

# **655<sup>th</sup> Forward Surgical Team Combat Trauma Volume of Experience**

## ***Protocols, Practices, and Lessons Learned***



**Last updated August 2010**

## **Contributors**

Captain Toni Davidson, RN, US Air Force

Major Sean Glasgow, MD, US Air Force

Lieutenant Colonel Matthew Martin, MD, US Army

Major Kari Miller, RN, US Air Force

Major Richard J. Robins, MD, US Air Force

Captain Chad Stuckey, CRNA, US Air Force

# **655<sup>th</sup> FST Volume of Experience**

## **Introduction**

Welcome to your assignment with a deployed Forward Surgical Team (FST). You and your colleagues have the unique challenge of quickly learning to work together and to provide medical care in a unique and extremely challenging environment. Some of you may have little to no trauma experience and/or deployment experience. Don't worry – you will learn quickly.

The most important factor in determining success is learning to work within the significant limitations and restraints of an FST. The primary mission is emergent surgical procedures to preserve life and limb, and stabilize the patient for transfer to more definitive care. Note that this does not mean rushed or incomplete surgery. The type and amount of care you provide will also vary significantly by the type of patient (U.S. vs coalition vs local national) and by the local requirements of your mission. Unlike a role 3 facility (combat support hospital), you do not have the capability for prolonged care and patient holding. One patient who requires prolonged care can quickly exhaust your team and make you mission incapable. Always factor this in to your medical and surgical decision making.

This guidebook is not intended to replace your training or tell you how to provide care. The primary purpose is to collect and to pass on some of the lessons learned by those who have come before you (often learned the hard way). Most everything you will encounter during your deployment has been seen and done by the team you are replacing. Use these lessons as a guide to shorten your combat trauma learning curve and to hopefully avoid some of the mistakes that have been made before you.

The basic principles you learned in residency, ATLS, and previous experience will serve you well, but are just that – basic principles. This is advanced trauma management, most of which doesn't follow any textbook or CPG. The usual things still apply here: Open wounds are harder to get infected than closed wounds; tachycardia and hypotension in trauma is bleeding to death until proven otherwise; sleeping when you can is a good thing; etc. This is not intended to replace your significant training or experience, but to augment it and help adjust it to the realities of combat trauma. Don't be the surgeon who comes to theater and decides he/she knows better, can primarily close all wounds, etc.

At the end of your rotation cycle, please update this document as you see fit and pass it on to the next group. Remember that the period when the facility is turned over to a new group of providers is the time of highest risk for the patients. Do everything you can to pass on your experience and knowledge to the next group to ensure a seamless transition and maintenance of the high standard of care that is expected of U.S. medical forces.

## **Top Ten Combat Trauma Lessons**

1. Patients die in ATLS, and
2. Patients die while getting extensive xrays of every bone;
3. Therefore, a hypotensive trauma patient belongs in the operating room ASAP
4. Most blown up or shot patients need blood products, not crystalloid. Avoid trying “hypotensive resuscitation” – it’s for civilian trauma.
5. For mangled extremities and amputations start blood products as soon as they arrive. A good rule of thumb is 4units PRBC/FFP per mangled or amputated extremity.
6. Patients in extremis will code during rapid sequence intubation, be prepared, and intubate these patients in the OR (not EMT) whenever possible.
7. This facility can go from empty to full in a matter of hours, don’t be lulled by the slow periods.
8. The name of the game here is not continuity of care, it is throughput. If the recovery beds are full, you are mission incapable.
9. MASCALs live or die by proper triage and prioritization – starting at the door and including which xrays to get, labs, and disposition.
10. Avoid personal projects, elective surgeries (often tempting), attempts at extensive humanitarian care, etc.

"Good surgery must be done as far forward as possible. If it is too good, in the sense of too elaborately equipped, it will not be far enough forward, and if it is too far forward it will not be good enough."

*William H. Ogilvie, 1887-1971*

## **Table of Contents:**

- I. Mass Casualty Management
- II. Help and First Assistants
- III. ATLS Plus
- IV. Blood Product Usage and Safety
- V. Operative Treatment of the Mangled Extremity
- VI. – Bowel Injuries and the Great Ostomy Debate
- VII. Damage Control Surgery
- VIII. Stage Five Clingers (Hanging on to Pet Projects)
- IX. Burns
- X. Pediatrics
- XI. Thoracic Trauma
- XII. MROE and evac to Level III or other local facilities
- XIII. Elective Operations
- XIV. MEDEVAC
- XV. Intensive Care Unit
- XVI. Forward Anesthesia Care
- XVII. Discharge and Recovery
- XVIII. 655<sup>th</sup> FST Orthopaedic Care
- XIX. Unit Meetings, Events, and Lectures
- XX. U.S. – Polish Collaboration at FOB Ghazni
- XX. Deployment and Life at Ghazni

**Attachments:**

- A. MASCAL plan
- B. Gardez military hospital capabilities
- C. Field improvised medicine and surgery pointers

## **I. Mass Casualty Management**

Leadership: No matter what system you run or what your support staffing may be, two things have made our mass casualty events run as smooth as could be expected: Leadership and people doing what they're told.

### Mass Casualty Plan

With the employment of a mostly Air Force personnel- staffed, Army- designed Forward Surgical Team, a mass casualty plan was created to utilize appropriate personnel in appropriate places. At FOB Ghazni, a mass casualty is officially defined and reported as 4 simultaneous patients, but in reality this is a "Multiple Casualty," experience most of the time, and the mass casualty plan was not activated in these cases. 5 or more patients elicited activation the Mass Casualty Plan to mobilize necessary personnel and resources.

