.4.1.5. Upon mission termination, all exits and doors are opened and the interior of the aircraft is aired out after the mission is complete (Refer to [Table A12.1](#)). This may be done at home station but AECMs and all crewmembers must continue to wear masks until airing-out is complete.

A12.3.1.4.1.5.1. Cleaning of patient care area will occur as outlined in paragraph [A12.2.8](#)

NOTES:

1. No one will enter the aircraft without a N95 filter mask until the aircraft is aired out. MCD will coordinate N95 mask requirements with mission ground support personnel. Refer to [A12.2.2.3.3.2](#).

2. All mission personnel and medical personnel will follow-up after mission completion at their local MTF or IAW local policy. Refer to [A12.3.1.5](#).

A12.3.1.5. **Pre-Mission and Post-Mission Requirements for Airborne Precautions.**

A12.3.1.5.1. The MCD will coordinate mission N95 mask requirements with the aircraft commander and medical support personnel.

A12.3.1.5.2. Instruct the crewmembers and ground personnel on the correct fitting and wear of the N95 mask as described in paragraph [A12.2.2.3.3.2](#) and paragraph [A12.3.1.4](#) Strict AE Airborne Precautions.

A12.3.1.5.3. Pre-mission planning includes sufficient number of N95 masks and PPA to meet mission requirements, including replacements due to contamination, damage, and limits of the mask. Planning should also include extra N95 masks for ground support personnel.

A12.3.1.5.4. At mission termination, the following information will be submitted to the PMRC and the unit infection control or public health officer: Mission number/date, total time the patient was on the aircraft, personnel's name, rank, unit of assignment and phone number, mission position, and approximate time in direct patient care.

A12.3.1.5.4.1. Unit infection control or public health officers will institute follow up surveillance and treatment based on the infectious agent, and will maintain information IAW local directives and report all health-related issues to their PMRC. The PMRC will review, follow up with the local infection control or public health officer, and forward all data to AMC/SGP.

A12.3.1.6. Transport of Patients, Including Infants and Young Children with Known TB. (See [Figure A12.1](#)).

A12.3.1.6.1. Patients with pulmonary TB responding to treatment (known drug sensitivity and clinical signs of improvement) may be safely transported on any aircraft without respiratory protection when they meet all of the following criteria:

A12.3.1.6.1.1. Have negative sputum smears on three consecutive days.

A12.3.1.6.1.2. Received at least two or more weeks of chemotherapy with appropriate medication.

NOTE: Patients with laryngeal TB will receive at least 30 days of chemotherapy with appropriate medication regardless of smear status.

A12.3.1.6.1.3. Are not coughing.

A12.3.1.6.2. Use Standard and Airborne Precautions if the above criteria are not met or in undiagnosed pulmonary infectious disease processes in which TB is suspected or possible. Refer to [Table A12.1](#) Aircraft Airflow, *WARNING*.

NOTES:

1. HIV infected patients going for evaluation of a new undiagnosed pulmonary process will be transported as possible active TB.
2. All mission medical personnel will have a follow-up PPD 90 days after mission completion at their local MTF or IAW local policy. Refer to [A12.3.1.5.4](#).

A12.3.1.7. Transport of Patients with Known or Suspected Multi-Drug Resistant (MDR) TB (poor or non-sensitivity to early chemotherapy). Refer to paragraph [A12.3.1.4](#) Strict AE Air- borne Precautions and [Figure A12.1](#)

NOTE: Consider the regional population rates of MDR TB when validating and planning AE transport.

A12.3.1.7.1. Will be moved on a designate/devoted mission with limited crew and with no other patients or passengers on board. **EXCEPTION:** in extreme instances, the theater surgeon and the director of theater airlift operations will determine the use of the above aircraft for AE intratheater operations.

Theater surgeons will receive approval from destination MAJCOM/ CC and MAJCOM/SG, and the USTRANSCOM/CC and USTRANSCOM/SG to use these aircraft during AE inter- theater operations.

NOTE: All mission personnel and medical personnel will have a follow-up PPD 90 days after mission completion at their local MTF or IAW local policy. Refer to paragraph A12.3.1.11.

A12.3.1.8. Transport of Ventilated Patients with Known or Suspected TB. Refer to paragraph [A12.3.1.4](#) Strict AE Airborne Precautions and [Figure A12.1](#)

A12.3.1.8.1. Poses the highest risk to the HCW, crew and passengers due to the potential for aerosolization of respiratory sections and TB droplet nuclei.

NOTES:

1. Use Standard and Strict Airborne Precautions regardless of smear status. Move on a designated/devoted mission with limited crew and with no other patients or passengers on board.
2. Refer to paragraph [A12.3.1.4.1.4](#). for ventilator requirements.
3. All mission personnel and medical personnel will have a follow-up PPD 90 days after mission completion at their local MTF or IAW local policy Refer to paragraph A12.3.1.11.

A12.3.1.9. Additional Considerations for Suspected and Active TB and MDR-TB Patients.

A12.3.1.9.1. The use of cough suppressants may be indicated for patients who are actively coughing.

A12.3.1.9.2. Patients will wear a N95 mask prior to leaving the MTF's isolation room and will wear the mask until admitted to the receiving MTF's or RON MTF's isolation room. Refer to paragraph [A12.2.2.3.3.2](#)

A12.3.1.9.3. Cleaning of patient care area will occur as outlined in paragraph [A12.2.8](#)

A12.3.1.9.4. Hand washing with an antiseptic is sufficient for removing organisms possibly acquired from direct contact with infectious sputum or other discharges.

A12.3.1.10. Post-Mission Requirements for Flight and Medical Crew Carrying Active TB, Ventilated TB, and MDR-TB Patients.

A12.3.1.10.1. Medical personnel transporting non-MDR TB patients, and all crewmembers and medical personnel transporting MDR-TB and ventilated TB patients will receive a IPPD 90 days post-mission at their local MTF or IAW local policy; results will be forwarded to the PMRC NLT 100 days post-mission. The PMRC will then review and forward personnel mission data to AMC/SGP.

A12.3.2. Droplet Precautions : Use with patients who have infections spread by large particle drop- lets generally larger than 5 μ in size, generated by the infected patient during coughing, sneezing, talk- ing, or during respiratory-care procedures. This includes microorganisms such as pneumonic plague, tularemia, CCHF, rubella, diphtheria, mumps, pertussis, influenza, and adenovirus.

A12.3.2.1. Spreads via droplets through the air by coughing, sneezing or talking.

A12.3.2.2. Droplets can travel up to three feet.

A12.3.2.3. Transmitted through mucosal surfaces (conjunctiva, nasal and oral mucosa).

A12.3.2.4. Instruct the patient on the wear of the N95, the use and disposal of tissues in the appropriate waste bag, and washing hands.

A12.3.2.5. All caregivers and crewmembers within three feet of the patient care area will follow Standard, Droplet, and Contact Precautions (N95 mask, gown, gloves, and goggles).

A12.3.2.6. Follow the guidelines for Airborne Precaution Guidelines to position on aircraft.

A12.3.3. Contact Precautions : Use with patients who are infected or colonized by a microorganism that spreads by direct contact (skin to skin) or indirect contact (touch) with a contaminated object in patient's environment. Examples include gastrointestinal (GI), respiratory, skin or wound infections, and antimicrobial resistant microorganisms such as vancomycin and methicillin resistant bacteria. Scabies, Pediculosis, and Acinetobacter baumannii are in this category. Follow Standard Precaution Guidelines. **NOTE:** Use N95 mask, gown, and gloves when providing direct care.

A12.3.3.1. Suspect Multi-Drug Resistant organisms in patients who sustained a wound during combat or while deployed, have been hospitalized more than one week, were in a critical care set- ting, are recovering from multiple trauma, and have indwelling catheters and multiple tubes.

A12.3.3.2. A clean sheet or Chux may be placed over the wound site to prevent contamination of litter or seat.

NOTE: Treat all linens as infectious.

A12.4. Infection Control Special Interest Items

A12.4.1. Vaccinia Patients

A12.4.1.1. Vaccinia virus infections are complications of smallpox vaccination. This infection should not be confused with smallpox disease, caused by Variola virus. While Vaccinia is a contact transmission hazard (i.e. contagious), it is significantly less infectious and pathogenic than Variola (smallpox).

A12.4.1.2. Vaccinia patients are contact transmission hazards and require standard/contact trans- mission-based precautions, including:

A12.4.1.2.1. Thorough hand-washing after patient contact is the most important.

A12.4.1.2.2. Wear of PPA (gloves, gowns, and, depending on lesion site, goggles).

A12.4.1.2.3. Handle of BBF as infectious for bloodborne pathogens.

A12.4.1.2.4. Terminal cleaning of the patient area.

A12.4.1.2.5. There is no airborne/droplet threat so respiratory masks are not required.

A12.4.1.2.6. A clean sheet or Chux will be placed over the site to prevent contamination of litter or seat, treat all linens as infectious.

A12.4.1.3. Use contact precautions to protect personnel from vaccinia lesions. Flight crew and medical personnel not caring for vaccinia patients are not at risk nor required to be considered for post-mission screening.

A12.4.1.4. For those directly caring for a vaccinia patient, the following additional screening cri- teria may be considered, but is not mandatory:

A12.4.1.4.1. No immunosuppression due to medication or underlying medical condition.

A12.4.1.4.2. No history of eczema, atopic dermatitis or active skin disease (including psoria- sis, moderately severe acne, and other forms of dermatitis).

A12.4.1.4.3. Not pregnant or attempting to become pregnant.

A12.4.1.4.4. No recent PRK or use of ophthalmic steroid drops.

A12.4.1.4.5. Not breastfeeding

A12.4.1.5. Recent smallpox vaccination is highly recommended for all medical personnel, including AECMs, CCATT's and medical attendants directly caring for vaccinia patients to pre- vent complications of vaccination at unintended body sites (i.e. fingers, hands, face).

A12.4.1.6. Vaccinia wounds must be covered, preferably with dry, cotton gauze dressings, and are reinforced in flight, as needed. Occlusive dressings should be avoided. Do not change dressings in-flight; reinforce only.

A12.4.1.7. Requires dedicated PMI.

A12.4.1.8. Minimize potential for cross-contamination of non-vaccinia patients. When feasible, assign a single caregiver. If operationally feasible, personnel caring for vaccinia patients should not be assigned to care for patients with the following medical conditions: immunosuppression, to include HIV, cancer, burns, sepsis, autoimmune disorders, trauma, steroid use, skin disease, preg- nancy, breast-feeding, or recent PRK.

A12.4.2. Managing Suspected Highly Communicable Diseases. Refer to the United States Trans- portation Command (USTC) Interim Policy on Movement Regulation of Aeromedical Evacuation (AE) of Bioterrorism (BT) and Centers for Disease Control (CDC) Critical List (CL) Agent Casual- ties, 20 Mar 03. The source document is referenced at the following link: click on Aeromedical Evac tab then go to AMC Surgeon Policy letters, then

open letter on Managing Suspected Highly Communicable Diseases Nov 03. AMC Aircrew Portal **Error! Hyperlink reference not valid.**

A12.4.2.1. Casualties and personnel may exhibit clinical indicators for highly infectious diseases or biological agents while traveling from any geographical location. All medical personnel must be aware of these clinical indicators and reporting categories found in [Table A12.2](#) Rule Out Clinical (ROC) Indicators List for Highly Communicable Diseases.

A12.4.2.2. All medical personnel will report suspected positive categories IAW the ROC List to the PMRC and validating flight surgeon (VFS).

A12.4.2.3. The VFS will notify the MAJCOM/SG/CC, USTC/AMC/SG/CC and when applicable, the Centers for Disease Control (CDC).

A12.4.2.4. DECON, quarantine and post-mission surveillance will be directed and coordinated with TACC/AMOCC/AOC, PMRC VFS, MAJCOM/CC/SG and USTC/AMC/CC/SG and the local public health officer or flight surgeon.

A12.4.2.5. If in-flight, AECM and CCATT will initiate strict airborne precautions (see [A12.3.1](#) and [A12.3.1.4](#)) and notify the MCD. The MCD will notify the aircraft commander. The aircraft commander and the MCD will notify the TACC/AMOCC/AOC and the PMRC VFS for guidance for landing at an airfield capable of handling the situation.

A12.4.2.6. TACC/AMOCC/AOC, PMRC VFS, MAJCOM/CC/SG and USTC/AMC/CC/SG will coordinate and provide guidelines to the public health officer or flight surgeon at the airfield meeting the aircraft. **WARNING:** The MCD will assure all personnel remain on the aircraft and no ground personnel board the aircraft until otherwise directed by the local public health officer or flight surgeon. Complete and forward a DD Form 2852, and document occurrence on AF Form 3829.

A12.4.2.7. If at an en route location, all medical personnel will initiate strict airborne precautions (see [A12.3.1](#) and [A12.3.1.4](#)) and local policy, notify the local public health officer or flight surgeon, and the PMRC VFS. The PMRC VFS will notify the MAJCOM/CC/SG, USTC/AMC/SG and the CDC IAW USTC Interim Policy. The CDC may provide guidelines to the CONUS local MTF POC in coordination with the PMRC VFS and the USTC/AMC/SG. **WARNING:** Assure all personnel remain in the facility area and no personnel enter until otherwise directed by the local public health officer or flight surgeon. **NOTE:** AE Crews/CCATTs will notify their C2 when operationally feasible. Complete and forward DD Form 2852.

A12.4.2.8. If at the Veterans Administration (VA) or National Disaster Medical System (NDMS) facility, initiate strict airborne precautions IAW local and CDC guidelines, and notify the local public health officer, the area Federal Coordinating Center (FCC), and the PMRC VFS. The local public health officer, the PMRC VFS, and USTC/AMC/SG will coordinate with the CDC as required. The CDC may provide guidelines to the local MTF POC in coordination with PMRC VFS and the USTC/AMC/SG.

A12.4.2.9. Flight, support and medical personnel immediate post-exposure: follow-up IAW Theater Surgeon.

Table A12.2. Rule Out Clinical (ROC) Indicators List for Highly Communicable Diseases.

The following five key indicators, if present, suggest a highly communicable infectious disease. These patients may pose a serious disease threat to healthcare providers, aircrews, casual contacts and receiving communities. These indicators are classified into five categories.

NOTE: A “YES” to Categories 2-5 should prompt immediate telephone consultation with the Theater Validating Flight Surgeon. Category 1 alone does not necessarily require consultation.

1. POSITIVE HISTORY OF EXPOSURE *PLUS* ANY OF THE OTHER FOUR CATEGORIES.

- Exposure to sewage, body fluids, and animals prior to illness
- Report of insect bites

2. FEVER (Oral temperature greater or equal to 102 F or 38.9 C)

3. ABNORMAL BLEEDING

- Bleeding from gums or nose
- Petechiae on palate, throat, or on mouth exam
- Patient’s eyes are “bloodshot” in appearance (conjunctival injection)
- Bloody stools or vomitus

4. ADENOPATHY

- Tender or painful lymph nodes
- Report of lymph nodes with a “bruised” or darkened appearance
- “Matted lymph nodes,” “goose-egg” size lymph nodes or lymph nodes draining pus.

5. RAPID RESPIRATORY DECLINE, RASHES/SKIN CHANGES, UNUSUAL DETERIORATION

- Rapid progression to severe symptoms and illness over a period of less than three days, once the patient began to feel ill
- “Pox” or “pox-like” skin rash/lesion
- Petecchiae or purpura on the skin
- Positive “Tourniquet Test” (Inflating a BP cuff on an extremity performs this test. It is extremity distal to the cuff. This is a very good indicator of the vasculitis associated with

hemorrhagic fever). •

Icterus (yellow eyes, skin or tongue)

• Cough AND fever in conjunction with any of the following:

o Rapid disease progression or o Petechiae, purpura or

o Lymphadenopathy as described herein.

A12.4.3. Severe Adult Respiratory Syndrome (SARS-CoV). For further information see <http://www.cdc.gov/ncidod/sars/airtransport-sarspatients.htm>.

NOTE: Transported on a dedicated mission with the minimum number of crew members IAW **A12.3.1.4. Strict AE Airborne Precautions.**

A12.4.3.1. If possible, place a N95 or surgical mask on the patient to contain droplets expelled during coughing. If this is not possible (i.e., would further compromise respiratory status, difficult for the patient to wear), have the patient cover the mouth/nose with tissue when coughing.

A12.4.3.2. Oxygen delivery with a non-rebreather face mask may be used to provide oxygen support during transport. If needed, positive-pressure ventilation should be performed using a resuscitation bag-valve mask, preferably one equipped to provide HEPA or equivalent filtration of expired air. If a patient has been mechanically ventilated before transport, HEPA or equivalent filtration of airflow exhaust will be used.

A12.4.3.3. Healthcare providers who directly handle a patient with SARS-CoV or who are in the compartment with the patient will wear PPE as recommended for Standard, Contact, and Airborne Precautions. This includes: Disposable isolation gown, gloves, eye protection, N95 mask.