Priorities change during a mass casualty situation. The goals during mass casualty are:

1. Patient Movement (From Triage to Treatment to Holding to Evacuation)
  2. TRIAGE (Assessment and Plan)
  3. Stabilize Patients (Do Most Good for Most amount of people)
  4. Patient Disposition (Early Transfer to next level of care)
- 
1. Patient Movement: The FST currently has 1 FLA that can transport 2 patients, 1 Gator that can transport 3 patients, and 2 gators that can transport 2 patients each, for total transport capability from the ECP or Flight line of 9 patients. The Polish ambulance can transport 2 patients. During a mass casualty situation or when patients are created from the FOB coming under attack, FST personnel should report immediately to the FST and allow for the surrounding units to bring the patients to the FST. There are not enough FST personnel to serve as ambulance crews and cover patient care in the FST—the PAR teams and assigned units are responsible for patient transfer to the FST and these policies are written into the Base Defense Plan. Transfer from the flight line and ECP are FST/Polish medical team responsibility, but other units can be employed to aid in transport as needed. We typically assigned the OR room/surgical technicians first to the role of patient transport, because the OR is not used during the initial stages of a mass casualty situation.
  2. TRIAGE: This is the most important part of the mass casualty process, and the easiest one to try to skip. The temptation is to give patients coming off the ambulances a "once over," and move them directly into the treatment area. The problems with this are two-fold. First, without having a grasp on the injury patterns and condition of ALL of the patients prior to deciding who is "most critical," a patient that looks bad may be sent into the treatment room prior to the arrival of an even more critically injured patient who needs immediate attention, but the treatment beds have already been filled. The treatment room is able to handle 5 patients and will forego the need to use the Triage area with less than 5 patients. 6 or more arrivals (whether ambulatory or litter), the

recommendation is to hold the patients in the front room/canopy area, perform initial assessment, and then assign patients into beds in the treatment room. Second, by skipping the triage area, patients are not appropriately labeled, and charting becomes quickly confusing. This is a big issue when trying to track labs and radiographs. A triage treatment box was prepared which included supplies that could be used while patients were held in the treatment area (dressing supplies, IV lines and fluids, basic splinting material etc.). The triage officer was assigned to the most senior experienced trauma surgeon, and this individual met the patients in the front area and assigned patients priority of treatment. The Triage Area was also assigned primary responsibility to one of the critical care nurses to manage the patients that are held in the triage area awaiting movement to treatment. Additional staffing came from ADT, PRT, RCP, and non-medical units' medical personnel. Some patients may only spend 30 seconds in the triage area, but it cannot be stressed the importance of prioritizing patients before jumping into treatment. Patients can change status while in the triage area and become "more critical." It is important to have a competent and experienced supervisor of the triage area so they can alert the triage officer to any change in patient's status that are awaiting treatment.

3. **Stabilize Patients:** The purpose of the treatment area is to stabilize patients' physiology and anatomy. The other purpose of the treatment area is to do the most amount of good for the most amount of people. Normal treatment plans may have to be curtailed in order to stabilize the most amount of patients as short as time as possible. For instance, normal IND in the OR may have to be substituted for thorough irrigation in the treatment room with splinting of an extremity and planned urgent transfer to role III. Use of the OR is done only when absolutely necessary as this draws away surgeons and valuable treatment personnel. Blood products should be readily available. In addition, the whole blood bank coordinator needs to be ready and assigned in such a way that this individual can be tasked at any moment to initiate a whole blood bank drive (usually performed at the PRT). They will require at least 1 FST personnel to assist in pre-screen testing and labeling, and can be aided by CLS or other unit's medical personnel to aid in drawing blood.
4. **Patient Disposition:** While patients are being stabilized, the triage officer is assessing and re-assessing the patients' conditions, and assigned team leaders/surgeons are updating the triage officer on diagnoses and condition of the patients. The XO/administrative officer works closely with the triage officer to develop a patient list and determine injury status so as to arrange appropriate and timely transfer to the next echelon of care. Often times, a 9-line medical evacuation is being dropped before any patient has been moved to the operative suite. The administrative officer would often alert Bagram early on before a complete patient list was accomplished so resources could be mobilized early and ready to respond. Again, the goal is to stabilize patients to the point they can be transported to the next level of care. Once patients have been stabilized, they should be moved out of the treatment area as soon as possible to the Holding area (ICU/PACU in the FST or the Polish Ward for non-urgent patients). Again, a critical care nurse was assigned as



supervisor of the Holding area to prepare patients for medical evacuation and keep patients stabilized or alert the triage officer of any change in patients' condition.

Other points of consideration:

Treatment area: Having a surgeon assigned as supervisor of the treatment area is helpful when the mass casualty is large and the triage officer has to move regularly between each of the three areas. Team leaders are assigned to each patient as are a right medic, left medic, and recorder. It helps to have the anesthesia providers in ATLS for airway management as well as assisting the Treatment area surgeon with carrying out resuscitation with blood products, establishing central lines, etc. In addition, 1 personnel assigned to lab, 1 personnel assigned to medications, 1-2 personnel assigned to X-ray, and 1 person assigned to blood products (the blood bank coordinator) is ideal. Arrange for translators as needed ahead of time and prior to arrival of patients (admin officer). Occasionally, the orthopaedic surgeon may be needed to serve a team leader, but as often as possible, the orthopaedic surgeon should be performing secondary surveys on all patients and arranging for appropriate treatment of axial skeleton and extremity injury. Frequent communication and re-assessment is necessary among the providers and supervisors to communicate findings with the triage officer so he can direct appropriate use of personnel, resources, and arrange evacuation through the administrative officer.

Operative Room: The OR nurse and 1 surgical technician was assigned to the OR to prep the room when an immediate and appropriate need was identified. Again, expeditious use of the OR is recommended. Some mass casualties have required no use of the OR, usually 1 or 2 patients out of 6 will need some type of operative stabilization, and once 5 patients needed stabilization in the OR prior to transfer.

Additional resources: Medical personnel from other units (Texas ADT, PRT, Route Clearance Patrol, ODA, etc.) are usually available and eager to assist when a mass casualty is called. Coordination ahead of time with these individuals will greatly aid in optimizing their skills and abilities when called upon. We found these personnel most useful in aiding in transport, staffing the triage area, occasionally helping in the treatment area (PRT nurse practitioner can be used as a team leader), and assisting with whole blood bank drives. The PRT has had an OR technician assigned as a medic, and was used in the OR during 2 mass casualty situations. Frequent communication with these units' medical personnel will allow for appropriate planning and use of their capabilities.

Prior Preparation: A talk-through or practice mass casualty will pay dividends prior to actual implementation. Pre-made boxes/medical kits were made for the ambulance, triage area, and holding area and regularly adjusted and restocked based upon evolving needs. Pre-made numbered envelopes with trauma sheets and required charting were placed in the triage area box to aid in triage and rapid organization of the patients.

Reality of Mass Casualty Situations:

1. Expect the Plan and Assignments to Change in the first 2 Minutes. Mass Casualties are ordered chaos, and the greater flexibility built into the plan and personnel, the better the response to the patients' needs.

2. Loss of patients during mass casualty is not unusual. The expectant area has been moved several times, but is currently labeled to be between buildings on the south side of the ATLS building. Plan to have staffing and chaplain care available for expectant care.
3. Expect to be overwhelmed and short of supplies. Perform after action reviews to determine how better to staff, supply, treat, and disposition patients for next time.
4. Plan to save lives with ATLS principles and basic interventions.

Xray: Xray techs are a precious commodity, as are the machines. **Don't do extremity films in a MASCAL until all critical films (i.e. chest xrays) are done.** Identifying a life threatening chest injury takes priority. Now, we're not all board-certified orthopaedic surgeons, but if an extremity bends where it's not supposed to or bone fragments are sticking out of holes, it's most likely broken. Films in those cases are often unnecessary. Similarly, if a stable patient has a tender extremity without neurovascular compromise, then you don't really need to shoot the film right now anyway. Alert the orthopaedic surgeon of your findings and move the patient somewhere else and shoot the films when the dust settles. The Triage Officer should be able to tell everyone when it's safe to shoot extremity films. Resist the urge to outthink this advice. You'll hold up the tech on someone who doesn't need it and miss something drastic in someone who does.

Everyone involved in the MASCAL should do a sweep of all the patients when it quiets down to make sure you know who you admitted, who is waiting for surgery, and that no patients get overlooked or have clinically worsened.

**M – *Minimize chaos*** – remain calm and confident

**A – *Assess*** – perform accurate, ongoing triage; assess weather, supply status, personnel, etc.

**S – *Safety*** – do not create additional patients;

Take care of self and staff

**C – *Communication*** –can never be enough;

Make it clear and concise

**A – *Alert*** – be ready for more casualties; Reconstitute and resupply

**L – *Lost*** - don't lose patients or staff-

Use tracking system for patients,

Maintain accountability of the team

*(courtesy of COL Jorge Klajnbart, Chief of Surgery, Evans Army Community Hospital)*

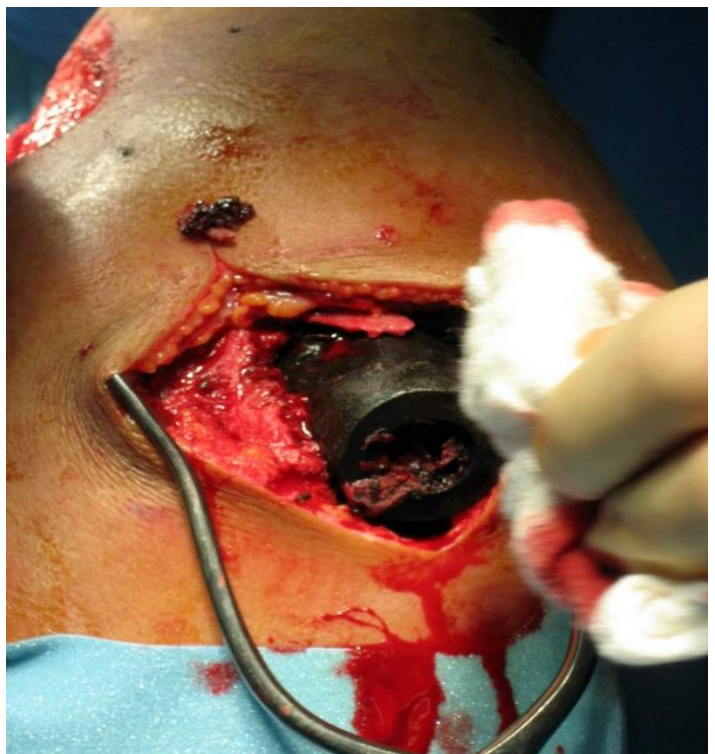
**Figure 1.1:** MASCAL mnemonic illustrating key points for mass casualty scenario management.

## **Special Scenario - Unexploded Ordinance**

Your next patient arrives, another extremity wound with a big piece of metal embedded in the soft tissue. No big deal – until you realize that it is actually an unexploded rocket propelled grenade (Figure 1.2). It doesn't matter how good your residency or fellowship training was, this will be something you have not seen before or been prepared for. Check your pulse, take a deep breath, and then take care of your patient. Your efforts now should focus on 1) protect yourself and your unit, 2) avoid inadvertent detonation, and 3) remove and dispose. Immediately isolate this casualty, preferably by moving the patient out of your primary patient care and resuscitation areas. Notify your local explosives and ordinance personnel who may be invaluable in providing assistance and expertise about this particular explosive. If this occurs in a MASCAL situation, then this patient should be moved down on the priority list until you have taken care of the other urgent patients. You can safely x-ray the involved area if necessary, but do not use ultrasound! Turn off any cell phones or similar devices in the immediate area. Now prepare your team and OR for removal.

Minimize the personnel involved in the procedure to only those absolutely necessary. All should be wearing full body armor and ballistic goggles. Create a hasty protective barrier (sandbags) around the patient, at least up to waist height. Ensure full chemical paralysis before starting. Do not use any electrocautery devices, and never use a defibrillator until the device is removed. Manual retraction and manipulation should be used as much as possible to avoid touching the device with any metallic instruments. A self-retaining retractor may be used if necessary but avoid any contact with the explosive. Gently encircle the device and remove it from the wound, handing it off to the ordinance personnel for disposal. Now you can control bleeding and proceed as with any other patient.

**Figure 1.2: U.S. soldier with unexploded RPG in thigh, removed by FST surgeon.**



## **II. Help and First Assistants (Number of surgeons who should be in a case)**

You should rarely be operating alone at an FST, and should never be on your own for a real trauma case. It is not a question of whether you CAN do the procedure on your own – most of us are used to operating without another fully trained surgeon scrubbed in. But when you do that, even for a simple washout, you take MORE TIME. Time is a precious commodity, particularly at an FST. As long as you are operating, that bed and that OR team are not available for other emergent cases. If you have multiple casualties and more than one that will require operative management, then it is critical to get the patient on and off the table as fast as possible. Also remember that the longer the case takes, the more strain you have put on the entire operating team. You can only run sustained operating capabilities for 24-48 hours, so don't wear your people out by turning a 30 minute case into 3 hours.