A12.4.3.3.1. Respiratory protection will be an N-95 mask or higher-level respirator

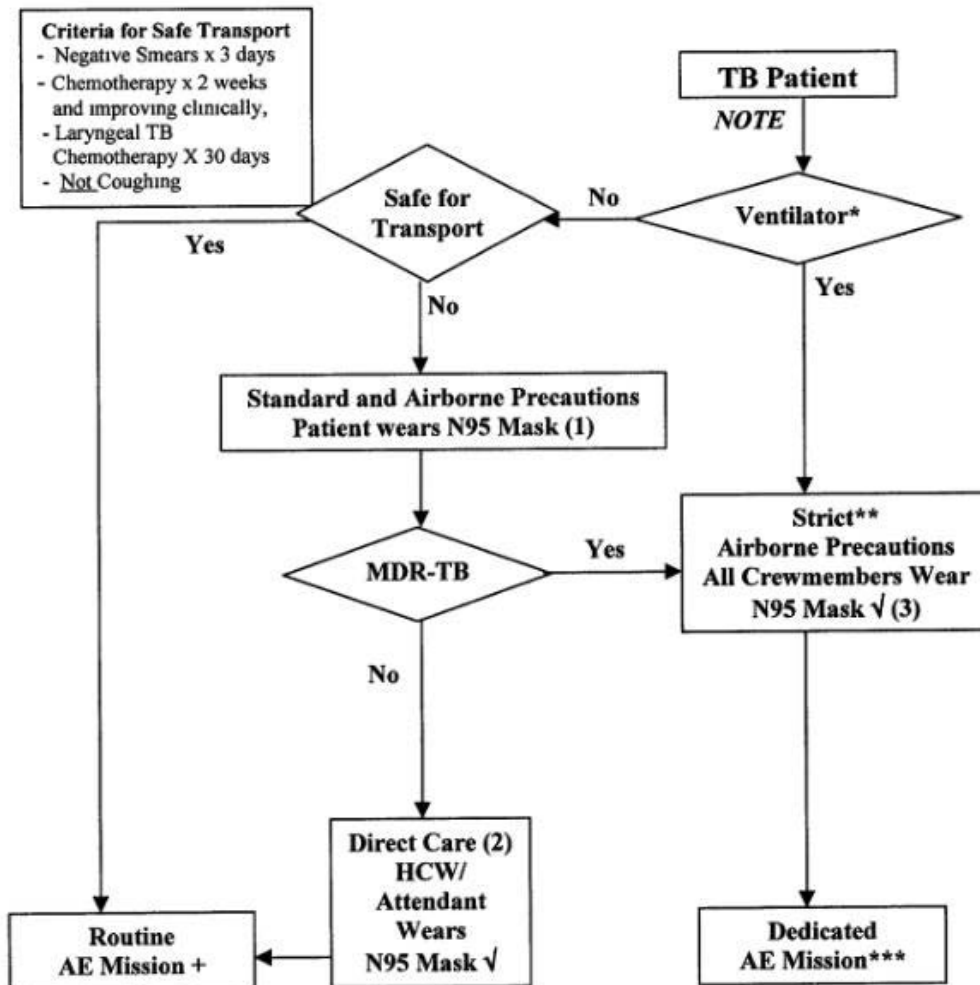
A12.4.3.3.2. Personnel who will have no direct patient contact will wear an N-95 or higher-level respirator during transport. See **A12.3.1** and **A12.3.1.4**

A12.4.3.3.3. Personnel who also provide direct patient care (e.g., moving patients on stretchers) will wear the recommended PPE.

A12.4.3.4. Follow **A12.2.4** for the disposal of biohazard medical waste.

A12.4.3.5. Flight, support and medical personnel immediate post-exposure: follow-up IAW Theater Surgeon.

Figure A12.1. Aeromedical Evacuation of Mycobacterium Tuberculosis (TB).



NOTE: HIV infected patients going for evaluation of a new undiagnosed pulmonary process will be transported as possible active TB
 (1) Position in a low traffic area with no other patients within 10' radius N95 Mask is worn at all times, need not be fit tested but should not have noticeable gaps Change every 8 hours, when wet or contaminated with BBF or if the mask or straps become damaged
 (2) N95 Mask is worn by all personnel who are within a 10' radius of the patient. All medical personnel will have a follow up PPD 90 days after the mission
 (3) All mission personnel and medical attendants will have a follow up PPD 90 days after the mission

✓ N95 Mask will be fit tested for all HCWs

* Highest risk for HCWs Move as known TB regardless of smear status. Use in-line suction, in-line expiratory HEPA filter, and maintain ventilation tubing integrity by securing all connections to prevent aerosolization of respiratory sections.

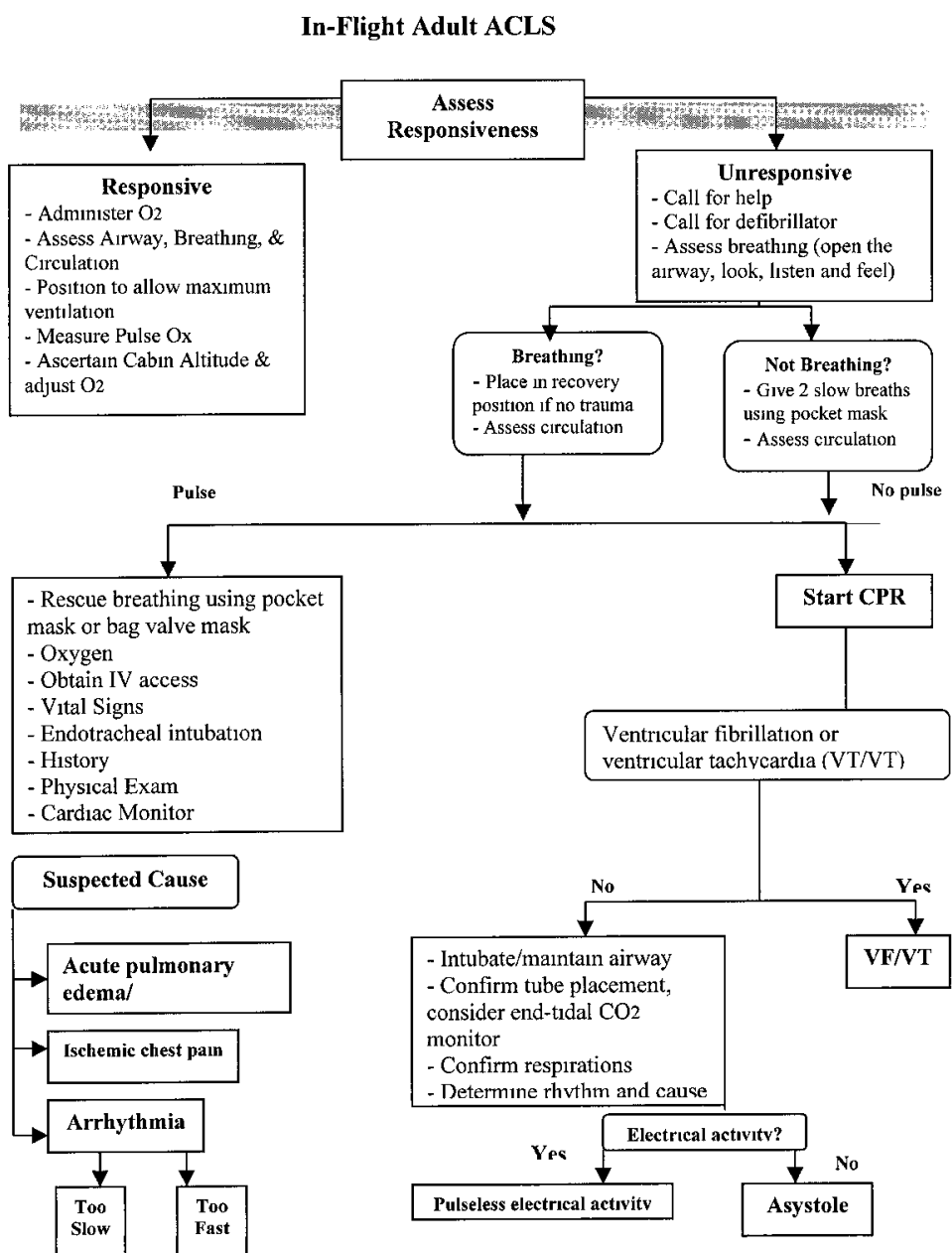
**All crewmembers in the cargo/passenger compartment will wear a N95 Mask. Flight Deck Crew in aircraft with forward to aft airflow do not require a N95 Mask, unless in the cargo/passenger compartment Flight Deck Crew in aircraft with aft to forward airflow may optionally use the aviator mask at 100% O₂, otherwise, they will wear the N95 mask The N95 mask need not be fit tested for mission crewmembers but it should not have noticeable gaps Change every 8 hours, when wet or contaminated with BBF or if the mask or straps become damaged

*** Moved with limited crew with no other patients or passengers on board Refer to Table X 1. EXEMPTION and post-mission airing No one will enter the aircraft without a N95 Mask, mask for ground personnel need not be fit tested but should not have noticeable gaps
 + The C-17, C-21 & C-130H will not be used due to airflow characteristics unless all patients meet the criteria for safe transport Refer to Table A12 1 **WARNING**

Attachment 13

IN FLIGHT ADULT ADVANCED CARDIAC LIFE SUPPORT (ACLS).

Figure A13.1. In Flight Adult Advanced Cardiac Life Support (ACLS).



Attachment 14

AE PATIENT SAFETY PROGRAM

A14.1. Scope. This chapter defines the requirements and responsibilities for the AE Patient Safety Program (formerly called Clinical Performance (Quality) Improvement/Risk Management Program). Each unit operating within the scope of the AE system will develop an active Patient Safety program. This instruction applies to non-AE medical units, as well as AE units, because non-AE military treatment facilities play various roles in AE patient care, e.g. patient preparation, remain overnight (RON) care, or emergency/unplanned evaluation and treatment. Associate ARC AE Units will coordinate programs with their active duty counterparts.

A14.2. References. Commission on Accreditation of Medical Transport Systems (CAMTS), 2002; Joint Commission on Accreditation of Healthcare Organizations (JCAHO) Standards, 2001; *Flight Nursing Principles and Practice*, Mosby, Inc. AFI 44-119, *Performance Improvement and Sentinel Events: Evaluating Cause and Planning Improvement*, JCAHO, 1998; DoD Instruction 6025.17, Military Health System Patient Safety Program, 2001.

A14.3. Intent of Program. This instruction describes a “world-wide” AE Patient Safety program administered at the AE squadron level. It provides a structure and process for engaging all MAJCOMs, service components, Department of Defense (DoD) and Unified Commands to support investigation, analysis and process improvement for AE patient safety. The program should actively promote an environment that encourages event identification and remedial steps to reduce the rate of future, recurring events. This environment includes minimization of individual blame or retribution for those involved in an event or in the reporting of an event. The focus is to establish an AE-wide patient safety program that uses internal and external knowledge of events and errors to prevent the occurrence of errors and patient harm. All personnel assigned to an AE unit supporting operational patient missions must be actively involved in these programs, defining standards, documenting care, improving care, and ensuring standards are met or exceeded. AMC/SG and DO as the AE lead, in coordination with other MAJCOMs, will use trend data to adjust policies/procedures as needed to improve processes and patient care.

A14.4. Objectives of Patient Safety in AE. These include but are not limited to:

A14.4.1. Ensure an acceptable standard of patient safety at all levels, when operationally feasible.

A14.4.2. Provide ongoing and systematic approach for assuring the quality of patient care.

A14.4.3. Reduce events that cause potential or actual patient harm through risk identification.

A14.4.4. Identify mechanisms to assess and monitor system-wide problems.

A14.4.5. Improve patient satisfaction with the AE system.

A14.4.6. Provide up-to-date Patient Safety/Clinical Performance Improvement information to all AE personnel.

A14.5. Responsibilities:

A14.5.1. **USTRANSCOM/SG.** Responsible for all patient movement issues worldwide. The AMC Command Surgeon serves as the medical director for AE and is responsible for the overall supervision and quality of medical care provided worldwide by the AE system.

A14.5.1.1. Oversee entire AE Patient Safety program.

A14.5.1.2. Direct the appropriate level review of AE event, based on classification of events (Table 14.1). Conducts Medical Incident Investigation (MII) IAW this publication and AFI 44-119, *Clinical Performance Improvement* as necessary for inter-theater AE events. Coordinates with MAJCOM/SG where MII is conducted.

A14.5.1.3. Appoint an USTRANSCOM/AMC AE Patient Safety Manager.

A14.5.2. **AE Patient Safety Manager, USTRANSCOM/AMC.** The AE Patient Safety Manager is an individual designated by the Command Surgeon and is responsible for oversight and direction of the worldwide AE Patient Safety Program. Activities include, but are not limited to:

A14.5.2.1. Ensure a comprehensive and integrated AE Patient Safety Program is established and supports the DoD system. Plan, develop, implement and coordinate AE Patient Safety functions to identify and assess actual and potential risks and coordinate a proactive risk assessment plan to avoid, prevent or limit intangible and tangible risks.

A14.5.2.2. Coordinate/prepare instructions with MAJCOM SG/DO functional experts for appropriate DoD directives and Air Force publications, SG NOTAMs, Flight Crew Information Files and DMS messages.

A14.5.2.3. Provide guidance and a system to all theaters and service components for the reporting, collection, storage, retrieval, and analysis of AE Patient Safety information. Develop and maintain AE Patient Safety database that provides a timely means of inputting identified data points and trending AE event data.

A14.5.2.4. Provide the AF/SG, HQ AMC/SG and/or DO, as appropriate, with trend analyses. Proposes courses of action to correct or prevent AE patient safety problems. Facilitates the corporate dissemination of AE lessons learned and Patient Safety initiatives through the AMC/DO.

A14.5.2.5. Serve as an AE patient safety resource and confer with all levels of personnel to develop program plans directed at proactive risk assessment and trend identification, decreasing both the frequency and severity of AE Events and assist in achieving patient safety improvement within the AE System.

A14.5.2.6. Develop, coordinate, and present ongoing AE Patient Safety education in the form of in service training, briefings to AE Squadrons, ASFs, PMRCs and AE conferences as needed.

A14.5.2.7. Initiate a feedback system for staff involved in improving Patient Safety. Provide education for all levels of staff regarding a culture of patient safety, its relevance to their position and their personal role in insuring this as a high priority.

A14.5.2.8. Maintain expertise and a proactive approach to enhance and sustain AE patient safety by applying benchmark practices, developing creative approaches to eliminate or minimize patient risk and apply safety principles.

A14.5.2.9. Provide monthly activity report to USTRANSCOM/AMC SG highlighting AE events/near misses, progress of AE Patient Safety Program or on an individual event basis, as required. Provide quarterly updates and identify major trends to USTRANSCOM/AMC SG concerning worldwide AE patient safety data.

A14.5.2.10. Provide monthly activity report to USTRANSCOM/AMC SG highlighting AE events/near misses, progress of AE Patient Safety Program or on an individual event basis, as required. Provide quarterly updates and identify major trends to USTRANSCOM/AMC SG concerning worldwide AE patient safety data.

A14.5.3. **HQ AMC/DO.** Responsible for the oversight of the operational safety and crew resource management programs.

A14.5.3.1. Responsible for all aircrew and airlift issues; inflight equipment and aircraft systems interface.

A14.5.3.2. Update policy and operational guidance.

A14.5.3.3. Provide oversight to the AE squadron and identify AE operational safety issues for inclusion in inspection processes.

A14.5.3.4. Act as an advisor for AE Patient Safety requirements and a liaison to the USTC/AMC AE Patient Safety Manager.

A14.5.4. **Command Surgeon, Theater.** Responsible for the oversight of the AE Patient Safety Program during intra-theater movements. The destination theater MAJCOM/SG takes the lead for AE event assessments and/or investigations.

A14.5.4.1. Responsible for the theater AE Patient Safety program.

A14.5.4.2. Appoint a theater-level AE Patient Safety Manager.

A14.5.4.3. Disseminate lessons learned from unit or MAJCOM/Theater level AE Event Review (see paragraph 14.7.) within respective theater of operations and through USTRANSCOM AE Patient Safety Manager.

A14.5.4.4. Decide scope of investigation needed for significant intra-theater AE Events, based on classification of events (Table 14.1).

A14.5.4.5. Direct appropriate level review of event, based on event classification (Table 14.1). Conducts Medical Incident Investigation (MII) IAW this instruction and AFI 44-119 as needed for significant intra-theater AE events. HQ MAJCOM/SG who directed the MII funds the investigation IAW 44-119 8.27.2.5. MAJCOM/SG must ensure no conflict of interest exists for MII members.

A14.5.4.6. Notify AMC/SG of any significant clinical AE events or any medical issue requiring command surgeon action. The AE Patient Safety database is located on the AMC SG Home page. All units, PMRCs, and MAJCOMs will have access to reports in their theater.

A14.5.4.7. Implement HQ USAF/SG-approved investigation recommendations within respective theater of operations.

A14.5.5. **AE Patient Safety Manager, Theater.** Required for commands and theaters with owned or gained AE assets. Responsible for local theater level review of events/near misses.

A14.5.5.1. Monitor the MAJCOM/Theater AE Patient Safety program and analyzes data to identify potential problems that may be common to all units. Maintain communication on MAJCOM/Theater level issues with USTRANSCOM/AMC AE Patient Safety Manager.

A14.5.5.2. Evaluate event review and determines if root cause analysis is needed, briefs all AE MII teams prior to the start of an investigation, and provides on-going expertise pertaining to the MII process.

A14.5.5.3. Disseminate lessons learned from unit or MAJCOM/Theater-level AE Event Review (see paragraph 14.7.) within respective theater of operations and to USTRANSCOM /AMC AE patient safety manager.

A14.5.5.4. Act as an advisor for AE Patient Safety requirements to unit level programs and a liaison to the USTC/AMC AE Patient Safety Manger.

A14.5.6. **Commander, AE Squadron/Unit.** Establish an organizational culture conducive to the identification, reporting, analysis, and prevention of events that caused, or have potential for, patient harm.

A14.5.6.1. Ensure policies and procedures governing the management of the AE Patient Safety program is established. Provide oversight of the unit AE Patient Safety function.

A14.5.6.2. Review AE unit Patient Safety program annually for appropriateness of scope, structure, and priorities, and recommends changes accordingly.

A14.5.6.3. Promote Patient Safety continuing education opportunities for all clinical personnel.

A14.5.6.4. Ensure unit corrective action and follow-up are taken on events as needed.

A14.5.6.5. Ensure reporting of all information concerning significant AE Events to Theater AE Quality Manager, and USTRANSCOM/AMC AE Patient Safety Manager.

A14.5.6.6. Appoint members of unit-level AE event review team as described in paragraph 14.7.