Using another surgeon can make even the simplest cases go faster. It also gives you another pair of experienced hands and eyes who may notice or think of something that you missed. If you have to operate on multiple areas of the body – i.e. laparotomy and leg amputation, DO NOT do them both yourself and in sequence. Prep and drape both areas, and get two teams working at once. We have had up to 5 surgeons operating simultaneously on one patient, and many hands truly do make light work. SPEED is the key to getting out of the operating room and, by default, getting the next patient in. Things can change from being not very busy to an ATLS section full of pending cases before you realize it. Even if you don't think you need help, particularly early in the deployment, getting others involved improves everyone's experience level and teamwork. This is nice to have for a semi-urgent case, but is absolutely critical for the emergent case on a crashing trauma patient.

A related (and sometimes conflicting) issue involves who to have performing and assisting on trauma cases. There is a tendency for all of the general surgeons to scrub in on a case such as a laparotomy, particularly during slow periods when everyone is bored and looking for work. It may often be better for the team in the long run to get your orthopaedic surgeon comfortable with first assisting on chest and abdominal cases early in the deployment. Remember that you should be training your team toward the ultimate goal of functioning smoothly during a MASCAL situation. This frequently has meant that we are running two operative cases simultaneously, so you may not have the luxury of another general surgeon to assist you. If you have trained up your orthopaedic surgeon (or another skilled provider) to first assist, then you have enhanced your ability to handle multiple simultaneous cases. This also helps solve the problem of pulling all of your general/trauma surgeons into the OR when they may also be needed in the ATLS or triage area during a MASCAL. Alternatively, the same cross-training of the general surgeons by the Orthopedist should be taking place so that everyone can handle basic operations on the severely injured or amputated extremity. This will be your most common operation during the deployment.

Training team members to function above and beyond their normal range of duties should also extend to your nurses and medics. This will result in savings on OR time and in freeing you up to attend to more critical issues. It also provides a huge morale boost when you get your people

more involved in hands-on care. Train your medics to perform basic ATLS procedures such as laceration closures, incision and drainage of abscesses, and irrigation/debridement of simple wounds. Slow periods where boredom and restlessness tend to set in are perfect opportunities to conduct this type of training. This may require a time investment up-front, but it will pay off exponentially in the future.

### III. ATLS-Plus (Blood Products in the ER and Management of the Blown Up)

For the most part, the principles you've learned in ATLS hold true for trauma in theater. ABC's, role 'em over, identify injuries, control bleeding, chest x-ray, etc. The main difference we have practiced is the use of blood products. Additionally, accurate assessment and transport to the OR can be essential, and it takes constant "motivation" of the medics and nurses (particularly if they are Polish) to ensure this is done in a timely manner.

You can try various personnel arrangements, but we've found that at a minimum for each bed there should be: one general surgeon (Team Leader), one nurse (usually acts as the recorder), one medic on each arm to start IVs and place monitors, and the anesthetist at the head. Additionally, we typically have a medic running labs (iStat), a nurse drawing medications and getting blood products, and sometimes an additional nurse manning the Belmont rapid infuser. The medics must all be familiar with taking x-rays; there is no dedicated radiology technician. The orthopaedic surgeon usually floats between patients and helps perform secondary surveys on extremities. Certain individuals of the Polish medical contingent can function well with the trauma team, but these are case-dependent.

The FST has supplies of pRBCs, FFP and cryoprecipitate (no platelets). Thawed plasma is not maintained, as its use is too unpredictable. Thus, if you receive report of a patient who sounds seriously injured (e.g. extremity amputations, torso wounds, etc) the thawing bath needs to be warmed immediately and FFP started thawing. It takes about 25 minutes to thaw four units of FFP, so if you wait until the patient arrives it can be too late. **Do not underestimate the importance of early administration of blood products.** Waiting to give blood until 2L of crystalloid are given (as per ATLS protocol) only delays the inevitable in the seriously wounded patient.

To continue this theme, we've found that 4 units pRBCs and 4 units FFP are required for each destroyed extremity. The definition of "destroyed" varies but these include high velocity gunshot wounds to the extremity, traumatic amputations, or massive injuries to the extremity. Pretty much most things that require a tourniquet can be classified as destroyed in this scenario, although tourniquets are often inappropriately applied by the field medics for non-devastating wounds so use good judgment.

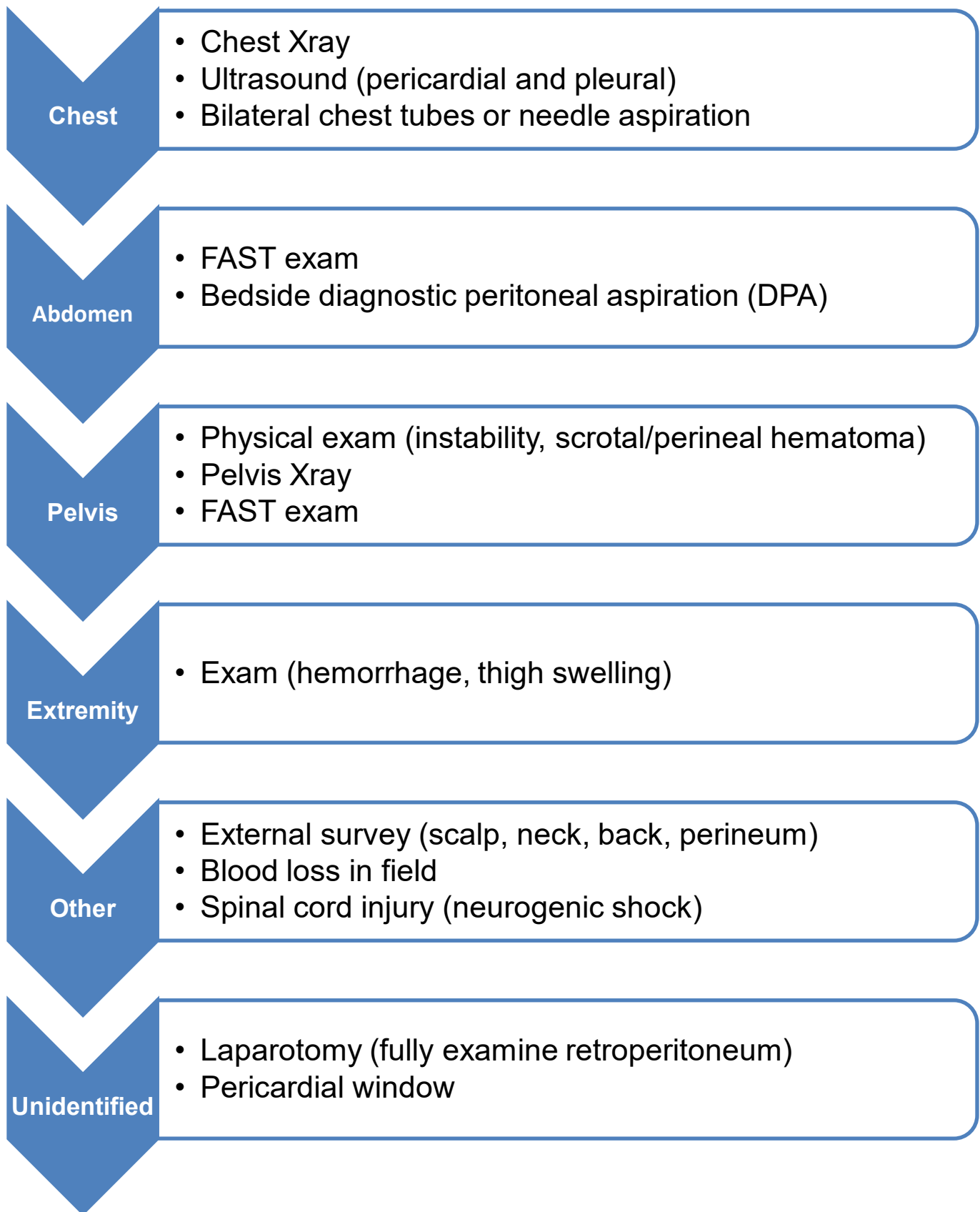
Dealing with fragment injuries is not very common in the United States but is the most common injury here. If you follow the principles of ATLS and use the judgment you acquired during residency you should be fine. Holes in the abdomen with any hemodynamic instability, extruded contents, tenderness, or terrible abdominal pain are no-brainers—go to the OR. Chest

injuries are treated just like in the US, lots of non-operative management with the occasional thoracotomy. Extremities with multiple retained fragments should usually be taken to the OR for a washout and remove any easily accessible fragments; avoid the temptation to “fish” for tiny fragments buried in muscle.

You will become very familiar with the FAST ultrasound exam, if you’re not already. Without a CT scanner, FAST is the best tool for evaluating blunt injury to the abdomen, and we often see patients with blunt mechanisms from vehicles hit by IEDs. Also remember that a negative laparotomy is perfectly acceptable, and a better alternative to exsanguinating from abdominal trauma. Blast patients also frequently have spine injuries, or at least complain of back pain/tenderness. **Radiographic evaluation of the spine is not a priority.** Obtaining spine films is generally the exception rather than the rule at role II, but certain situations may benefit from early diagnosis. Wasting time shooting lumbar and thoracic spine plain films is very low yield; patients will still need a CT scan at BAF and still require transport with spine precautions.

The Unstable Patient: See Figure 3.1 for an algorithm to rapidly evaluate the unstable patient for a source of hemorrhage. The trauma patient in extremis should spend as little time in the ATLS area as possible. This patient needs to be in the OR, where bleeding can be exposed and clamped. We will rapidly place a Cordis (typically femoral), start transfusing blood and perform a rapid-sequence intubation. Leave tourniquets in place in the patient in shock. A quick CXR is a luxury; if the patient is crashing he needs rapid decompression of both pleural spaces. Proceed with laparotomy if he remains hypotensive or if the FAST was positive.

**Figure 3.1. Algorithm for Rapid Evaluation of Instability**





#### IV. Blood Product Usage and Safety

Red Cells, Plasma, and Platelets: People bleed whole blood. In the absence of giving them whole blood it only stands to reason that giving reconstituted whole blood makes common sense. Our practice here is to give roughly unit for unit FFP and packed cells. Remember that it will take time to thaw the FFP, so order it early.

The FST is stocked with PRBC, FFP, and Cryo. The PRBC and FFP are usually stocked with a 1:1 ratio. During the summer months which usually has a higher ops tempo there is about 40-50 PRBC (mostly O+) and FFP (A and AB) on hand. The Cryo usually stays around 30-35 units. During the winter months 30 units of PRBC and FFP are kept on hand. All blood products are kept in the ATLS. The FFP and Cryo are kept in the Freezer and the PRBCs are kept in the hemacool located under the laboratory area. **Note that we do not have platelets: our only source of platelets is to administer whole blood (see below).**

FFP and Cryo are stored frozen (between -21 to -24 degrees) and will need to be thawed prior to patient use. There is a thawer on hand located in the ATLS. FFP usually takes about 25 minutes to thaw 4 units and Cryo about 5 minutes to thaw 4 units. The PRBCs are kept at a temp between 2 to 8 degrees. All blood products should be administered through some type of warmer. We have Angel Warmers, Level 1 warmers, and Belmonts on hand for this. There is a blood report that is maintained on the SIPERNET and goes out daily by noon in optimal conditions. This report is used as record keeping and also as a notification to let our suppliers know what blood products we are in need of. Resupply comes from Bagram CJTH hospital Blood support Detachment (BSD). The resupply comes on the Black Ring once a week if needed.

During any trauma admission blood typing is done along with the chemistry by the person assigned as the lab tech. This information is used for the delivery of any blood product. The team leader for an individual patient will make the determination on whether a patient needs blood products. The available nurse will administer the blood products as ordered. Tracking of all blood products is mandatory. This is done by placing appropriate information on the blood tracking form that is located in the laboratory area. This is a critical step in making sure that each patient requiring blood products get the appropriate type of blood. During a MASCAL situation it is very important that any blood samples given to the lab tech be labeled with the appropriate patient number.