A14.5.6.7. Appoint a unit AE Patient Safety Manager.

A14.5.7. **Patient Safety Manager, AE Squadron.** Monitor and evaluate AE Event/Near Miss data input from all sources on an ongoing basis to identify potential and actual problems.

A14.5.7.1. Review all AE Event/Near Miss reports originating from the unit level and enters the data into the AE Patient Safety database tool, located at AMC/SG home page.

A14.5.7.2. Obtain additional information as needed to complete event documentation.

A14.5.7.3. Use a locally developed coordination sheet to document review and resolution by involved functional areas. Works closely with wing/OG/DOV/DOT/NAF and MDG as required.

A14.5.7.4. Implement the integrated AE Patient Safety program as established herein. Publish a squadron written AE Patient Safety plan to guide the program (IAW AFI 41-

307, Attachment 14). Ensure unit corrective action and follow-up are taken on events as needed.

A14.5.7.5. Provide feedback to unit personnel submitting reports regarding resulting actions or outcomes, including lessons learned.

A14.5.7.6. Maintain completed report of AE Event/Near Miss Report form DD 2852 on file for 3 years.

A14.5.7.7. Capture required data from AE Event/Near Miss Reports, or from the computer-generated Mission Cover Sheet (formerly AF 3829) and forward to Unit Commander, MAJCOM and USTRANSCOM/AMC AE Patient Safety Manager, via the web based collection tool, NLT than 24 hrs after event.

A14.5.7.8. Work closely with AMC/DOV/DOT/SEF (Flight Safety), TACC, XOG/XOB/SGP/SGN and the PMRC during review and analysis of reported events and near misses.

A14.5.7.9. Establish patient satisfaction measurement tools.

A14.5.7.9.1. Provide a monthly/quarterly report as needed to Unit Commander as to the status of open AE event resolution, patient satisfaction, and other patient safety issues.

A14.5.7.9.2. Provide annual AE patient safety program analysis. Each January, the unit will prepare an appraisal of its AE patient safety program for submission to HQ AMC/SG AE patient safety manager (with info copy to its respective MAJCOM). Suspense for submission of this report is 15 Feb. The unit AE patient safety plan is the basis for this report. In completing the report, consider the following issues:

A14.5.7.9.2.1. Identify the important aspects of care, the indicators for evaluation related to patient care/movement and services.

A14.5.7.9.2.2. Determine if patterns of performance or trends were identified, if appropriate actions were taken, and if the actions taken were effective.

A14.5.7.9.2.3. Identify any opportunities for improvement in the AE system.

A14.5.7.9.2.4. Identify any special training opportunities for AE patient safety/quality management in the AE unit.

A14.5.7.9.2.5. Identify the top five patient safety concerns for the unit, giving special emphasis to issues beyond the unit's control. *Note: Information about urgent or adverse patient safety issues or AE events/near misses or patient outcomes should be reported immediately to the MAJCOM/SG and USTRANSCOM/AMC AE Patient Safety Manager.*

A14.5.7.9.2.6. Provide recommendations for improving the AE patient safety program for either local, MAJCOM or AF-wide consideration to USTRANSCOM/AMC AE patient safety manager.

A14.5.8. **Member, Squadron/Unit.** Report all events and near misses using the DD 2852 AE Event/Near Miss Report IAW squadron/unit policy. Enters the AE event/near miss into

the AE patient safety database. At the end of mission also faxes the DD 2852 and computer generated Mission Cover Sheet (formerly 3829) to the TACC, PMRC.

A14.5.8.1. Participate in all event reviews or investigations, as required.

A14.5.9. Medical Crew Director (MCD). Responsible for in-flight medical mission management and the administrative issues concerning the AE crew/critical care air transport team (CCATT)/medical attendant or patient concerns. Reports all AE Events (Medical Class A or B events as defined in Table 14.1 of paragraph 14.6.1.14) to TACC, 1-800-AIRMOBIL, (618) 229-0330 (with phone patch to the PMRC immediately and in the most expedient manner available; radio communication, telephone, fax or email.

A14.5.9.1. The MCD is responsible for in-flight documentation on the AF 3899/DD602 however this may be delegated to the flight nurse. The MCD assigns and delegates in-flight medical duties, including emergency duties and cardiac arrest assignments. He/she coordinates with the Aircraft Commander (AC) on any issues concerning changes in patient conditions, receives report from the medical facilities, and completes AF3829/3330 at the end of mission. He/she begins and terminates the mission with TACC/GPMRC, and by faxing the mission cover sheet and reporting patient load and any occurrences via phone or fax to the PMRC. DD Form 2852 is used for documenting any AE events/near misses. Notification to the PMRC is to be done at the mission termination, prior to beginning crew rest.

A14.5.10. Global Patient Movement Requirements Center (GPMRC). The GPMRC provides assistance and medical direction as needed when notified of a Medical Class A or B event.

A14.5.10.1. The GPMRC follows the progress of a theater evaluation of a medical class A or B event. GPMRC staff may be requested to provide any and all patient regulation documentation and information related to the event as needed by reviewing or investigating agencies.

A14.5.10.2. The GPMRC does not take over TPMRC event review during medical Class A or B events. The GPMRC does not assume primary responsibility for assessing the event in another theater.

A14.5.10.3. The GPMRC QA representative assists with gathering information on AE events/near misses and investigations, reports on events pertinent to the GPMRC, and analyzes data to identify potential problem areas in patient regulation/medical mission management.

A14.5.10.4. Provide consultative support on patient movement issues as needed to the theater surgeon and serves as Patient Safety/QA POC on medical issues for inter theater missions in progress.

A14.5.10.5. Provide patient movement expertise and information/data to the USTRANSCOM/AMC AE Patient Safety Manager upon request.

A14.5.10.6. Disseminate lessons learned from clinical AE Event reviews to the USTRANSCOM SG, MAJCOM SGs, AE Patient Safety Manager, MAJCOM DOs and PMRCs.

A14.5.10.7. Notifies USTC/SG of any significant clinical events or any issues requiring immediate action. The GPMRC QA representative enters data from near misses/events pertinent to the patient movement process into AE Patient Safety Web Tool.

A14.5.10.8. Monitors the GPMRC QA/RM Program.

A14.5.11. Theater Patient Movement Requirements Center (TPMRC). The TPMRC provides assistance and medical direction as needed when notified of a Medical Class A or B event within their theater of operations.

A14.5.11.1. Follows the progress of a theater evaluation of medical class A or B event. TPMRC staff may be requested to provide any and all patient regulation documentation and information related to the event as needed by reviewing or investigating agencies.

A14.5.11.2. Does not assume primary responsibility for assessing the event in another theater.

A14.5.11.3. The TPMRC QA representative assists with gathering information on clinical AE events/near misses and investigations, reports on events pertinent to the TPMRC, and analyzes data to identify potential problem areas in patient regulation/medical mission management.

A14.5.11.4. Provides consultative support on patient movement issues, as needed, to the theater surgeon.

A14.5.11.5. Serves as Patient Safety POC on medical issues for missions in progress.

A14.5.11.6. Provides Patient Movement expertise and information/data to USTRANSCOM/AMC AE Patient Safety Manager as requested.

A14.5.11.7. Notifies USTRANSCOM/SG and MAJCOM/SG/DO of any clinically significant events or any medical issues requiring immediate action by the USTRANSCOM and or MAJCOM Surgeon. PMRC QA representative enters data from near misses/events into AE Patient Safety Web database.

A14.5.11.8. Monitors the PMRC QA/RM Program.

A14.6. AE Event/Near Miss Reporting Process.

A14.6.1. AE Event (previously termed incident). Occurrences or conditions associated with care or services provided within the AE system that reached the patient and may or may not have caused unexpected harm to a patient (but may be a crew member/CCATT/medical attendant or passenger) during care or services.

A14.6.1.1. Near Miss. An event or situation that did not reach the patient, either by chance or through timely intervention, but may have resulted in harm to a patient.

A14.6.1.2. The boundaries of reporting AE events or near misses start with the PMRC clinical and administrative validation activities, extend through all phases of actual patient movement, and end with acceptance of custody of care at the final destination medical facility (civilian or military).

A14.6.1.3. Guidelines for completing DD 2852 AE Event/Near Miss Report are identified IAW AFI41-313, Chapter 2, *Aeromedical Evacuation Documentation*.

A14.6.1.4. **Event Classifications.** Capture not only events causing harm but also near misses that have a high potential for causing harm. There are six possible classifications for AE events. Based on the degree of harm or disability to the patient involved. These classifications are comparable to the Safety Assessment Code (SAC), which defines the severity of harm to the patient as a result of the event as well as the probability of the event recurring.

Table A14.1. Events Classification.

Event Classification	Description	Example
Medical Class A.	Event resulting in immediate death, near death or major permanent loss of function within 24 hrs of AE movement.	Cardiac arrest, suicide, or overdose of medication, infant/child abduction, rape.
Medical Class B.	Event resulting in temporary patient harm, minor/ permanent loss of function and initial or prolonged hospitalization.	Patient fall with simple fracture, fingertip amputation, low back pain, suicide attempt.
Medical Class C.	Event resulting in temporary patient harm and emergency evaluation and/or treatment.	Patient fall with abrasion or bruising from an improperly applied splint; in-flight seizure.
Medical Class D.	Event did not result in patient harm, but increased monitoring is required.	HTN medication given in error or occupied ALSS incubator temperature set too high.
Medical Class E.	Event did not result in patient harm, or need for increased monitoring not required.	Vitamin given in error or piece of equipment not cleared for flight.
Medical Class F.	Event did not reach patient and did not result in patient harm.	No anti-hijacking done prior to flight.

A14.6.1.5. **Event Categories.** There are 9 possible AE Event Categories. The Unit Quality manager will designate both category and subcategory for the reported event. Special Interest Sub-Categories further divide categories into logical groupings or areas of special interest.

Table A14.2. Event Categories.

Event Categories	Sub-categories	Description	Example
Medication		Events that are associated with the administration of medication in the AE environment	
	Medication error	Deviation from the 5 R's of medication administration Right Patient, Right Med,	

		Right Dose, Right Route, Right Time	
	Use of AE protocol	The use of a drug protocol or "standing order"	Administration of Haldol to a 1C patient IAW AFI 41-307
	Narcotics not properly accounted for	Deviations in the transfer of narcotics, any narcotics found to be missing or other narcotic discrepancy.	
	Other	Events that do not fit in the previously listed Medication Issue sub-categories	AECM realizing that all the acetaminophen in stock is expired.
Equipment Issue		Any event related to medical equipment used in the AE environment	
	Approved for flight With waiver from DOV	Use of equipment not found in 41-309	Use of a Infusion pump not approved for in-flight use
	Failure/malfunction	A piece of medical equipment either fails or does not operate as expected while attached to patient/required for patient in-flight	Battery - not charging
	Missing		The ASF notes that a piece of equipment documented on a RON patient's Form 5 or DD602 is not present or accounted for.
	Other	All events that do not fit in the previously listed equipment issue sub-categories	
Anti-hijacking issue	Not completed	Any inconsistency in the anti hijacking procedure	
Event Categories	Sub-categories	Description	Example
	Other	All events that do not fit in the previously listed anti-hijacking sub-categories	
Injury		Events that may or do cause injury to persons in the AE environment. Further categorize to caregiver,	

		Passengers, or patients.	
	Actual	An event that produces a discernable injury. (NOTE: all injured persons should be offered a medical evaluation by a licensed provider)	AECM with obvious bruising to the face after being struck by a patient.
	Potential	An event that did not produce a complaint or evidence of injury but a repeat of this event could produce actual injury	A fall without evidence of, or complaint of injury.
Status change		All significant changes in patient condition. (NOTE: Changes in medical condition will be captured whether expected or not)	
	Death in Flight	Symptoms consistent with death during flight or while in transit to and from an aircraft	
	Death within 24 hours of AE movement	Death of a patient that occurs within 24 hours of having been transported	
	Birth	Birth occurring within AE system	
	Cardiac/Respiratory arrest	Cardiac or respiratory arrest in the AE system that did not result in immediate death	
	Suicide attempt	Event that is determined to be suicidal in nature	Includes both actual suicide attempts as well as suicidal gestures.
	Other	All events that do not fit in the previously listed status change sub-categories	A patient who develops chest pain, an ear block, or seizure during flight.
Patient preparation		Events that pertain to issues with the preparation of the patient for flight to include interagency communication/report	
	Paperwork, Documentation, Orders	Insufficient or incorrect documentation or physician orders	No physician orders No meds documented No narrative summary
Event Categories	Sub-Categories	Description	Example
	Medication/supplies/equipment	Events that pertain to medication supplies, or	No antibiotics sent with patient.

		equipment inadequacies	
	Attendant issue	Any issue concerning a medical or non-medical attendant that does not fit in any other category	An attendant accompanying a patient who is not able to care for that patient or not prepared for a RON
	Other	Events that do not fit in the previously listed Patient Preparation sub-categories	To include insufficient or lack of patient transfer report at patient handoff points (a patient delivered to an ASF without an adequate report from the MCD/FN)
Infection Control		Events pertaining to high-risk spread of infection	Transport of known or suspected infectious patients
	Blood or Body fluid Exposure	Actual or potential exposure to pathogens contained in blood or other body fluids	Needle-stick or blood spill
	Other	Events related to infection control, but not applicable to the Blood or Body Fluid exposure sub-category	Inability to clean contaminated equipment at en-route stop or identification of possible chicken pox infection
ASF/RON specific		Event particular to an ASF or RON facility that cannot be captured in one of the previously described categories.	A patient that reported sub-standard sleeping provisions. Inadequate report given to crew.
Other		Patient care events that do not fit into the previously defined categories	NOTE: Use this category only for events that are relevant to patient care or patient safety.

A14.6.2. Reporting a Medical Class A or B event. These events result in definite and serious patient harm. Patient care and safety are paramount and will be managed before beginning the reporting process. Reporting of events occurs through the use of DD 2852 Aeromedical Evacuation Event/Near Miss Report and will be completed and submitted to the PMRC and AE Patient Safety Manager within 24 hours of the event.

A14.6.2.1. An event can be reported by anyone who is aware of it. The reporting person should:

A14.6.2.2. Notify TACC/XOGA for AMC missions and Air Medical Operations Cell (AMOC) for theater missions. The C2 agency will notify the regulating PMRC. This communication should be accomplished in the most expedient manner available, e.g. radio communication, telephone, fax or email.

A14.6.2.3. The MCD is responsible for obtaining copies of patient care documentation contained on a DD Form 602, *Patient Evacuation Tag*, DD Form 1380, *US Field Medical Card* or AF Form 3899, *Aeromedical Evacuation Patient Record*. Originals of any form documenting patient care will always accompany the patient but, when feasible, copies should also be forwarded to the Unit QA representative and the PMRC.

A14.6.2.4. Notify unit per local procedure. All verbal notifications will be followed up with written documentation of the event using DD 2852 *AE Event/Near Miss Report*. **NOTE:** Do not refer to any forms such as the DD 2852 AE Event/Near Miss Report in patient records. The information contained in these forms is protected from disclosure under 10 U.S.C. 1102.

A14.6.2.5. The Unit Quality Manager or designee will input the information from the DD 2852 into the AE Patient Safety database, within 24 hours of receipt. Units will maintain the original DD2852 *AE Event/Near Miss Report* for one year. All copies of AE Event/Near Miss Report must be reviewed and approved by the Unit Commander prior to leaving the unit.

A14.6.2.6. PMRC Medical Class A or B event response. The regulating PMRC, upon notification of Medical Class A or B event, will do the following: provide medical direction/immediate assistance and make notifications as needed to TACC/AMOC/Validating Flight Surgeon (VFS)/receiving and/or originating MTF.

A14.6.2.7. Within 3 hrs of notification of a Medical Class A or B event, the PMRC will collect and review all internal PMRC records regarding validation prior to movement. Special emphasis should be placed on gathering printouts of the TRAC2ES audit history, the patient movement record (PMR), all internal notes, daily log entries, mission tracking records, and memoranda by PMRC personnel involved with validation of the movement.

A14.6.2.8. The PMRC will develop policy for responding to requests for assistance during any AE event class.

A14.6.2.9. Upon notification of a Medical Class A or B Event, the theater MAJCOM (AMC, PACAF, USAFE) Surgeons office will, within 7 calendar days of notification, decide the level of investigation necessary for this event. The MAJCOM/SG can make one of the following decisions:

A14.6.2.9.1. Medical Incident Investigation (MII). If the event warrants investigation, but does not meet the criteria for a MII, the MAJCOM/SG may refer to the Theater AE Medical Director to conduct an AE Event Review as described in paragraph 14.7.

A14.6.2.9.2. If the event occurred intra-theater and meets criteria for an MII, the MAJCOM/SG will initiate the investigation process. If the event crosses service

lines, the MAJCOM/SG may refer this investigation to the Unified Command Surgeon.

A14.6.2.9.3. If the event occurred inter-theater and meets criteria for an MII, the MAJCOM/SG will refer the investigation to AMC/SG. If the event crosses service lines, AMC/SG may refer this investigation to the USTRANSCOM/SG.

A14.6.3. MAJCOM/SG will forward event notification and determined level of investigation to AMC/SG.

A14.6.4. In most cases, a Medical Class A , B, or C event will result in either an AE event review and/or an AE MII. Either investigative process should ideally be initiated within 10 calendar days of the incident.

A14.7. AE Event Review. Provides a less formal review than an MII of an AE Event. AE event reviews serve as preliminary analyses of the circumstances surrounding an AE event. Perishable data must be captured without delay, recognizing the difficulty across time zones and geography in contacting medical treatment facilities, AE crews, and controlling agencies. The picture of events developed by an AE Event review aids the MAJCOM Surgeon's decision-making regarding the requirement to convene more formal reviews or initiate the corrective AE system actions to prevent a recurrence. AE event reviews are protected from disclosure under 10 U.S.C. 1102.

A14.7.1. **Authority.** The MAJCOM, as well as the Theater AE Medical Director or Theater AE Quality Manager, can direct an AE event review of a any class event even if that event does not meet MII criteria.

A14.7.1.1. Separate from a MAJCOM-directed review, a Unit Commander can direct a unit-level AE Event Review at any time, for any event. The information gained would lead to local unit process improvement and if findings have system-wide implications, would be forwarded up the AE chain for dissemination.

A14.7.2. **AE Event Review Process.** Refer to Addenda C for a flowchart of the AE Event/Near Miss review process, which also includes the medical incident review reporting process. The AE event review should be structured much like the Root Cause Analysis for sentinel events as described in AFI 44-119, *Clinical Performance Improvement*.

A14.7.2.1. The Theater AE Medical Director and/or the Theater AE Patient Safety Manager will appoint an AE event review team to conduct a primary assessment of a Medical Class A or B event on behalf of the Theater Surgeon. The Theater PMRC and theater air component medical units will support the AE event review team takings, as directed by the Theater Surgeon or his/her designated convening authority.

A14.7.2.2. **AE Event Review Team.** This multidisciplinary team should consist of personnel from clinical and functional areas related to the event. The core functional areas of the team should consist of team leadership, flight medicine, and flight nursing. Efforts should be made to identify personnel who can represent AE execution (TACC or AMOC), requirements validation, and clinical specialization related to the patient's condition when selecting team members to review the AE medical event.

A14.7.2.3. MAJCOM-directed AE event reviews should be completed and forwarded to MAJCOM/SG within 45 days of the initial notification of event.

A14.7.2.4. Unit Commanders will forward AE Event Review Reports on Medical Class A through F events to the USTRANSCOM/AMC AE Patient Safety Manager for data collection and trending. The AE Patient Safety Tool is a centralized database that provides Unit Commanders and representatives, MAJCOM QA and PMRC's the ability to review investigations, results, and process improvements associated with specific events.

A14.7.2.5. Implement the system and process improvements in the final AE Event Review Report.

A14.7.3. The AE Event Review Team will: Provide an in-depth review of all class A, B, C events, focusing on potential system or process problems and prepare a final review report with action plan and evaluation methodology. The AE event review team will consist of at a minimum the AE patient safety manager, AMC-VFS and other members as required.

A14.7.3.1. Develop an action plan to make system or process improvements. The review team may also determine that no such improvement opportunity exists.

A14.7.3.2. Design a method to evaluate the effectiveness of the recommended improvements.

A14.7.3.3. In some instances, an AE event review may occur concurrently with an MII. When this occurs, the two investigative teams will work in coordination to minimize duplicate efforts. If an AE MII occurs after an AE event review, the final review report will be made available to the MII Team.

A14.7.3.4. MAJCOM/SG will: review and approve all final MAJCOM directed AE Event Review Reports.

A14.7.3.5. Forward copies of final AE event review reports to USTRANSCOM/AMC AE Patient Safety Manager for data collection and trending.

A14.7.3.6. USTRANSOM/AMC AE Patient Safety Manager will review all AE event review reports and disseminate applicable system-wide lessons learned, through AFMOA, the DO community or other avenues as required.

A14.8. AE Medical Incident Investigation (MII). The investigative and event analysis purpose of an AE event review and a MII are similar. An MII may be considered for any AE event and is convened when an AE event occurs and an objective evaluation cannot be completed at the affected unit level and/or the event involves multiple services, geographical locations or units.

A14.8.1. An AE MII is a global and in-depth review of an AE event to evaluate a system of care. The primary focus of the AE MII is on how or if the AE system contributed to the outcome; however, investigators are not restricted from commenting on the appropriateness of care delivered by individual providers or services.

A14.8.1.1. AE MIIs are protected from disclosure under 10 U.S.C. 1102, which is the Federal statute that states DOD quality assurance records are confidential and privileged.

A14.8.2. Authority. MAJCOM/SG can direct an AE MII for any AE event that occurs in their theater of responsibility. AMC/SG is the authority for MIIs pertaining to events that occur between theaters in coordination with the MAJCOM/CCs of the involved AORs.

A14.8.3. Refer to AFI 44-119, Chapter 8 for specific guidelines on the AF MII process. Major differences between an MTF and AE MII exist and must be considered. An AE MII may involve multiple geographical locations, services, and systems of care, which may complicate and significantly lengthen the investigative process.

A14.8.4. MAJCOM/SG reviews and approves or disapproves the final AE MII report. USTRANSCOM/AMC SG is notified of results prior to MAJCOM/SG briefing HQ USAF/SG or AFMOA/CC.

A14.9. AE Patient Safety (Clinical Performance Improvement/Risk Management Information) Sources.

A14.9.1. AE Patient Safety database. <https://amc.scott.af.mil/aeq/servlet>.

A14.9.2. AMC/SG. <https://sg-www.satx.disa.mil/amcsg>. Information on all Command Surgeon directorates, and specific information related to Quality (SGQ).

A14.9.3. HQ USAF/SG <http://sg-www.satx.disa.mil/af/sg>

A14.9.4. ANG/SG <https://airguard.ang.af.mil/sg/>

A14.9.5. AFRC/SG Medical Directorate. <https://www.mil.afrc.af.mil/HQ/SG/default.htm>

A14.9.6. TRAC2ES. <https://www.trac2es.transcom.mil>

A14.9.7. Armed Forces Institute of Pathology: Patient Safety Center <http://www.afip.org/Departments/PSC/Index/html>

A14.9.8. Commission of Accreditation for Medical Transport (CAMTS) <http://www.camts.org>

A14.9.9. AFMOA/SGOC. <http://www.afms.mil/moasgoc/index.html>. Clinical Performance Improvement/Risk Management Division of the Air Force Medical Operations Agency. Contains both urgent and historical information over the entire spectrum of Clinical Performance Improvement/Risk Management.

A14.10. QuIC Web Site. <http://www.quic.gov/index.html>. Quality Interagency Coordination Task Force (QuIC). QuIC's goal is to ensure that all federal agencies that purchase, provide, study, or regulate health care services are working in a coordinated way toward the common goal of improving the quality of care.

A14.10.1. JCAHO has a large website at <http://www.jcaho.org>. Of particular value are the sections on Patient Safety and Sentinel Events.

A14.10.2. AMC DOV/DOT for training and equipment issues. <https://www.amc.scott.af.mil/DO/>

A14.10.3. AMC DOO for operational issues. <https://amc.scott.af.mil/do/doSub.cfm?page=division%2Ehtm>

Attachment 15

DIETETIC/NUTRITION SUPPORT AND FOOD SAFETY

A15.1. General Principles

A15.1.1. The goals of administering meals in the Patient Movement (PM)/Aeromedical Evacuation (AE) system are to keep the patient comfortable, well nourished, and hydrated while preventing food-borne diseases. **NOTE:** Patients with a history of extensive trauma and illness are more susceptible to food-borne diseases.

A15.1.1.1. The process starts at the originating Medical Treatment Facility (MTF) and continues with the en route Aeromedical Staging Facilities (ASF), Mobile and Contingency Air Staging Facilities (MASF/CASF), and Aeromedical Evacuation Crewmembers (AECMs). Assessment includes significant nutritional risk, food allergies/intolerances, special dietary needs, and nutrition education needs.

A15.1.2. Originating and/or en route joint base operating support (BOS) and contracting food services, flight kitchens, and MTFs provide meals, snacks, and beverages for patients and attendants in the PM/AE system.

A15.1.2.1. In some instances, the availability of food items is highly dependant on prime vendor sources and the location's contingency and sustained BOS capabilities.

A15.1.2.2. Dietitians and/or diet therapy technicians may not be available to monitor all aspects of dietetic/nutritional support and food safety, and the local nursing personnel, Public Health Officer (PHO), and/or Flight Surgeon (FS) may be required to provide support and oversight. Refer to AFMAN 44-144, Nutritional Medicine.

A15.1.2.3. Procedures for feeding patients during peacetime, contingency, and disaster operations will vary at each location. Use AF Form 812, **Meal Order Record**, AF Form 1094, **Diet Order**, memorandums of understanding (MOUs), other AF Services Agency forms, and/or instructions on food selection based on dietary requirements.

NOTE: Notify the supporting Command and Control (C2) of significant impact/delays due to inadequate dietetic support and/or food safety issues. Complete DD Form 2852, **Aeromedical Evacuation Event/ Near Miss Report**. Provide detailed information on AF 3829, **Summary of Patients Evacuated by Air**, if indicated.

A15.2. Responsibilities

A15.2.1. **Sending or En Route Physician.** Physicians write diet orders, including tube feedings on AF Form 3899, **Aeromedical Evacuation Patient Record**, which serves as the source document for all diet orders. At locations where there is no dietary/nutritional medicine support, the local FS may be required to provide food safety oversight.

A15.2.2. **Originating MTF Patient Administration Desk (PAD)/AE Clerk**

A15.2.2.1. Provide diet orders to the PMRC through Transcom Regulating and Command and Control Evacuation System (TRAC2ES) IAW Theater OPOD and/or local directives.

A15.2.3. **PMRC**

A15.2.3.1. Provide diet information to the ASF/MASF/CASF or the originating MTF by using the Armed Services Medical Regulating/Patient Airlift Center Daily File.

A15.2.3.2. Submit PM/AE diet orders and bulk food requirements to MTF dietetic/nutritional and/or BOS food support personnel at locations without an ASF/MASF/CASF.

A15.2.3.3. Complete diet order request according to TRAC2ES for each flight when faxing diet orders.

A15.2.4. Originating and/or En Route MTFs

A15.2.4.1. Provide therapeutic in-flight meals (TIMs)/special diets, and when required, regular diets, snacks, and bulk food. **NOTE:** Each MTF contacts their designated PAD/AE clerk or Aero- medical Evacuation Liaison Team (AELT) to coordinate ground and aircraft arrivals and departures.

A15.2.5. Base Operating Support (BOS) Food Services

A15.2.5.1. Provides patient and attendant regular diets, snacks, beverages, and bulk food, and may fill TIM/special diet requirements under the direction of dietetic/nutritional medicine/nursing personnel.

A15.2.6. ASF/MASF/CASF

A15.2.6.1. Update TRAC2ES diet orders/requirements as required.

A15.2.6.2. Submit diet and bulk food orders to dietetic/nutritional support personnel at least 4 hours before aircraft departure time or IAW local directives.

A15.2.6.3. Deliver patient meals to patient care areas and aircraft in coordination with local PHO and/or FS if applicable.

A15.2.6.4. Clean/disinfect refrigerators used to store patient nourishments IAW local policy. After each use, clean/disinfect insulated transportation containers, coolers, and tray transportation systems and return to supporting food service agency. **NOTE:** MTFs and/or ASF/MASF/CASF nursing personnel may be required to help prepare, provide oversight, and/or obtain meals from BOS food services if dietetic/nutritional medicine personnel are not available.

A15.2.7. Aeromedical Evacuation Crewmembers (AECMs)

A15.2.7.1. Coordinate meal storage requirements and feeding times with aircraft commander and/or loadmaster/boom operator per AECM checklist.

A15.2.7.2. If available during AE operation, clean/disinfect refrigerators before and after each mission when using to store patient nourishments. Clean/disinfect insulated transportation containers, coolers, and tray transportation systems. See Infection Control, [A12.2.8](#), Cleaning/Disinfecting. (Note: This is a fleet service responsibility).

A15.2.8. At Each Patient Care Hand Off

A15.2.8.1. Assess and document nutritional status (intake patterns, appetite, ability to chew/swallow, and digest), time of last meal, and fluid intake.

A15.2.8.1.1. Evaluate and document gastrointestinal (GI) status and/or symptoms, especially for patients receiving pain medication and those who are in the PM/AE system for more than 24 hours. For GI/GU Assessment refer to 3.3.5. For GI Considerations, refer to 12.1.

A15.2.8.2. Utilizing Standard Precautions, personnel handling and preparing food items and patients will wash hands prior to contact with any food items. Refer to Infection Control, [A12.2.1/A12.2.2.1.4](#)

A15.2.8.3. Assist patients with positioning and eating as necessary. If not clinically contraindicated, elevate head or assist to upright sitting position.

A15.2.8.4. Provide beverages at least every 2 hours for those not on fluid restrictions.

A15.2.8.5. Check for food item accuracy before administering patient meals, snacks, and beverages.

A15.2.8.6. Administer meals and snacks as close to normal mealtimes as possible.

A15.2.8.6.1. Meal Times: 0600-0800, 1100-1300, 1700-1900. Times may be adjusted to the destination time zone if there are no contraindications.

A15.2.8.6.2. Special diets are usually served first. Provide hot meals at scheduled meal times when operationally feasible.

A15.2.8.6.3. Time between the evening and breakfast meals will not exceed 15 hours.

A15.2.8.6.4. When operationally feasible, patients will be fed prior to patient care handoffs, ground/aircraft departure and arrival, and if delay in feeding is anticipated due to operational constraints. Note: Consider sending a cold or shelf-stable meal with the patient if meal and transportation times overlap.

A15.3. Patient Diet Orders

A15.3.1. In-Flight Meals for Patients with Regular Diets. Supporting food services and MTFs at installations where flights originate will fill orders received from the Patient Movement Requirement Center (PMRC), AE element, and/or ASF/MASF/CASF personnel.

A15.3.1.1. Whenever possible, provide shelf-stable food that does not require refrigeration and heating.

A15.3.1.2. **Meals Ready to Eat (MRE).** Use MREs during contingency operations if other food is unavailable. Provide MREs and snacks for meals during the entire flight. For MRE diabetic exchanges, see https://kx.afms.mil/kxweb/dotmil/file/web/ctb_077841.pdf

A15.3.2. Therapeutic In-flight Meals (TIMs)/Special Diets. MTFs, where AE flights originate, provide TIMs or “special diets” according to the appropriate menu plan. During contingency operations, UTC medical personnel may be required to select appropriate food items at local BOS food services.

A15.3.2.1. TIM/special diet requests should arrive at the MTF or BOS food services no later than 2 hours before the aircraft’s scheduled departure time or IAW local policy. Submit all diet orders according to the TRAC2ES. Current TRAC2ES diets are: bland, diabetic, liquid, low fat, NPO, other, regular, renal soft, and tube feeding.

A15.3.2.2. Diet orders include:

A15.3.2.2.1. Prudent/Healthy. Despite the large variation in ordering capabilities, MTFs often provide a frozen heart-smart commercial meal to meet the diet modification for most diet orders. The heart-smart frozen meals meet therapeutic diet restrictions and are convenient for use in flights with heating and refrigeration capability. A “Prudent/Healthy” diet can take the place of diabetic, low fat, regular, bland, and renal diets. This is appropriate since these healthy frozen meals are moderate in carbohydrates, protein, and lower in fat, sodium, and potassium.

A15.3.2.2.2. Renal

A15.3.2.2.3. Dental Soft

A15.3.2.2.4. Liquid Diet (clear and/or full)

A15.3.2.2.5. Tube Feeding. IAW Enteral Tube Feeding [A19.1](#)

A15.3.2.2.6. NPO

A15.3.3. Adapt snacks for TIMs/special diets using **Table A15.1**, as well as carbohydrate replacement items for diabetics if meals are delayed (**Table A15.2**).

Table A15.1. Allowable Snacks for TIMs/Special Diets.

Diet	Allowed Snacks	Not allowed
Pediatric	Milk, juice, ice cream, sugar	Coffee, tea
Liquid		
Clear	Apple juice, grape juice, coffee, decaffeinated coffee, tea, sugar	Milk, ice cream, cream, other juices
Full		
Blenderized	Milk, ice cream, juice, coffee, tea,	Pepper, anything not liquid at body
Cold Semi-liquid (T&A)	Same as above	Any red products
Soft		
Soft Mechanical Dental	Milk, ice cream, juice, coffee, tea, sugar, , pureed, pepper (NOTE: not for neutropenic patients)	Any difficult-to-chew or crunch foods
Diabetic	Black coffee, tea, diet soda	Any sweetened beverage, sugar, or food with carbohydrate (i.e. fruit/crackers/yogurt) unless medically indicated.
Renal		

	Cranberry juice, hard candy, sugar, coffee, tea	All other foods
Protein Restricted		
Potassium Restricted	Cranberry juice	All other foods

Table A15.2. Carbohydrate Replacement for Insulin Dependent Diabetics (15 gm carbohydrate).

Note: Diabetics are able to choose appropriate food items and then cover with insulin.	
Fruit Group	Simple Carbohydrates
(15 gm Carbohydrate)	(15 gm Carbohydrate)
1/2 C Fruit Juice:	
Apple, Grapefruit, Orange, or Pineapple	1/4 C Pudding
1/3 C Fruit Juice:	1/2 C Regular Gelatin
Grape, Prune, or Cranberry	
	Soft Drinks, Regular:
	1/2 C Cola
	3/4 C Ginger Ale
	Starch Bread Group
	(15 gm Carbohydrate)
	6 Saltine Crackers (2-in squares)
	4 Soda Crackers (2-1/2 in squares)
	1 Slice Bread
Vegetable Group	3 Graham Crackers (2-1/2 in squares)
(5 gm Carbohydrate)	
1/2 C Tomato or Vegetable Juice	

A15.4. Preparing Patient Diets

A15.4.1. Prepare all diets according to the current American Dietetic Association (ADA) Nutrition Care Manual and locally approved therapeutic menu patterns. Additional menu patterns and references can be found at the Knowledge Exchange Nutritional Medicine Knowledge Junction website.

A15.4.2. Check regular and therapeutic menus prior to serving to ensure nutritional adequacy/accuracy. At a minimum, the regular and TIM/special diet menus should be compared to the Food Guide Pyramid for nutritional adequacy. See Figure 15.3 below.