Because FFP and cryo are frozen, it may be thawed beforehand based on the information that is dropped on the 9 line so that it is ready ASAP. Otherwise it will be ready about 25 minutes after the thawing process is begun. O+ PRBC, A and AB FFP is what is mostly kept on hand. These general types of blood product will be used in an emergency situation. Remember that if you are giving emergency, non-type specific blood to a patient: **Type O is the universal donor for PRBC, but type AB is the universal donor for FFP.**

The whole blood program is used in emergency situations where the blood products on hand are at critical levels or in a situation where the team leader determines that a patient will consume large amounts of blood products that would deplete our on hand supply. The prescreen donor list has the information of people whose blood has been prescreened for disease since arriving to Ghazni. This list is gathered after the blood samples obtained by medical personnel are forwarded to Bagram for testing. Each patient is tested for HIV, malaria, HCV, HBsAG, and RPR. Once the information is obtained from Bagram the patient is either placed on the donor list or the deferment list depending on test results.

In the event that whole blood is needed a call is made to White Eagle and they place an all call around the FOB with the information of what type of blood type is required. The whole blood drive is usually held at Big Daddy's (on the PRT compound). The person in charge of the blood bank runs the drive. Help is enlisted from any member of the FST who is not needed for the trauma and also any available personnel from The PRT's medical staff.

The optimal donor is one that has been screened in the last 90 days. With the arrival and departure of new units, it is an ideal time to prescreen volunteers for the blood bank. If we don't have enough people to meet this requirement we use what we have. After the blood is obtained each unit is tested using rapid kits for HIV, malaria, HCV, HBsAG, and RPR. In the event of a critical patient the team leader may make the determination on whether or not to waive testing. The rapid kit process takes about 20-30 minutes once it is started. In an emergent situation, the whole blood can be released and administered before the rapid viral testing has been completed (at the discretion of the operating surgeon). But this testing should still be completed and strict records kept of the results in case of a positive test. See the Task Force Med Whole Blood SOP for detailed information on procedures and documentation.

**FRESH WHOLE BLOOD IS GOOD FOR ONLY 5 DAYS BEFORE IT EXPIRES!**

## **V. Operative Treatment of the Mangled Extremity**

**Tourniquets:** The pneumatic tourniquets in the OR work... However, a small tourniquet on a large extremity can increase venous blood loss without stopping arterial bleeding. Add a second CAT tourniquet if necessary to control bleeding. It is pretty difficult to get good control over vessels high in the thigh, especially in a large person. The tourniquets in the OR are great. If you can get one on a patient above the level of injury then do so. General Surgeons are not used to using these devices and may be tempted to just get by without using one. This is not advisable. You'll lose more blood than the surgeon who uses the tourniquet. Don't be overanxious to release tourniquets prematurely, as their release will result in surprisingly rapid blood loss and reperfusion problems.

Should I remove the tourniquet in EMT? Yes, and no. The field tourniquets should be converted to the pneumatic ones as soon as possible. In the patient with mangled extremities, just leave it on and get to the OR. In the patient with less severely injured extremities (i.e. a couple fragment holes and a fracture) it is very helpful to know if there is an arterial injury and if there is active bleeding with the tourniquet down. We usually take these tourniquets off in ATLS and then re-examine the limb - if any significant bleeding then re-tighten the tourniquet and move the patient to the OR as soon as possible. If no bleeding, then you can proceed with the evaluation of the patient and examine the extremity for evidence of an arterial injury. However, beware of the hypotensive patient with no bleeding – they will often start bleeding as they get resuscitated. You lose style points if your patient has exsanguinated under the blankets while performing a laparotomy in the OR.

**Two or More:** As in item II above, you should never be alone on a severely injured extremity. At least have a second skilled pair of hands assisting you. There should be two operators for each severely injured extremity, including amputations. It was not uncommon to have 3-5 surgeons involved in a case at one time, even in the middle of the night. Two people can see, bovie, pickup, and tie faster than one. SPEED is the key. The faster you are, the less blood you'll lose, the faster the patient will get out of the OR, get warm, and get better. And the sooner the OR will be ready to take care of the next patient.

**Vascular Injuries:** If you suspect a vascular injury, explore it. Angiograms were very uncommon for us. Most of the time, if you suspected it, there WAS a vascular injury. Angiograms are useful for the extremity with multiple levels of injury (i.e. femur and tib/fib fractures). If you feel compelled to shoot an angiogram, the OR has percutaneous access needles and 4fr and 5fr introducer sets that work very well. We do not currently have fluoroscopy, so you will be shooting a plain xray angiogram.

Interposition grafts are the expectation unless the injury to the artery is tangential or less than 50% of the circumference of the vessel. We usually use vein whenever possible, but prosthetic is a viable option if vein is not available or adequate, or speed is of the essence. Measure the graft with the extremity extended.

Amputations: You did a surgery residency. Your judgment is worth more than these guidelines. Likewise, the maxims you learned in the civilian world still hold true here. Large soft tissue defects, dusted bone, vascular and neurologic injuries are essentially amputated already. Just complete the amputation. Similarly, the unstable patient with a severely mangled extremity should undergo primary amputation. For most other injuries, it is a judgement call that can be very difficult to make. We favor an aggressive approach to limb salvage, especially at this early stage of injury when the exact neurologic and skeletal status might be unclear. For US soldiers, decisions about amputations for functional reasons or skeletal reconstruction should be made down the line, not here. For locals, use best trauma and orthopaedic judgment. Always remember that most Afghani patients are not going to be taken to a state of the art prosthetic lab, and amputation carries a much higher morbidity here than in the states. They may also have poor wound care management and little to no antibiotic coverage in the acute stages of recovery.

Fasciotomies: Just like amputations, your training in residency and the collective civilian experience will guide you. Certainly anyone with compartment syndrome should have fasciotomies. Many of these extremities will have the fasciotomy done for you - just extend them properly. But for those folks you are operating on for extremity injuries who did not have compartment syndrome on admission use these guidelines for prophylactic fasciotomies in the injured extremity:

- Large resuscitation
- Local injury to the compartment
- Arterial Injury with a prolonged unperfused extremity
- Major venous injury regardless of time to revascularization
- Comminuted Fracture
- Explosion injury
- Popliteal artery injury – almost always. Combined popliteal artery and vein injury = ALWAYS

## **VI. Bowel Injuries and the Great Ostomy Debate**

Injury to the small bowel and/or colon will be the most common problem you are faced with when doing a laparotomy for combat trauma. The presentation and decision-making are usually not too difficult – they have a hole in their abdomen/flank/back and have peritonitis on exam. No other imaging or lab confirmation is required here – go to the OR. The more difficult scenarios are when you have a patient with multiple small fragment wounds (“peppering”) with

either an equivocal or unreliable exam. In these cases you must base your decision on the wound location and clinical status, xray findings, and ability to evacuate to a role 3 facility. Laparotomy is still the safe option if you have reasonable suspicion.