A15.4.3. When operationally feasible, offer a selection of lower-fat entrees and salad dressing, whole grain breads, 2 percent (or less) fat milk, and margarine as standard items for all regular and soft diets. Whole milk should be offered on 1-3 year old preschool child

menus. Vitamin C-rich food should be offered daily and Vitamin A-rich foods should be offered every other day.

Table A15.3. Major Food Groups and Suggested Daily Intake.

Calorie Level	1,200	1,400	1,600	1,800	2,000	2,200	2,400	2,600
Fruits	1 C	1.5 C	1.5 C	1.5 C	2 C	2 C	2 C	2 C
Vegetables	1.5 C	1.5 C	2 C	2.5 C	2.5 C	3 C	3 C	3.5 C
Grains	4 oz-eq	5 oz-eq	5 oz-eq	6 oz-eq	6 oz-eq	7 oz-eq	8 oz-eq	9 oz-eq
Meat and Beans	3 oz-eq	4 oz-eq	5 oz-eq	5 oz-eq	5.5 oz-eq	6 oz-eq	6.5 oz-eq	6.5 oz-eq
Milk	2 C	2 C	3 C	3 C	3 C	3 C	3 C	3 C
Oils	4 tsp	4 tsp	5 tsp	5 tsp	6 tsp	6 tsp	7 tsp	8 tsp
Discretionary Calorie	171	171	132	195	267	290	362	410

A15.4.4. Infant/Child Meals. Request food items by specifying the child's age on the diet order request. Pediatric nutrition needs assessment/screening criteria should include an assessment of weight for age, weight loss, special dietary needs, food allergies, chronic illnesses, and nutrition education needs.

A15.4.5. Packing Meals

A15.4.5.1. Meal Sizes. Keep the entire meal as small as possible due to limited storage space aboard the aircraft and other transportation assets.

A15.4.5.2. Label. Label the box containing the meal and snack with the following information: Name, diet, flight #, station enplaned, preparation date, and time.

A15.4.5.3. Diabetic Snacks. Pack diabetic snacks separately, sealed in a bag. These may be placed in the same box with the meal, however, clearly label these packages as snacks and indicate the time they should be eaten.

A15.4.5.4. Packing Patient Meals and TIMs/Special Diets. If operationally feasible and available, pack in insulated containers, with ice, and deliver to the patient departure point for loading onto the aircraft or transportation asset. **NOTE:** Consume meals or discard non-processed patient food items within four hours.

A15.5. Planning En Route Meal Requirements

A15.5.1. Refer to TRAC2ES Lift Bed Plan, Manifest, TIM/Special Diet List, [Table A15.3](#) and [A15.4](#) to determine the number and type of meals for each mission.

Table A15.4. Aircraft Refrigeration and Heating Capability.

Aircraft	Refrigeration	Heating
C-130	Aircrew only	No
C-17	Yes*	Yes*
KC-135	No	No
KC-10	Aircrew only	Yes

C-21	No	No
B-767	Yes (limited)	Yes

*Comfort pallet added depending on patient load/mission length

NOTE: Because of limited space, aircraft commander's coordination and final approval is required for placing patient food items in aircraft refrigerators and for adding food transportation containers to the mission.

Table A15.5. Planning Patient Meals and Snacks.

Flight Time	Refrigerator for Patient Meals is Available	No Refrigerator is Available
Less than 4 hours	Snacks and beverages ¹ if not over meal time	Snacks and beverages ¹ if not over meal time
4-7 hours	Box lunch ² or frozen entree meal and beverages ¹	Box lunch ² , or MRE ³ and beverages
More than 8 hours	2 meals	2 meals
	1 box lunch ² and 1 frozen meal and beverages ¹	1 box lunch ² and 1 mre ³ and beverages ¹
	OR	OR
		1 MRE ³ and snacks and beverages ¹
	2 frozen meals and beverages	
Each additional 4 hours	Add additional frozen meal and beverages ¹	Add additional snacks and beverages ¹

NOTES:

1. Shelf stable and does not require refrigeration.
2. Includes sandwiches. Considered "safe" to consume within 4 hours of issue from a food service facility if not stored in a refrigerator at or below 41° F. Avoid using mayonnaise.
3. Only when no other shelf-stable food is available.

A15.6. Maintaining Food Safety

A15.6.1. Dysentery and food-borne illness are a threat to the health of all personnel. Patients who are compromised have an increased risk for food-borne illness. Personal hygiene, food safety, and sanitation practices are critical for all personnel responsible for patient feeding. Follow safe food handling practices and limit access to food preparation areas. Refer to Infection Control, [A12.1](#)

A15.6.2. At operationally feasible locations, potentially hazardous/non-processed foods (meat, eggs and milk products) will be maintained either below 41° F or above 140° F in order to remain safe. **NOTE:** Meals containing non-processed food items will be consumed within 4 hours or discarded.

A15.6.3. To minimize risk for food-borne illness, use commercially prepared shelf-stable food available through local prime vendor sources whenever possible. MREs are used if other shelf-stable food is unavailable.

A15.6.4. Depending on the location, water and ice sources may not be adequate, so bottled water will be required. Follow commander's OPOD and/or local directives.

A15.6.5. MASFs, CASFs, ground transportation vehicles, and aircraft may lack adequate equipment to store food at safe temperatures.

A15.6.6. Insulated Containers, Coolers, and Tray Transportation Systems

A15.6.6.1. When operationally feasible and available, insulated containers or coolers are primarily used for transport and short-term storage of meals and beverages containing cold or hot, non-processed foods (meat, eggs and milk products). **NOTE:** Unsealed food items, medications, and blood products are prohibited. Refer to Infection Control, [A12.1.4.8](#)

A15.6.6.2. Usually there is no temperature reading device or power associated with these units, making it difficult to know how well the temperature is being maintained. Temperatures are not evenly distributed. **NOTE:** Regardless if using wet or dry ice, consume or discard non-processed patient food items within 4 hours of controlled refrigeration.

A15.6.6.3. Ensure clean food transportation containers (ground/aircraft) pre and post use.

A15.6.7. Storage of unsealed food items, medications, and blood products is prohibited. Refer to Infection Control, [A12.1.4.8](#)

A15.6.7.1. Food and drinks are prohibited in biomedical refrigerators.

A15.6.7.2. Temperature ranges are 34° to 40° F.

A15.6.7.3. Monitor ground UTC internal refrigerator temperatures at least three times a day with a refrigerator thermometer and record on a locally developed temperature chart.

A15.6.7.3.1. Ground UTC food refrigerators are cleaned at least weekly.

A15.6.7.4. Aircraft food refrigerators may be used for patient nourishment items, with coordination and approval of the loadmaster and/or PIC.

A15.6.7.4.1. Fleet services to clean aircraft refrigerators used for patient food pre and post mission.

A15.6.8. After meals are consumed, and before leaving the patient care area, all en route nursing personnel will check used box lunches/patient trays for possible contamination (i.e., syringes, wound dressings, body fluids) for disposal and/or cleaning.

REFERENCES

Lippincott, The Manual of Nursing Practice, 7th Edition

AFI 44-135, Clinical Dietetics

AFI 44-144, Nutritional Medicine, 14 June 2004

AFI 48-116, Food Safety Program, 17 March 2004

Attachment 16

EN ROUTE PATIENT MOVEMENT/AEROMEDICAL EVACUATION PAIN MANAGEMENT

A16.1. En Route Patient Movement (PM)/Aeromedical Evacuation (AE) Pain Management.

A16.1.1. Pain is a complex experience with multiple dimensions and is always subjective.

Pain is defined by the International Association for the Study of Pain (IASP) as an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage. **NOTE:** The ability to communicate effectively in a verbally form may be diminished while an individual is experiencing pain and is in need of appropriate pain-relieving treatment.

A16.1.1.1. Under treated and poorly managed pain may lead to adverse physical and psychological consequences and complications such as pneumonia, deep vein thrombosis (DVT), delayed recovery and/or progression to chronic pain. Chronic pain diminishes one's quality of life.

A16.1.2. The goal of administering any type of medication or treatment in the PM/AE system is to maintain continuity of care from the originating medical treatment facility (MTF) to the destination MTF. **NOTE:** Every patient has a right to consistent and appropriate assessment and adequate pain management to deal with the stresses of the PM/AE environment.

A16.2. Stresses of Transport and Flight. Refer to [Chapter 2](#) for detailed discussion.

A16.2.1. Decreased partial pressure of oxygen: Decreases tissue oxygen availability and will exacerbate oxygenation deficiencies due to preexisting hypoxias related to injury, disease, and/or treatment. May exacerbate the CNS effects of pain medication.

A16.2.2. Barometric Pressure Changes: Gas expansion in the abdominal cavity at cruise altitude may lead to crowding of the diaphragm increasing pain and splinting. Splinting and diaphragmatic crowding decreases lung volume and expansion, and may exacerbate the risk of hypoxia. Consider placing a nasogastric tube.

A16.2.3. Thermal: Cold temperatures may lead to vasoconstriction, shivering and exacerbated pain. Keep patient warm and limit exposure to cold temperatures.

A16.2.4. Vibration/Turbulence: Increases muscle activity, metabolic rate, and peripheral vasoconstriction. Avoid excessive speed of ground transportation assets. Secure patients away from the bulkhead and floor of ground vehicles and aircraft, encourage and assist with position changes, and provide adequate padding and skin care, especially for orthopedic patients with internal/external fixators.

A16.2.5. Gravitational Forces: Seat belts in side facing and rear facing seats may cause injury during acceleration/deceleration; use extra padding between abdomen and seat belt for patients with abdominal surgery.

A16.2.6. Fatigue: Exacerbates the patient's underlying condition/diagnosis due to the overall effect of previously mentioned stresses of flight, and length of time the patient has been in the PM/AE system.

A16.3. Indicators of Pain by Hierarchy:

A16.3.1. Patient self-report – single most reliable measure of intensity of pain.

A16.3.2. Pathological conditions or procedures known to be painful.

A16.3.3. Observed pain-related behaviors (grimacing, restlessness, vocalization, groaning).

A16.3.4. Reports of pain by family or attendant.

A16.3.5. Physiological changes (increased pulse and blood pressure).

A16.4. Assessment : WARNING: When assessing pain, always rule out and treat life threatening conditions, such as cardiac pain/pulmonary embolism

A16.4.1. Obtain vital signs, including pulse oximetry and assess pain at least every 4 hours for patients who require en route pain medication administration. **NOTE:** Take into consideration the type of medication, time of onset based on route, and duration of known effectiveness.

A16.4.1.1. Rule out hypoxia ([Table 2.1](#)) and compartment syndrome ([10.2.2.9](#)).

A16.4.2. Ascertain the patient's pain level and their acceptable level of pain. The acceptable level of pain is the level of pain the patient is willing to tolerate. Respect the patient's self-report of pain.

A16.4.2.1. Have the patient rate pain on a numerical scale of 0 – 10 with 0 being no pain, 1 being the least and 10 being the worse pain possible. Use patient numerical scale verbalization or the Wong-Baker FACES Pain Rating Scale ([Figure A16.1](#)).

Figure A16.1. Wong-Baker FACES Pain Rating Scale (From Wong D.L., Hockenberry-Eaton M., Wilson D., Winkelstein M.L., Schwartz P.: Wong's Essentials of Pediatric Nursing, ed. 6, St. Louis, 2001, p. 1301. Copyrighted by Mosby, Inc.).



A16.4.2.1.1. Wong-Baker Faces Pain Rating Scale ([Figure A16.1](#)) is the pain rating scale recommend for persons age 3 years and older.

A16.4.2.1.2. Explain to the person that each face is for a person who has no pain (hurt) or some, or a lot of pain. **Face 0** doesn't hurt at all. **Face 2** hurts just a little bit. **Face 4** hurts a little more. **Face 6** hurts even more. **Face 8** hurts a whole lot. **Face 10** hurts as much as you can imagine, although you don't have to be crying

to have this worst pain. Ask the person to choose the face that best describes how much pain he/she has.

NOTE: Once the best pain grading approach is found for a given patient, document and communicate this scale to en route/in-flight healthcare providers to maintain consistency between evaluations.

A16.4.3. Refer to 7.4.1, and document on AF IMT 3899A and 3899I (reverse). Note the patient's self-reported pain as, 'verbalizes pain scale as "X/10"' or 'chooses Wong-Baker FACES pain scale "X/10."'

A16.4.4. Assess patient understanding and educate patient and staff on the patient's acceptable level of pain and the availability of medications.

A16.4.5. A pain score of 3 or more usually indicates the need for pain medication.

A16.4.6. Ascertain characteristics of pain: quality, region, radiation, what provokes/triggers (movement/dressing changes/deep breathing and coughing), palliates/eases (repositioning/elevation/sup-port/medication), and the adequacy and adverse effects of pain medication.

A16.5. Assess cultural attitudes, stoicism, guilt, and potential frustration and helplessness, mental functioning, mood, and fear of pain.

A16.5.1. Educate patients, family and attendants regarding reporting pain and availability of pain medication, as well as, the low risk of addiction from long-term use and/or high doses of medication for pain relief, and document on AF Form 3899I (reverse). **NOTE:** Include information about prn medications being available around-the-clock.

A16.6. Barriers to Communicating Pain. Infants/children, emotional or cognitive disorders, cultural, educational or language barriers; artificial airway; sedated/ventilated, and seriously ill.

A16.6.1. Utilize a rating scale (Wong-Backer Faces), interpreter, and medical attendant/family member.

A16.6.2. Note the patient's body position, facial expressions, posture and any guarding or self-protection movements. Note rate and depth of respirations, and color. Observe for stiffness, rigidity, or flaccid muscles.

A16.6.3. For children under the age of 3 and infants, note crying, moaning, arched/rigid torso, grabbing/touching wound, extremities tense or pulled up, kicking/squirming, and the physiological changes of increased pulse and blood pressure.

A16.7. Treatment/Management: **NOTE:** Document all known allergies on the AF IMT 3899 series

A16.7.1. Administer pain medication as ordered prior to potential painful events such as transportation movement and en route staging treatments and dressing changes. Take into consideration the type of pain medication, time of onset based on route, and duration of known effectiveness. For example, opioid analgesic onset is immediate when administered

intravenously, and rapid when administered via intramuscular and oral routes (approximately 30 – 60 minutes); duration is usually 1– 8 hours.

A16.7.2. Assess adequacy of pain medication at all patient care handoffs, en route staging locations and in- flight. Consider medication for breakthrough pain (pain that “breaks through” relief provided by ongoing analgesia).

NOTES:

1. If medication is inadequate or absent at the en route staging facility, the physician/flight surgeon will evaluate and order pain medication prior to continuation of PM, complete and forward a DD Form 2852.

2. If a physician is not present and pain medication is not available or is insufficient, request and establish immediate radio communication with the TACC/AMOCC/AOC/PMRC for a physician order. The MCD/nurse will complete DD Form 2852 and document the occurrence on AF Form 3829 if flight related.

A16.7.3. Non-drug interventions to assist in alleviating pain: Maintain body alignment, elevate extremity, change position; readjust splints and bivalved casts; encourage physical activity, if operationally and clinically feasible. Consider heat/cold application if not contraindicated.

A16.7.4. Prescribed controlled drugs entrusted to a patient/attendant are considered the property of the individual, who is then responsible for safeguarding and administering the drug(s) during all phases of PM. Ensure patients understand use and have an adequate supply for duration of movement to the receiving MTF. All medical personnel will determine if the patient or attendant is competent to safely manage these drugs. **NOTE: Patients and non-medical attendants will not carry or administer controlled injectible medications without a written physician's order.**

A16.7.5. The originating facility will be responsible for providing pain medication. Intratheater requires a 1 day supply and intertheater requires a 3 day supply of medication. If narcotics are sent, refer to 7.3. Controlled Drugs.

A16.8. Pain Management Special Interest Items. For detailed information see <https://kx.afms.mil/anesthesiology>

A16.8.1. Patient Controlled Analgesia (PCA).

A16.8.1.1. Various pieces of PCA equipment/pumps for the administration of pain medication may be encountered in the PM/AE system. Refer to AMC Equipment Standards Guide for current list of AE approved PCA pumps, and waiver process.

WARNING: In addition to correct labeling of IV and pain medication containers/bags, assure all IV and pain management tubing is taped/labeled with drug/location/date/time in ZULU. For example, “PCA IV Morphine, Right Forearm, Date/ZULU time”

A16.8.1.2. Prior to flight:

A16.8.1.2.1. Anesthesia Services/Pain Service Personnel:

A16.8.1.2.1.1. Will provide consultation and programming of the PCA infusion

pump at the MTF for all patients transiting the PM/AE system, including during ASF/CASF RON.

A16.8.1.2.1.2. Will order and/or review all pain medication loading dose(s), PCA bolus dose amount, lock-out interval, basal flow (continuous) rate, breakthrough pain orders, continuous peripheral IV infusion or saline lock, and over sedation protocol on the AF Form 3899 series. Refer to 1.17. Clinical Documentation.

A16.8.1.2.1.3. After confirming infusion programming, the pump and narcotic reservoir will be placed in the protective casing (if available) and locked. NOTE: Assure pain management tubing is taped/labeled with drug/location/date/time in ZULU.

A16.8.1.2.1.4. Will consider increasing the dose or decreasing lock-out interval to account for increased pain during patient transport. A nurse or credentialed provider will consider increasing or decreasing the dosage in accordance with physician orders.

A16.8.1.2.2. At Each Patient Care Hand Off Aircraft/CASF/ASF/MTF) and/or “Change of Shift:”

A16.8.1.2.2.1. Assess pain score, vital signs, pulse ox, and sedation baseline and treat pain PRN, and assess for the presence of medication side effects (nausea, pruritus, constipation). AETs may perform these duties in accordance with their enlisted Career Field Education and Training Plan (CFETP). See A16.4. and A16.7.

Table A16.1. ambIT PCA Functions.

Proper Functioning	WARNINGS	NOTES
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<ul style="list-style-type: none"> - “Lock” Symbol in the LCD - A number in the LCD - A green blinking light behind the bolus button 	<ol style="list-style-type: none"> 1. If line occludes: must rely on the LCD display to warn of occlusion. Green indicator light continues to blink just as in normal operation. Check line. 2. There is no backlight on the LCD display and it may not be visible under low-light conditions. 3. Under bright sunlight conditions, the LCD display and green indicator light may be difficult to see. 4. Audible alarms cannot be heard in flight. 5. If cap is turned past the ‘OFF’ position, the cap may inadvertently come off and batteries may fall out. 6. Air Bubbles: On decompression, air bubbles may form in tubing, however, the amount of bubbles formed did not cause clinical concern during testing <ul style="list-style-type: none"> • Efforts should be made to reduce/eliminate air bubbles in the reservoir bag to limit increases in volume during pressure 	<ul style="list-style-type: none"> - Program settings are maintained if pump turned Off/On - Sending MTF should send two extra “AA” Batteries
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A16.8.1.3. Prior to flight:

A16.8.1.3.1. Anesthesia Services:

A16.8.1.3.1.1. Will provide consultation and programming of the ambIT PCA at the MTF for all patients transiting the PM/AE system, including during ASF/CASF RON

A16.8.1.3.1.2. Will order and/or review all pain medication loading dose(s), PCA bolus dose amount, lock-out interval, basal flow (continuous) rate, breakthrough pain orders, continuous peripheral IV infusion or saline lock, and over sedation protocol on the AF Form 3899 Patient Movement Record series. Refer to [1.17](#) Clinical Documentation

A16.8.1.3.1.3. After confirming infusion programming, the pump and narcotic reservoir will be placed in the protective casing and locked. **NOTE:** Assure pain management tubing is taped/labeled with drug/location/date/time in ZULU.

A16.8.1.3.1.4. Will consider increasing the dose or decreasing lock-out interval to account for increased pain during patient transport. **NOTE:** Anesthesia service providers are the only providers who will make changes to the pump and/or medication while in the PM/AE system.

A16.8.2. **DELETED.**

Figure A16.2. Label 1. Red Box.

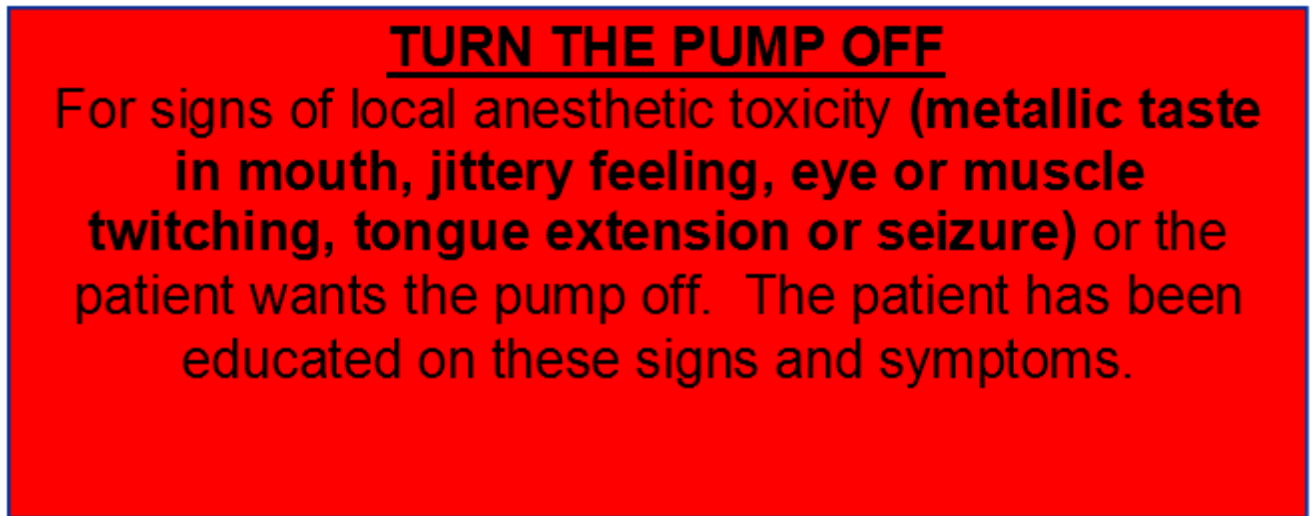


Figure A16.3. Label 2. Yellow Box.

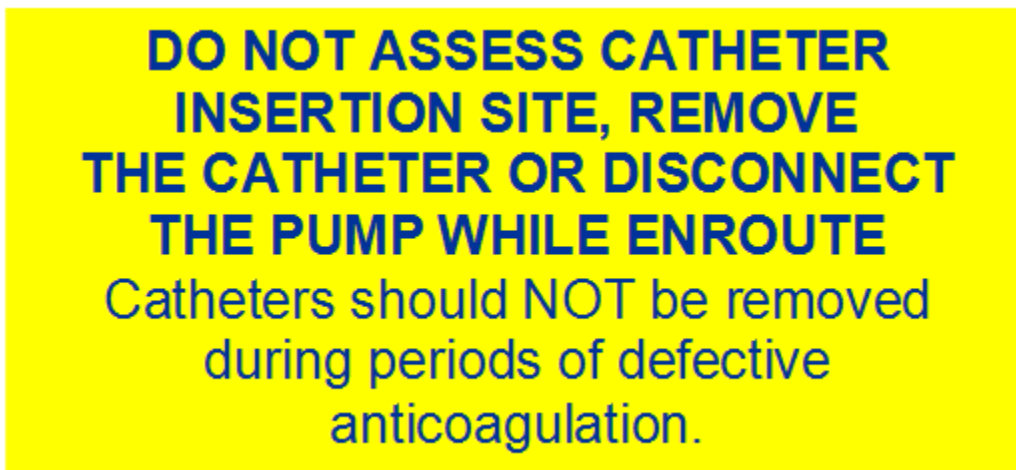
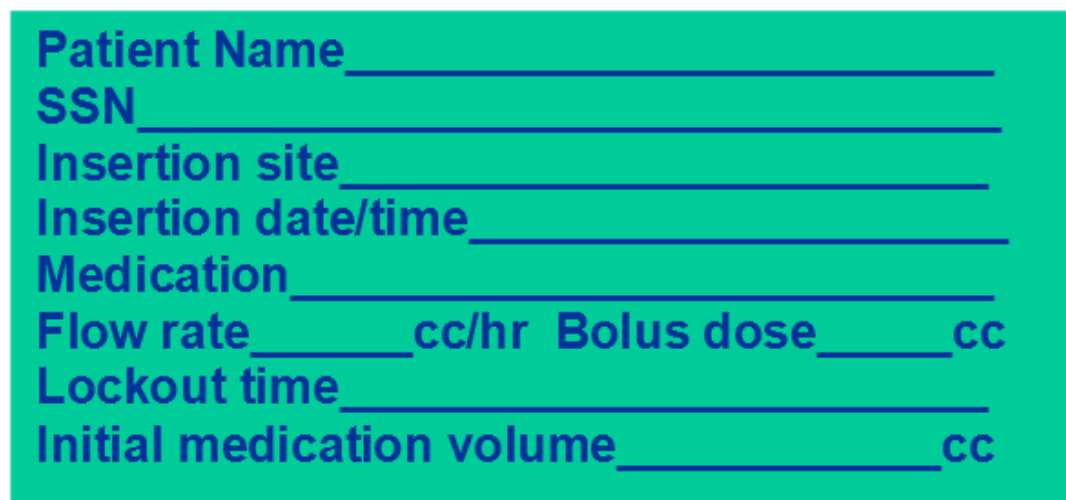


Figure A16.4. Label 3. Green Box.



Patient Name _____
 SSN _____
 Insertion site _____
 Insertion date/time _____
 Medication _____
 Flow rate _____ cc/hr Bolus dose _____ cc
 Lockout time _____
 Initial medication volume _____ cc

A16.8.2.1. Assess baseline pain score, vital signs, pulse ox, sensation and circulation status distal to the catheter insertion site, and sedation baseline and treat pain PRN, and for the presence of medication side effects (Table A16.1.). See A16.4. and A16.7. **NOTE:** While on Stryker Pain Pump, assess all the above every 2 hours and assure skin integrity.

A16.8.2.2. Assure the Stryker Pain Pump has adequate supply of medication for the duration of the transport, and verify tubing label location. **NOTE:** Assess every two hours and assure tubing and pump are secured to the patient.

A16.8.2.2.1. Stryker Pain Pump does not have an “empty” sensor and will continue to pump when empty. If this occurs, close the clamp on the tubing, turn the pump OFF (Hold “Off” button for 8 seconds), leave pump attached to catheter. Document on AF IMT 3899 series, submit DD Form 2852, and document on AF IMT 3829, if flight related.

A16.8.2.2.2. It is difficult to assess fluid in the pump. Read amount on the pump to determine amount delivered.

A16.8.2.2.3. Document and verify pump infusion history and current configuration with the sending/receiving nurse or MTF representative and annotate remaining fluid (mL) on AF IMT 3899A (Front).

A16.8.2.2.4. Confirm with the sending/receiving nurse or MTF representative: physician orders, labels on the pump, and breakthrough pain orders. Also confirm tubing is taped/labeled with drug/location/date/time in ZULU, and the tubing is secured.

A16.8.2.2.5. **While En Route or RON ASF/CASF:** **NOTE:** During vibration, the pump turns OFF automatically. If this occurs, turn pump back ON (Patient or AECM). If pump remains OFF, initiate Back-Up Pain control plan. Document on AF IMT 3899 series, submit DD Form 2852, and document on AF IMT 3829, if flight related.

A16.8.2.2.5.1. Document amount of Stryker Pain Pump medication administered

for each trip segment/patient care handoff and/or shift change on AF IMT 3899I (Front) Scheduled Medications and/or IMT 3899

A16.8.2.2.5.2. If any of the Signs and Symptoms of Local Anesthetic Toxicity ([Table A16.1](#)) are present, close the clamp on the tubing, turn the pump OFF (Hold “Off” button for 8 seconds), leave pump attached to catheter. Monitor and treat the patient (high flow O₂, protect airway/breathing, etc.). Provide backup pain management measures when stable.

Table A16.2. Signs and Symptoms of Local Anesthetic Toxicity.

Metallic taste	Feeling of impending doom
Light-headed or dizzy	Loss of consciousness
Excitation	Seizure
Restless	Cardiovascular instability

A16.8.2.2.5.2.1. Notify TACC/AMOCC/AOC/PMRC if in-flight. If in the ASF/ CASE, notify anesthesia and/or flight surgeon. Document all assessment data and follow-up on the AF IMT 3899 series and submit DD Form 2852, and AF IMT 3829, if flight related.

A16.8.2.2.5.3. Discontinued pumps remain attached to the tubing and the patient, and are disconnected/discarded by the supporting Anesthesia Service at the next en route stop or MTF.

A16.8.2.2.5.4. **Patient/Family Education.** Also see [A16.5.2](#)

A16.8.2.2.5.4.1. Benefits of the pain control system and medication side effects/toxicity, and the need to change position of the effected area to prevent decreased circulation.

A16.8.2.2.5.4.2. Safety mechanisms/operation of pump including alarms and signals, and need to immediately notify AECMs/medical personnel in the event of side effects/ toxicity.

A16.8.2.2.5.4.3. The availability of additional PRN pain medication for breakthrough pain and/or pump malfunction.

A16.8.3. Epidural Analgesia and Peripheral Nerve Blocks.

A16.8.3.1. Epidural analgesia and peripheral nerve blocks are a proven adjunct for severe pain management for patients transiting the continuum of care. Patients will be managed by Critical Care Air Transport Teams (CCATT), medical attendants, and/or aeromedical evacuation crewmembers (AECMs) and aeromedical staging facility personnel. AECMs will manage stabilized patients (not CCATT patients) through the AE system. NOTE: All staging facility nursing personnel and AECMs currently providing patient care in the AE system must accomplish the approved training plan. This training will be completed annually and within 90 days of deployment. This training will be documented in the flight nurse's Competency Assessment Folder and the aeromedical evacuation technician's Career Field Enlisted Training Plan. However, completion of the AF IMT 2519 All Purpose Checklist by the aeromedical evacuation

technician is not required. The Chief Nurse will be responsible for ensuring all AECMs/staging facility nursing personnel have accomplished training prior to caring for patients with epidural analgesia or peripheral nerve block infusions. Prior to manifesting a patient with epidural analgesia or peripheral nerve block infusions onto an AE flight, the presence of the epidural or peripheral nerve block (infusing or capped) will be annotated on the Patient Movement Request (PMR) within the TRAC2ES system. The theater validating flight surgeon must be aware of the presence of the epidural or peripheral nerve block infusion prior to clearing the patient for flight.

A16.8.3.1.1. It is essential for all providers to know the action and side effects of patient specific medications prior to starting care and prior to departure.

A16.8.3.1.1.1. The following apply to patients moving in the AE system without an attendant/CCATT:

A16.8.3.1.1.1.1. An epidural analgesia or peripheral nerve block infusion must be in place and running without incident for a minimum of 4 hours prior to departing the sending facility.

A16.8.3.1.1.1.2. During the placement of the epidural catheter if “loss of resistance technique with air” has been used, or a “wet tap” occurs, the patient will wait a minimum of 24 hours prior to planned AE mission to decrease the possibility of complications such as pneumo-encephalopathy occurring.

A16.8.3.1.1.1.3. Only analgesic concentrations of local anesthetics will be infused. Narcotics (or any other medication) will NOT be added to the infusions.

A16.8.3.1.1.1.4. Only Amides such as Bupivacaine and Ropivacaine will be used. The use of Esters such as Procaine and Chlorprocaine is not permitted due to increased risks associated with these medications. More dilute solutions, i.e. 0.125% Bupivacaine, will be used to decrease the risk of sympathetic blockade.

A16.8.3.1.1.1.5. All infusions must be stable at an analgesic level, not a surgical anesthesia level at the T10 dermatome (umbilicus) level. The patient should be able to regain partial “motor” control of the lower extremities.

A16.8.3.1.1.1.6. Other pain medications or narcotics may be administered orally, IV or by PCA using established protocols or in conjunction with written physician orders.

A16.8.3.1.1.1.7. All epidural analgesia or peripheral nerve block infusions must be administered using an approved infusion pump. Non-approved pumps will not be accepted without a waiver from HQ AMC/A3VM. The pump and the IV tubing must clearly be labeled as “EPIDURAL INFUSION” or “PERIPHERAL NERVE BLOCK INFUSION”.

A16.8.3.1.1.1.8. A patient hand-off will be completed and documented each time a different clinician accepts care of the patient. The hand-off will be performed consistent with high alert IV medications to prevent programming errors. An independent double-check is defined as two medical persons

familiar with the process/equipment/medication (at least one being a registered nurse), independently verifying the practitioner's/provider's orders, medication hanging, and the correct set up of PCA or IV pump in use (rate, dose, volume to infuse, medication concentration, basal rate, bolus lockout, etc.). This hand-off will include clearing the infusion history on the infusion pump. Documentation of double-checks will be reflected by two signatures on required forms/flow sheets or on the AF Form 3899A. This is applicable to sending MTFs, ASFs/CASFs, CCATTs and AECMs. Double-checks are conducted and documented when initiating high alert medications, during handoffs of care, following a change in orders, and when a new bag is started.

A16.8.3.1.1.1.9. Sufficient orders for the epidural analgesia or regional block infusion must be fully documented on the patient movement record (AF Form 3899). These orders should include medication, infusion rates/settings as well as back-up pain management orders in the event the pump should fail or inadequate pain relief should occur while the patient is in transit.

A16.8.3.1.1.1.10. In the event there are complications related to the epidural infusion or regional block, nursing personnel will terminate the infusion and treat patient as appropriate and per established clinical guidelines included in the Epidural and Peripheral Nerve Block Training Plan established by Headquarters Air Mobility Command, Office of the Command Surgeon, Aeromedical Evacuation Clinical Operations and Training Division. Interventions could include a range of activities from administering alternate pain adjuncts to airway/circulatory support. Changes in status and interventions will be documented on AF Form 3899 and communicated to the appropriate C2 agency.

A16.8.3.1.1.1.11. At each en route location, an anesthesia provider will be contacted if needed for consultation.

A16.8.3.1.1.1.12. Catheters will not be removed by AECMs or staging facility nursing personnel.

A16.8.3.1.1.1.13. Sterile dressings to insertion site will not be changed in the aircraft. They may be re-enforced if necessary.

A16.8.3.1.1.2. Patients who do not meet the above criteria must be assigned a medical attendant who is appropriately trained/credentialed to support such a patient. The PMR should also reflect type of infusion and attendant information.

A16.8.3.1.1.3. All individuals participating in the care of the patient should have up-to-date training and experience with PCA use, regional analgesia and the equipment. All equipment associated with the use of regional analgesia must be approved for flight. Non-drug interventions may also be used to assist in alleviating pain: maintain body alignment, elevate extremity, change position; readjust splints and bivalved casts; encourage physical activity, if operationally and clinically feasible. Consider heat/cold application if not contraindicated.

A16.8.3.1.2. At each patient care hand off and every 2 hours, assess pain status, level of sedation, dermatome level of analgesia, vital signs, motor function, and drug side

effects. Aeromedical evacuation technicians may assist in providing care to these patients in accordance with their CFETP.

A16.8.3.1.2.1. Assessing Motor/Sensory Dermatome Levels includes motor and sensory function checks. NOTE: A "Dermatome" is best defined as that area of the skin that is supplied by a single spinal nerve...or more specifically, the vertebral level at which the spinal nerve exits the spinal cord that innervates the skin in a contiguous sensory band or stripe (~ 1-2 inches wide). These bands arise posteriorly, from the spinal column laterally/anteriorly. Each stripe or band is referred to as a dermatome and each dermatome corresponds to a specific nerve root. Dermatome segments are standardized to a specific nerve root. Dermatome segments are standardized to enable clear/consistent communication about the level of anesthesia (sensory blockade).