In general, you will find two types of injuries: 1) large and obvious gaping holes which are usually made by gunshot wounds, and 2) small and less obvious defects created by penetrating fragments. The second type is the one to watch out for – missing a small hole is easy to do if you are not paranoid and thorough in your approach. Small perforations into the mesenteric border of the bowel are the classic missed injuries. Carefully look, palpate, and squeeze the bowel as you run it. Do not base your surgical decisions on the mechanism – i.e. high velocity versus low velocity. Make them based on your intraoperative assessment of the degree of bowel injury, contamination, and the patient's clinical status. For small bowel you should resect most of these injuries unless they are clearly minor and limited perforations that can be primarily repaired. There is often a rim of devitalized or burned tissue (see Figure 7.1) surrounding the perforation – and this must be debrided if you are planning a primary repair. Run the entire small bowel to identify all injuries and plan how many resections will be required. Preserve small bowel length as much possible, but if you can avoid an extra resection (and anastomosis) by including a short bridge of normal bowel between two injured segments, then do it. Do not spend a lot of time trying to isolate and individually clamp mesenteric vessels – take the mesentery in large bundles and you only need to clamp the proximal side if you are in a hurry. In most cases you will be in damage control mode, so just leave the stapled ends in discontinuity and perform a temporary abdominal closure. Patients being evacuated to role 3 will be re-explored later and can then have any anastomoses performed. If the patient will not be evacuated (local national) then you will either reconstruct immediately or plan a second-look procedure and reconstruction after further resuscitation. Remember that you don't have the luxury of holding the patient for 48 hours and then taking them back. Do your takeback as soon as possible (even as soon as 4-6 hours) and then work on handoff to a local facility for continued care.

Like many things in life, nothing is as simple as it should be. Whether or not to divert someone with a colon injury is the prime example. The civilian experience has now clearly gone away from ostomies for almost all colon injuries. The military experience is still much less clear. Your judgment is very valuable here. Remember to resect a decent margin of healthy colon for all high-velocity type injuries. We rarely perform an anastomosis or an ostomy at the first look - just do temporary abdominal closure and evacuate to role 3 or plan a takeback as described above. This really won't be an issue for you with U.S. or coalition patients, but may be required for local nationals. Now make the decision based on the patient status, other injuries, and how the bowel looks. If the patient is unstable, has a rectal injury, has an open pelvic fracture or large perineal wound, or has multiple other intra-abdominal injuries, then an ostomy is the safest choice. If not, and there are two very healthy looking ends of bowel, a primary anastomosis should be considered. Also remember that a local national will likely not have access to any real ostomy care or supplies, and may not have access to a surgeon in the future for ostomy reversal. However - be aware that there are still surgeons out there who haven't changed their practice since WWII, and think anything but an ostomy is sacrilegious, and who

may criticize you for it. Just remember, an ostomy is certainly not a complication free procedure either - just do what you think is the best thing for the patient and the situation.

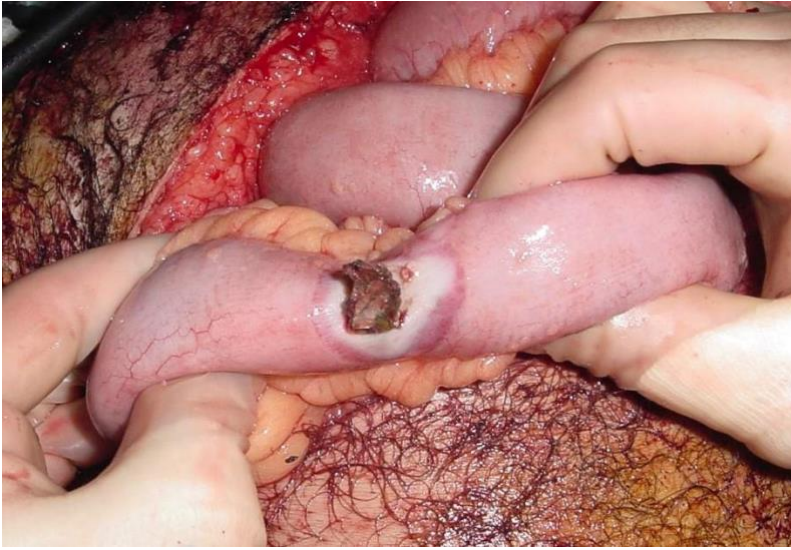


Figure 7.1: Fragment wound to small bowel with surrounding area of full thickness burn. The entire burned area should always be excised, in this case requiring a segmental resection.

## VII. Damage Control Surgery

The degree of damage control surgery performed depends both on the patient's injuries and their eventual disposition. For US and Polish troops, anyone requiring surgery at Ghazni will certainly be traveling to Bagram and likely out-of-theater. For them, traditional damage control concepts can be applied: leave injured bowel in discontinuity, use vascular shunts rather than definitive grafting, temporary abdominal closures, etc. However, for injured ANA/ANP or local nationals, surgical care at Ghazni or Ghardez is likely the best they will receive. We have been more aggressive at performing anastomoses and providing near-definitive orthopaedic care for these individuals. When unsure whether an ANA/ANP soldier will be accepted for transfer to Bagram, one surgeon should leave the OR and place the call to the DCCS, since this can dictate what surgical approach you take.

Along with early and aggressive blood product administration, recombinant activated factor VII (Novoseven) can also be given. We have used this prophylactically in one case (shrapnel to the chest with massive hemorrhage), and therapeutically in about 10 other instances (non-correcting INR with on-going blood loss). The dose is 100 mcg/kg, or about 7 mg in an average adult. This product rapidly corrects the diffuse ooze that accompanies coagulopathic patients with multiple fragment injuries. We have not needed to give a full second dose, but it can be re-dosed according to the product insert. The cost is approximately \$5000 per dose; use this resource wisely. It has reduced effectiveness during acidosis and hypothermia so avoid giving late in the resuscitation.