A16.8.3.1.2.2. Assessing Motor Function:

A16.8.3.1.2.2.1. Ask patient to wiggle toes, dorsiflex foot

A16.8.3.1.2.2.2. Ask patient to bend knees/raise leg.

A16.8.3.1.2.2.3. Tense the rectus muscles by lifting the head.

A16.8.3.1.2.2.4. Refer to your motor block scale to determine the level of motor blockade.

A16.8.3.1.2.3. Assessing Sensory Function:

A16.8.3.1.2.3.1. Temperature - use a cold object; ice/alcohol swab.

A16.8.3.1.2.3.2. Touch – apply a sharp and dull object to the skin (paper clip).

A16.8.3.1.2.3.3. Begin the assessment along the sternum moving from side to side, progressing downward until the patient identifies a 'change' in 'touch' sensation and 'temperature' sensation (cold warmth or no sensation). Sensation levels may return faster on one side than the other, therefore clear documentation identifying the sensory levels (left and right) should be recorded.

NOTE: Positive findings indicate return of motor function. It does not, however, indicate resolution of the sensory/autonomic blockade therefore adequate pain control may still be present.

A16.8.3.2. Will have continuous pulse ox monitoring

A16.8.3.3. Obtain temperature every four hours

A16.8.3.4. Assess skin integrity and change position every two hours

A16.8.3.5. The Stryker Pain Pump is used to deliver epidural medication. **NOTE:** Narcotics will not be added to epidural infusions,

A16.8.3.5.1. All infusions must be stable at an analgesic level, and the patient should be able to regain partial motor control of the lower extremities.

A16.8.3.5.2. Follow above guidelines in [A16.8.2](#) Stryker Pain Pump Anesthesia Administration.

A16.8.4. Peripheral Nerve Blocks.

A16.8.4.1. There are several types of regional anesthesia currently used including axillary, femoral, and popliteal peripheral nerve blocks. With these blocks, the anesthesia provider injects or infuses the local anesthetic into the tissue surrounding the nerve. Needle placement is determined initially by using anatomic landmarks. Next, a peripheral nerve stimulator is used to facilitate precise location of the appropriate nerve. The anesthetic effect occurs primarily distal to the injection sites. For example, a popliteal block may be used for distal surgical procedures, such as the Achilles tendon repair. In contrast, intravenous (Bier) nerve blocks are administered distal to the surgical site and rely on diffusion rather than direct injection to achieve anesthetic effects.

A16.8.4.2. All local anesthetic agents used in peripheral nerve blocks induce physiologic responses via the same mechanism. Specifically, anesthetics interfere with the neuronal membrane's permeability to sodium. Disruption of sodium exchange results in inhibition of neuronal impulses between the affected extremity and the brain. Consequently, sensory, motor, and sympathetic neural pathways are affected, and the patient is unable to feel or move the anesthetized limb.

A16.8.4.3. Signs of systemic toxicity include tinnitus, sudden metallic taste, confusion that progresses rapidly to loss of consciousness, seizures, and abrupt onset of cardiac dysrhythmias. Neurologic symptoms are likely to appear before cardiovascular disturbances, unless epinephrine has been added to the block. Inadvertent systemic administration of anesthetic combinations containing epinephrine will cause transient tachycardia and hypertension.

A16.8.5. Treatment of Epidural / Peripheral Nerve Block Complication or Toxicity.

A16.8.5.1. The most broadly accepted theory of Lipid Rescue is that Intralipids create a new intravascular lipid compartment, or "lipid sink", which increases the volume distribution of lipophilic drugs. Distribution of drugs to this additional lipid compartment rapidly decreases the concentration of overdosed medicines at vital organs and quickly reverses the effects of toxic overdoses. Lipid rescue has been proven to work in anesthetic overdoses such as bupivacaine and lidocaine.

A16.8.5.2. If the patient should have a cardiovascular collapse from local anesthetic toxicity (Local Anesthetic Toxicity or LAST), the infusion pump will immediately be turned off and the following actions will be taken:

NOTE: Every effort must be made as soon as possible to notify the nearest sending facility if patient is in the staging facility or, if in flight, the responsible PMRC so an immediate mission diversion can be coordinated.

A16.8.5.2.1. Airway Management.

A16.8.5.2.2. Seizure suppression as required.

A16.8.5.2.3. Initiate ACLS protocols as required.

A16.8.5.3. If the patient is in cardiopulmonary arrest and established ACLS protocols are not succeeding in resuscitating the patient administration of Intralipids must be considered using the protocol below. Administration of 20 percent lipid emulsion (values in parenthesis are for a 70kg patient):

A16.8.5.3.1. Bolus 1.5 mL/kg intravenously over 1 minute (~100mL).

A16.8.5.3.2. Continuous infusion 0.25 mL/kg/min (~18 mL/min; adjust by roller clamp).

A16.8.5.3.3. May repeat bolus twice at minute intervals for persistent cardiovascular collapse.

A16.8.5.3.4. Double infusion rate to 0.5 mL/kg/min if blood pressure returns but remains low.

A16.8.5.3.5. Continue infusion for a minimum of 10 minutes after attaining circulatory stability.

A16.8.5.3.6. Recommended upper limit: approximately 10 mL/kg lipid emulsion over the first 30 minutes.

A16.8.5.3.7. Avoid vasopressin, calcium channel blockers, beta blockers or local anesthetic.

A16.8.5.3.8. Immediately alert anesthesia if patient is in the staging facility or PMRC if in flight.

A16.8.5.3.9. Avoid propofol in patients having signs of cardiovascular instability.

A16.8.6. Patient Care Responsibilities for Epidural / PNB Infusions.

A16.8.6.1. Ensure the patient is on continuous pulse oximetry. Assess and document the respiratory rate and oxygenation saturation, sedation, vital signs, pain scale, dermatome level and side effects (if present) every 2 hours. Document this on the AF IMT 3899M. AETs may perform these duties in accordance with their enlisted Career Field Education and Training Plan (CFETP). The AET will report these vital signs to the flight nurse. If the oxygen saturation falls below 93%, refer to chapter 4, table 4.1 for oxygen delivery options.

A16.8.6.2. Assess motor and sensory function every 2 hours and record on the AF IMT 3899M. Some motor weakness in patients undergoing epidural analgesia or peripheral nerve block therapy to a lower extremity is expected and the patient should be considered a risk for falls and require assistance when ambulating. Identify the patient as a fall risk via the "Epidural Patient" or "PNB Patient" wrist band.

A16.8.6.3. Assess the dressing for leakage every four hours and record on the AF IMT 3899M.

A16.8.6.4. Monitor for adverse side effects. If adverse side effects occur the course of action to take for all problems related to these infusions during flight will be to terminate the infusion (turn off the approved AE infusion pump) and resort to other established pain management techniques.

A16.8.6.5. Catheters will NOT be removed until re-evaluated by an anesthesia provider at the next scheduled en-route stop. Only the anesthesia provider will remove the catheter if required. Staging facility personnel and AECMs WILL NEVER remove the catheter. Administration of PRN medications per physician's orders will be the method of pain management if the approved AE infusion pump must be turned off due to adverse side effects.

A16.8.6.6. Caution should be taken with any patient receiving epidural or peripheral nerve block analgesia via an indwelling catheter who is also receiving anticoagulation therapy, to include coumadin, heparin infusions, or Low Molecular Weight Heparin or Lovenox.

A16.8.6.7. Maintain IV access of #20 gauge or larger.

A16.8.6.8. Change epidural/peripheral nerve block medication bag before infusion runs out.

A16.8.6.9. Ensure the approved AE infusion pump and IV tubing is labeled "EPIDURAL ANALGESIA OR PERIPHERAL NERVE BLOCK" and the catheter is taped with label indicating "FOR EPIDURAL ANALGESIA or PERIPHERAL NERVE BLOCK USE ONLY.". The MCD will ensure the patient's placement on the aircraft is clearly marked on the load plan and specifically identify the patient's location to the AE crew during pre-mission crew brief.

A16.8.6.10. If in flight, notify the clearing flight surgeon or theater validating flight surgeon (via phone patch) for:

A16.8.6.10.1. Shortness of breath.

A16.8.6.10.2. Difficulty swallowing.

A16.8.6.10.3. Dizziness or light-headedness.

A16.8.6.10.4. Metallic taste in the mouth.

A16.8.6.10.5. Ringing in the ears.

A16.8.6.10.6. Catheter dislodgement.

A16.8.6.10.7. Patient expressions of impending doom.

A16.8.6.10.8. Pain out of proportion to the clinical injury or out of character for the patient's history.

A16.8.6.10.9. Seizure activity.

A16.8.6.10.10. Increasing sedation or presence of confusion.

A16.8.6.10.11. Respiratory rate of 10/minute or less, or 50% below baseline.

A16.8.6.10.12. Inadequate analgesia.

A16.8.6.10.13. Pruritus or nausea/vomiting unrelieved after initial treatment.

A16.8.6.10.14. Oxygen saturation less than 93% on room air.

A16.8.6.10.15. Hypotension: postural BP drop > 15mmHg from baseline.

A16.8.6.10.16. High sensory level: Numbness at or above nipples.

A16.8.6.10.17. Motor blockade: inability to bend knees while lying bed.

A16.8.6.10.18. Leakage on the catheter dressing.

A16.8.6.10.19. Catheter disconnection.

A16.8.6.10.20. Temperature >101 F and/or presence of shaking chills.

A16.8.6.11. Document the rate (ml/hr) and dose (ml) with vital signs on the AF IMT 3899 M q 2 hr.

A16.8.6.12. Epidural analgesia therapy and peripheral nerve block therapy to a lower extremity can cause motor weakness and is normal, therefore the patient will require assistance with all activity. The staging facility nurses and flight nurses will be responsible for assessing the patient's motor strength. If a patient cannot move their legs due to excessive motor block from the infusion, notify the Theater Validating Flight Surgeon immediately.

A16.8.6.13. Motor Activity Assessment Scale (MAAS) score should be documented in the chart and the effects of treatment should also be documented.

A16.8.6.14. If medication is inadequate, providers will follow the Air Mobility Command Office Of The Command Surgeon Clinical Practice Guideline For Patient Controlled Analgesia (PCA) and Epidural Medications, as well as complete and forward a DD Form 2852. If pain medication is not available or is insufficient, request and establish immediate radio communication with the TACC/AMOCC/AOC/PMRC for a physician order. The MCD/nurse will complete DD Form 2852 and document the occurrence on AF Form 3829 if flight related.

Table A16.3. Motor Activity Assessment Scale (MAAS) Sedation Scoring System.

0 Unresponsive	Does not move with noxious stimuli (i.e. suctioning or five seconds of vigorous sternal or nail bed pressure)
1 Responsive only to noxious stimuli	Opens eyes, raises eyebrows, turns head towards stimulus or moves limbs with noxious stimuli
2 Responsive to touch or name	Opens eyes, raises eyebrows, turns head towards stimulus or moves limbs when name is spoken loudly
3 Calm and Cooperative	No external stimulus required to elicit response, movements purposeful, follows commands
4 Restless and Cooperative	No external stimulus required to elicit response

	AND patient is picking at sheets or tubes OR uncovering self and follows commands
5 Agitated	No external stimulus required to elicit response AND attempting to sit up OR moves limbs out of bed AND does not consistently follow commands
6 Dangerously agitated, uncooperative	No external stimulus required to elicit response AND patient is pulling at tubes or catheters OR thrashing side to side OR striking at others OR trying to climb out of bed AND does not calm down when asked

A16.9. High Alert Medications.

A16.9.1. Conduct and document independent double-checks with all high alert IV medications, all PCA's, epidurals, and peripheral nerve blocks to help prevent programming errors. Documentation of double-checks will be reflected by two signatures on required forms/flow sheets or on the AF Form 3899A. This is applicable to ASFs/CASFs, CCATTs and AECMs.

A16.9.2. An independent double-check is defined as two medical persons familiar with the process/equipment/medication (at least one being a registered nurse), independently verifying the practitioner's/provider's orders, medication hanging, and the correct set up of PCA or IV pump in use (rate, dose, volume to infuse, medication concentration, basal rate, bolus lockout, etc.).

A16.9.3. Double-checks are conducted and documented when initiating high alert medications, during handoffs of care, following a change in orders, and when a new bag is started.

Attachment 17

DO NOT USE ABBREVIATIONS LIST

A17.1. The medical abbreviations found in [Table A17.1](#) “Joint Commission Do Not Use List,” were determined a risk to patient safety by the Joint Commission, and are adopted for the DoD Patient Movement and Air Force En Route Care System (ground and in-flight).

A17.2. Assure all clinical documentation eliminates these abbreviations.

Table A17.1. Joint Commission Do Not Use List. .

Official “Do Not Use” List ¹		
Do Not Use	Potential Problem	Use Instead
U (unit)	Mistaken for “0” (zero), the number “4” (four) or “cc”	Write “unit”
IU (International Unit)	Mistaken for IV (intravenous) or the number 10 (ten)	Write “International Unit”
Q.D., QD, q.d., qd (daily)	Mistaken for each other	Write “daily”
Q.O.D., QOD, q.o.d, qod (every other day)	Period after the Q mistaken for “I” and the “O” mistaken for “I”	Write “every other day”
Trailing zero (X.0 mg)*	Decimal point is missed	Write X mg
Lack of leading zero (.X mg)		Write 0.X mg
MS	Can mean morphine sulfate or magnesium sulfate	Write “morphine sulfate” Write “magnesium sulfate”
MSO ₄ and MgSO ₄	Confused for one another	

¹ Applies to all orders and all medication-related documentation that is handwritten (including free-text computer entry) or on pre-printed forms.

*Exception: A “trailing zero” may be used only where required to demonstrate the level of precision of the value being reported, such as for laboratory results, imaging studies that report size of lesions, or catheter/tube sizes. It may not be used in medication orders or other medication-related documentation.

Attachment 18

ENTERAL TUBE FEEDINGS

A18.1. General Principles.

A18.1.1. Enteral feeding is the delivery of commercially prepared nutritional liquid via a tube for adults, infants and children who have a functioning gastrointestinal tract, but are unable to orally ingest adequate nutrients to meet their metabolic needs.

A18.1.1.1. May play a role in both short-term rehabilitation and long-term nutritional management, and therapy ranges from supportive or a portion of the needed nutrients to primary therapy.

A18.1.1.2. Conditions requiring enteral feeding include but are not limited to: oral/maxillofacial injuries; multiple trauma; hypermetabolism (burns, cancer); sepsis; neck/esophageal/tracheal trauma; TBI/CVA; gastrointestinal disorders (tracheoesophageal fistula, disorders of: absorption, digestion, utilization, secretion and storage of nutrients); neuromuscular disorders (muscular dystrophy, spinal cord defects, and cerebral palsy or damage to the central nervous system); cardiopulmonary disorders; failure to thrive and prematurity.

Table A18.1. Gastrointestinal (GI) Tubes.

Type	Purpose	Management
Nasogastric/Orogastric (NG/OG) Salem Sump Recommended for Flight	Diagnostic; gastric decompression/evacuation; fluid/nutrient replacement; medication administration	<ul style="list-style-type: none"> - NG tube is contraindicated in basal skull and nasal fractures - X-Ray to confirm placement - Change tape and position of tube every 24 hrs
Jejunal	Fluid/nutrient replacement; medication administration	<ul style="list-style-type: none"> - KUB X-Ray placement confirmation: beyond ligament of Treitz either day before or day of transport. - May require simultaneous NG/OG decompression of stomach to prevent aspiration - May have physician order to position/secure litter head forward (towards cockpit) with backrest (if not contraindicated) - Aspiration for residual gastric content may not be possible

Gastrostomy/Jejunostomy	Fluid/nutrient replacement; medication administration; decompression/ evacuation	- X-Ray to confirm placement - Assess insertion site, evaluate for leaking or infection (redness, induration (hardness), warmth, purulence, pain). - Change dressing every 24 hrs at en route locations or when soiled
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A18.2. En Route/Preflight/In-flight Considerations for All Feeding Tubes.

A18.2.1. Feedings may be intermittent or continuous low-flow delivered via an AE approved feeding pump and tubing, or bolus/gravity feedings IAW the physician's order or in the absence of an AE approved pump. Follow feeding schedule (as ordered).

A18.2.1.1. Feeding administration set will be changed every 24 hours and labeled with the following: Date/Zulu Time, feeding solution and concentrate, rate; any other pertinent orders, and name and title of provider.

A18.2.2. Treatment/Management.

A18.2.2.1. Assess all GI tubes for placement and gastric residual at every patient care hand-off, every four hours, including during continuous feeding, and before injecting any fluids or medications:

A18.2.2.1.1. Ascultate lung sounds

A18.2.2.1.2. Abdomen: note distention, presence of bowels sounds, rigid/soft, tenderness, flatus, bowel movement, and feeding tolerance including nausea, vomiting, diarrhea.

A18.2.2.1.3. Tube placement:

A18.2.2.1.3.1. Inject 30 mL of air into the tube via irrigation tip syringe while listening for air flow over the epigastric area with a stethoscope to confirm placement (not advised in aircraft noise environment.)

A18.2.2.1.3.2. Aspirate stomach contents for amount of gastric residual – Note amount and characteristics, and document. **NOTE:** Do not discard, instill into tube and allow to gravity drain

A18.2.2.1.4. Administer all tube feedings if gastric residual is less than 50% the hourly rate or IAW physician's order.

A18.2.2.1.5. Hold all tube feedings if gastric residual is greater than 200 mL or greater than 50% the hourly rate or IAW physician's order. Recheck in one hour and resume if within normal range. **NOTE:** If residual remains above limits after the second assessment, hold tube feeding and contact TACC/AMOC/AOC/PMRC for physician guidance.

A18.2.2.1.6. After replacement of gastric contents, medications and bolus feeding add 30-60 mL distilled H₂O and allow gravity to clear the tube. Avoid infusing air.

A18.2.2.1.7. Clamp the tube for 30-45 minutes to ensure medication absorption before reconnected to suction, if ordered. **NOTE:** Do not clamp tube in-flight; secure glove/other gravity drainage device if feeding is held, or apply suction if indicated (i.e. nausea; vomiting; abdominal distention; excessive residual posing risk of aspiration).

A18.2.2.1.8. Maintain head of bed/litter elevated at least 30° with backrest to prevent aspiration. **NOTE:** If condition prevents use of backrest, additional care should be taken to prevent aspiration, including holding feedings 30-60 minutes prior to takeoff and landing. For flight, consider placing patient head forward (towards cockpit) in litter position to reduce 4°-8° negative grade, and administer bolus feedings preferably at cruise altitude to decrease risk of aspiration.

A18.2.2.2. Oral care will be accomplished every two hours with normal saline or clean distilled water, and cleaning/brushing teeth and tongue.

A18.2.2.3. Documentation includes at a minimum tube location (i.e. oral/nasal/J-G, landmarks, bowel sounds, lung sounds); intake/output; feeding type; GI assessment, position, oral care, etc.

A18.2.2.3.1. Vital signs and temperature every four hours on AF IMT 3899A or AF IMT 3899D.

A18.2.2.3.2. Document I&O every four hours on AF IMT 3899E.

A18.2.2.4. Additional feeding tube care/supplies and formula is required for the destination facility IAW [7.1.5.6](#).

A18.2.2.5. If NPO and/or documented intolerance to tube feedings for more than 48 hours, should be evaluated for Total Parenteral Nutrition (TPN) prior to flight

A18.2.2.6. If administration set becomes occluded during transport it should be changed and primed, then set at the previous administration rate. **NOTE:** If feeding tube becomes occluded irrigation is unsuccessful, hold feedings and notify TACC/AMOC/AOC/PMRC for physician guidance.

References:

Lippincott, Williams and Wilkins, **Lippincott Manual of Nursing Practice 8th Ed**, Wolters Kluwer Co 2006

Wiegand, Carlson, **AACN Procedure Manual for Critical Care 5th Ed**, Elsevier Saunders Co 2005

P. A. Higgins, B. J. Daly, A. R. Lipson, and S.-E. Guo, **Assessing Nutritional Status in Chronically Critically Ill Adult Patients**, Am. J. Crit. Care., March 1, 2006; 15(2): 166 – 176.

Attachment 19

PULMONARY AND FAT EMBOLISM MANAGEMENT

The AE environment promotes risk of embolisms to include; immobility, sitting for long periods and/or in cramped conditions (aircraft, tactical vehicles), significant dehydration potential.

A19.1. Pulmonary Embolism (PE).

A19.1.1. A clot that forms in a part of the body and travels through the venous system to another part of the body is known as an embolus. A PE is a sudden blockage (small, large or complete) in the pulmonary vasculature from an embolus, usually from the deep veins of the legs and pelvis. An embolus formed in the veins is known as a Deep Vein Thrombosis (DVT) and is the primary cause of PE.

A19.1.2. Conditions at risk for DVT:

A19.1.2.1. Poly-trauma, surgery; pelvic and lower extremity trauma/fractures; casts, bed rest, (immobile or limited mobility), thrombophlebitis/varicose veins, cardiac disease, obesity, malignancy; females who use birth control pills and smoke, pregnancy; geriatrics and any known coagulopathy.

A19.1.3. Symptoms may include, hemoptysis, dyspnea, diaphoresis, chest pain and cough.

A19.2. Fat Embolism.

A19.2.1. Fat embolism can occur whenever fat globules enter the circulatory system from long bone (femur/humerus) and/or pelvic fractures or during orthopedic surgery. Once in the bloodstream, the fat globule travels and lodges in the pulmonary vasculature causing an obstruction, and then metabolizes to free fatty acids with a resulting diffuse vasculitis and inflammation of the lung that leads to pulmonary failure.

A19.2.2. Symptom onset: 8 hrs – 14 days

A19.2.2.1. Cardinal Signs: petechial rash on trunk/chest/axillia.

A19.3. Prevention.

A19.3.1. Immobilize pelvis/extremity fractures to prevent bone movement.

A19.3.2. Assure adequate PO/IV hydration.

A19.3.3. Encourage ambulation and position changes for all litter and ambulatory patients, if not contraindicated

A19.3.3.1. Litter patients should be assessed for potential ambulation and mobility requirements at each en route stop and in-flight, and should receive maximum mobility assistance on a case by case basis.

A19.3.3.2. Immobile patients should receive active/passive ROM every two hours as condition permits. **NOTE:** Flexion/Extension of the feet to prevent pooling in the lower extremities is highly recommended—PREVENTION ONLY, do not use if DVT diagnosis is known/documented.

A19.3.4. Low molecular weight heparin (LMWH) is a drug of choice for prevention/treatment of DVT. **NOTE:** Contraindications for LMWH use are: closed head injury; incomplete spinal cord injury; complex pelvic fractures; multiple long bone fractures; and obvious bleeding/hemorrhage.

A19.3.5. Patients with known DVT or PE will have intravenous catheter (IVC) filter, aka, “umbrella” placement prior to flight when operational feasible.

A19.4. Signs & Symptoms Common to Both Pulmonary and Fat Embolism: NOTE: Pulmonary and Fat emboli are serious conditions and may cause death.

A19.4.1. Sudden onset and unexplained:

A19.4.1.1. Anxiety.

A19.4.1.2. Change in LOC (Irritability, restlessness, confusion, and disorientation).

A19.4.1.3. Sudden onset of dyspnea.

A19.4.1.4. Tachycardia.

A19.4.1.5. Angina-like chest pain.

A19.4.1.6. Decreased oxygen saturation and signs of hypoxia.

A19.4.1.7. Adventitious breath sounds: pleural friction rub, crackles, and wheezes

A19.4.1.8. May have fever 101° to 104° without any other causes.

A19.5. Treatment/Management of Acute Pulmonary and Fat Embolism Symptoms

A19.5.1. Maintain airway and assist breathing.

A19.5.2. Administer high flow O₂ via non-rebreather face mask to maintain pulse oximetry 91% or greater. **NOTE:** Intubation and mechanical ventilation may be required.

A19.5.2.1. Consider decrease in cabin altitude (≤ 4000) in-flight— if operationally feasible.

A19.5.3. Start IV with RL and administer 500 ml bolus and follow with an hourly rate of 150 ml/hour unless contraindicated.

A19.5.4. Place on cardiac monitor.

A19.5.5. Place on pulse oximeter.

A19.5.6. Monitor vital signs every 15 minutes at a minimum, if operationally feasible

A19.5.7. Hourly I&O

A19.5.8. Contact TACC/AMOC/AOC/PMRC for guidance and possible diversion to an MTF capable of handling patient condition if in-flight.

References:

Lippincott, Williams and Wilkins

Lippincott Manual of Nursing Practice 8th Ed

Wolters Kluwer Co 2006

Wiegand, Carlson

AACN Procedure Manual for Critical Care 5th Ed

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2007 Canadian Lung Association online: **http://www.lung.ca/diseases-maladies/a-z/embo-lus-embolie/index_e.php**.

Attachment 20

MANAGEMENT OF ADULT SEVERE HEAD INJURY

Figure A20.1. Management of Adult Severe Head Injury.

MONITORING & LAB EVALUATION			
INTRACRANIAL PRESSURE (ICP)	• GCS 3-8 with abnormal CT scan (hematoma, contusion, edema, or compressed basal cistern) <i>OR</i> 2 or more of the following features present with severe head injury & normal head CT scan: Age > 40 yrs, unilateral or bilateral motor posturing, SBP < 90 mmHg • Ventriculostomy is preferred.		
ARTERIAL LINE	• Any head trauma that requires tracheal intubation and/or for other medical indications		
CENTRAL VENOUS PRESSURE	• When ICP or cerebral perfusion pressure (CPP) management requires anything beyond simple measures and/or for other medical indications. <i>Trendelenberg position can raise ICP, sometimes severely. Consider femoral line placement during initial phases.</i>		
PULMONARY ARTERY CATHETER	• When vasoactive drugs are used for CPP management for extended periods and/or for other medical indications		
LABS	• ABG, CBC, Chem 10, PT, PTT, INR, Sasm <i>at least</i> q 8 hrs during initial 48 hrs		
GENERAL MANAGEMENT PRINCIPLES			
RESUSCITATION FLUID	• Normal saline (Beware of iatrogenic, hyperchloremic acidosis) • Blood products		
MAINTENANCE FLUID	• Maintain a "hyperosmolar-but-euvolemic" state • Normal Saline		
SEDATION	• Propofol 1 st choice up to 72 hrs. Typical sedation dose range: 25-75 mcg/kg/min • Other short-acting agents such as Fentanyl and Versed • Avoid agitation/↑ ICP during nasal or oral tube placement		
ULCER PROPHYLAXIS	• All patients. Zantac preferred. Carafate or proton pump inhibitor as alternatives.		
SEIZURE PROPHYLAXIS	• For patients at risk for post-traumatic seizures. Usually for 7 days • Dilantin. Load dose: 18 mg/kg (< 50 mg/min); Adult maintenance: 200 – 500 mg/day Tx level: 10-20 mcg/ml; $[Phy]_{corrected} = [Phy]_{measured} / (0.2 \times [albumin]) + 0.1$		
ANTIBIOTICS	• Ancef 1 gm IV tid while ventriculostomy/ other ICP catheter in place only		
ASSESSMENT	Assess hourly and prn: • Neurological exam, MAP, ICP, CPP (Documented hourly & prn, continually assessed) • Integrity, stability, and sterility of intracranial catheter site/system • Ventriculostomy level and stop-cock position • CSF drained		
STEROIDS	• Steroids are <i>not</i> recommended for head trauma		
NUTRITION	• Continue unless patient safety compromised		
GENERAL MEDICAL MANAGEMENT GOALS			
NEUROLOGIC	ICP	< 20 mmHg	See page 2 – ICP Management
	CPP	≥ 70 mmHg	
HEMODYNAMIC	Mean BP	Maintain CPP Avoid SBP < 90 mmHg	• SBP < 90mmHg increases mortality • Provide rapid physiologic resuscitation
	CVP	> 5 mmHg	
PULMONARY	SaO ₂ %	> 92%	• Aggressive avoidance of hypoxemia • Avoid <i>routine</i> hyperventilation
	PaCO ₂	≈ 35 mmHg	
HEMATOLOGIC	INR	≤ 1.3	• Fresh frozen plasma • Platelets • Packed red blood cells
	Platelets	≥ 100,000/mm ³	
	Hemoglobin	≥ 10 g/dL	
METABOLIC	Glucose	> 100 < 150 mg/dl	• Have low threshold for insulin drip
RENAL	Serum Osmolarity	> 280 & < 320 mOsm	Sasm = (2 x (Na + K)) + (BUN / 2.8) + (glucose / 18) See page 2 – Sodium Disorders
	Serum Sodium	> 138 & < 150 meq/L	
TEMPERATURE	• Aggressive temperature management. Consider cooling measures (Tylenol and body exposure) even for <i>modest</i> temperature elevations (100-101°F).		
GENERAL MEASURES	• Head in midline position • Must raise the HOB to ≈ 30° (litter back rest) – avoid trendelenberg. If ICP is refractory, may attempt HOB to ≈ 45°. • Avoid tight cervical collars and tight circumferential ETT ties – allows cerebral venous flow • Patients with concomitant C-spine injury may be transported with HOB 30° • Patients with concomitant thoracic or lumbar fractures should be transported flat 0° • Maintain occlusive dressing. Do not remove the dressing. Reinforce prn. Excessive catheter site wound drainage may indicate bleed, infection, or CSF leakage. • Avoid dislodging of the catheter – may cause excessive CSF drainage (ventricular collapse).		

INTRACRANIAL PRESSURE MANAGEMENT				
INTRACRANIAL HYPERTENSION Normal ICP < 10-15 mmHg		<ul style="list-style-type: none">Treat ICP Elevations ≥ 18 mmHg sustained for ≥ 5 minTreatment follows stepwise approachAlways consider an expanding mass lesion with ICP elevations refractory to therapy		
TITRATE TO EFFECT Goal of ICP < 15-18 mmHg	1. Ensure adequate sedation and analgesia	Avoid unnecessary noxious stimulation		
	2. Initiate CSF drainage via ventriculostomy	Open drain for 5-10 min to goal ICP of ≤ 10 mmHg. Consider initiating CSF drainage for ICP ≥ 15 mmHg.		
	3. Initiate diuretic therapy	Mannitol: 0.25 – 1.0 gm/kg over < 20 min then ≈ 0.25 gm/kg q 6 h. Hold Mannitol if Na ⁺ is > 149 and/or the S _{osm} is > 319		
	4. Initiate paralysis	Vecuronium: Initial IV Bolus 0.08 - 0.1 mg/kg OR 0.04 - 0.06 mg/kg after succinylcholine administration. Continuous infusion 0.8 – 2.0 mcg/kg/min		
	5. Initiate mild hyperventilation	P _a CO ₂ \approx 30-35 mmHg		
CEREBRAL PERFUSION PRESSURE MANAGEMENT (CPP = MAP – ICP)				
CPP GOAL ≈ 70 mm Hg	1. Ensure euvolemia	Utilize endpoints of resuscitation (exam, vitals, Art. Line, CVP, PAC)		
	2. Control the ICP	Beware of Mannitol use in hypovolemic patients		
	3. Consider vasoactive infusions	Phenylephrine - (20 mg/250 cc D ₂ W, NS) approx dose range 0.15 - 0.75 mcg/kg/min Norepinephrine (4 mg/250 cc D ₂ W) approx dose range 0.05 - 0.5 mcg/kg/min Vasopressin - as adjunct to Levophed (120 units/250 cc D ₂ W, NS) 0.01 - 0.04 units/min Dopamine - Avoid Dopamine, may ↑ ICP		
ACUTE CLINICAL DETERIORATION (e.g.: Acute mental status or pupillary changes, other signs of cerebral herniation, new focal neurological symptoms, severe progressive and refractory ICP elevation)				
	1. Verify oxygenation and ventilation	UNCAL HERNIATION SYNDROME <ul style="list-style-type: none">Unilaterally dilating pupil → progression to fixed and dilatedProgressive impairment of consciousness → comatoseContralateral Babinski → contralateral weakness → bilateral decerebrate rigidity		
	2. Hyperventilate (P _a CO ₂ 25-30 mmHg)			
	3. Re-dose Mannitol			
	4. Arrange Neurosurgeon on arrival			
	5. Arrange emergent CT scan on arrival			
GLASGOW COMA SCORE		Eye Opening	Best Verbal Effort	Best Motor Effort
	1	None	None	Flaccid
	2	To Pain	Nonspecific sounds	Decerebrates to pain (abnormal extension)
	3	To verbal stimuli	Inappropriate words	Decorticates to pain (abnormal flexion)
	4	Spontaneous	Confused	Withdraws to pain
	5	-	Oriented	Localizes to pain
	6	-	-	Follows commands
COMMON SODIUM DISORDERS SEEN IN HEAD TRAUMA				
Disorder	Na ⁺	Diagnostic clues		Treatment
SIADH	↓	↓ S _{osm} , usually euvolemic, ↑ U _{osm}		Free water restriction, hypertonic saline if severe.
Cerebral salt wasting		S _{osm} may be nl, ↑ uop, signs of volume depletion & hemoconcentration, very high U _{Na}		Volume replacement with NS or hypertonic saline. Oral sodium. Beware of rapid Na ⁺ correction.
Mannitol use	↑	↑ uop, ↑ Na ⁺ & S _{osm}		Hold Mannitol if S _{osm} > 319 mosm / Na ⁺ > 149
Diabetes Insipidus	↑	↑ uop (>250 cc/hr), ↑ Na ⁺ & S _{osm} , U _{Na} < 1.005		DDAVP (Vasopressin) \approx 2-4 units SQ/TV bid
AEROMEDICAL EVACUATION CONSIDERATIONS				
	Measure		Rationale	
PATIENT POSITION	• Physician determines, warranted by pt. condition		• To ↓ G force/trendelenberg effects on ICP	
VENTRICULOSTOMY	<ul style="list-style-type: none">Ventriculostomy stopcock should be in the OFF position during patient movement, take-off, and landing. Do not leave in OFF position > 15 min.Ventriculostomy drainage unit should be transported in the upright position at all times.Secure ventriculostomy to the stanchion both above and below the drainage unit at the appropriate reference height.If clogged, ventriculostomy may be flushed with sterile, preservative-free, physiologic saline. Flush away from the patient <u>only</u>. Do not flush into the patient.Drainage device and tubing should remain intact. Avoid breaching the system.		<ul style="list-style-type: none">To prevent excessive CSF drainage and possible ventricular collapse.Prevents wetting of the filters rendering the system inoperable & avoids allowing air bubbles in the system, which alters accuracy of readings.May ↑ ICP with fluid injection. Increased risk for infection.Prevents contamination of the system and infection. Only strict aseptic technique.	
ICP MONITORING	• Ensure adequate MAP during take-off and landing. Perform neuro assessment prior to initiating treatment for elevated ICP.		• Anecdotal info suggests ICP readings <u>MAY</u> be inaccurate during take off and landing.	
CATHETER D/C	<ul style="list-style-type: none">Strict aseptic technique. Clean site with Betadine and sterile gauze. Cover with sterile non-occlusive dressing.In the event of ventriculostomy removal with CSF drainage, a skin suture may be necessary.Note: In case of catheter dislodgement, the catheter should <u>not</u> be re-inserted.		<ul style="list-style-type: none">To prevent infection.To prevent pneumocephalus.To prevent infection.Requires Neurosurgical intervention.	

Figure A20.2. “Zeroing” of Ventriculostomy Drainage System.