For patients who have life-threatening injuries (massive bleeding, multiple-injured loops of bowel, more than one solid organ injury, large vessel injuries, massive liver injuries) it could be helpful to follow these guidelines:

- Pack the liver. Don't do any sort of formal resections. Suture hepatorrhaphy of lacerations with a large chromic suture works very well to control hemorrhage and prevent bile leaks. Leaving packs around the liver with a temporary vacuum abdominal closure works well too. Consider leaving a JP drain to help mitigate eventual bilomas.
- Small bowel anastomoses are fine in the stable patient. We have tended to leave colon injuries in discontinuity if the patient is going to Bagram; the surgeons there adamantly want to perform second-look laparotomies, and often the anastomosis isn't done until Landstuhl. For locals, use your judgment whether to hook them up or create a colostomy.
- For pancreas injuries, a wise trauma surgeon once said "treat it like a crawfish; suck the head and eat the tail". Don't get into complicated pancreatic head resections, just leave a drain. Don't waste time trying to repair or salvage a damaged tail – just resect it with a linear stapler and leave a drain.
- Don't attempt kidney repairs in an unstable patient; resect the damaged organ and pack the fossa. Ditto for the spleen – there is no "splenic salvage" in damage control mode.

- A distended abdomen often acts as a tourniquet. When it is released, expect bleeding and reperfusion sequelae.
- Early in our experience, patients were receiving huge amounts of crystalloid (15 to 20 L). We had several instances of abdominal compartment syndrome, requiring laparotomy and temporary closure. Bladder pressures can be easily checked by putting 50mL in the Foley, clamping it and checking the pressure using an arterial line set-up. Early administration of blood products and attempting to limit the amount of crystalloid has reduced this risk.
- Gain control of large vessel bleeding, anything that can safely be left tied off or clamped should be with plans to revascularize at the takeback operation.
- Close diaphragm injuries if at all possible; this will allow you to differentiate between chest and abdominal bleeding when following wound vac vs. chest tube output.
- Use the wound vac or temporary closure system that is fastest and most sensible. Please avoid reinventing the wheel. We've found that Mayo stand covers, Kerlex or a blue towel, Ioban, and a 32Fr chest tube with Heimlich valve works just fine.

Damage control principles can be extended to extremity surgery as well. As previously mentioned, routine vascular shunting of arterial and major venous injuries is fine; leave the popliteal anastomosis to the vascular surgeon in Bagram. Large wounds with raw surface oozing can be dressed with Combat Gauze (wonderful) and wrapped with an ACE bandage. External fixators can be placed in less than 15 minutes. Completion amputations should focus on debriding obviously dead tissue, with the understanding that the patient will likely have at least 3-4 additional operations down the road.

Finally, a tip for the multi-system trauma patients—if the injuries you find wherever you looked first don't match the patient's physiology (e.g. you find a small non-expanding kidney hematoma and a few small bowel injuries but the patient is hypotensive, acidotic, and requiring blood), get out quick and look somewhere else. Resuscitation can unmask quiescent bleeding sites, and some wound that was not bleeding on arrival may begin bleeding in the OR under the drapes. Just because the patient's abdominal injuries aren't bad does not mean they don't need a damage control bailout.

For further information or references on Damage Control resuscitation, see the JTTS Clinical Practice Guideline, available in the CPG binder.



## **VIII. Stage Five Clingers (Hanging on to Pet Projects)**

There is always a tendency for providers to fall back on the patterns of care that they are used to back in the U.S. All of us like to provide complete and continuous care – i.e. second look laparotomy and close the belly, close or skin graft fasciotomies, etc. At the FST level you need to abandon these practices and realize that you will almost never be reoperating on your surgical patients or holding them here for longer than 12-24 hours. Fortunately, this is much less of an issue at an FST than at a role 3 facility with more holding capacity and personnel.

The same principle applies to elective or semi-elective non-trauma surgery. People, especially local nationals and contractors, will walk in asking for skin lesions removed, scars revised, hernias repaired, etc. The majority of these should be turned away if it is not urgent, or evacuated to a less austere (and more sterile) environment to have their surgery. Remember that even though it seems like you can do a quick “30 minute” procedure, you have then bought off on the care of all the potential problems such as wound infections, aspiration, etc. We are not saying that these cases absolutely can’t and shouldn’t be done – but examine them on a case by case basis and ALWAYS discuss it with the FST Commander to get approval before taking it on.

There is a very good system in place to move patients who have gotten a life or limb-saving operation to the local hospitals in Ghazni, Gardez, etc. These hospitals have things like water and dressing supplies, and even well trained surgeons. Don’t try to save the world. You put the mission of the FST at risk. Don’t hang on to people for a few days to graft their fasciotomies, or follow their liver injury to make sure there’s no bile leak, or keep them “just for another day or two” so that you can DPC a leg wound. The same principles should apply for non-trauma host nation patients. This is not a humanitarian aid mission and we can’t bear the weight of medical care for the Ghazni province. Medical patients should have life threatening issues stabilized, and then sent out to a local national hospital just like the trauma patients. There are always several providers among the group who need to be reminded of this – don’t let “mission creep” compromise the trauma or emergency care of our soldiers.

## **IX. Burns**

Fortunately, we have not cared for many significant burn patients. However, anticipate seeing burned local nationals during the winter months since they rely on gas-powered stoves for heat. For coalition forces with >20% TBSA burns, I would not plan on performing any debridement at Ghazni, but rather would rapidly initiate a burn resuscitation (Parkland or BAMC formulas) and plan Urgent transfer to Bagram. Be sure to utilize and follow the Burn Flow Sheets and Order sets, which can be found in the file folder in the ATLS area. These are required by the JTTS. Remember to accurately estimate the size of the burn – only count 2<sup>nd</sup> and 3<sup>rd</sup> degree burned areas into your estimate of body surface area involved (Figure 9.1)

For ANA/ANP and locals, I would quickly assess the %BSA burned, start resuscitation and contact the DCCS at Bagram very early on to determine whether they might be accepted for

care there. If not, and they have >50% TBSA burned, they should be made expectant with comfort measures only. For small burns, we stock Silvadene and Sulfamylon; wound debridement can be performed in the ATLS or OR as appropriate.

We have seen several children who survived their burns but are left with significant contractures or disfiguring scars. These have been accepted at Bagram for further care on a case-by-case basis. Attempting any kind of surgical revision at Ghazni would be a mistake, and we do not have a dermatome for STSG.

The only truly emergent burn surgery you may have to do is an escharotomy. For circumferential or near-circumferential burns with evidence of compromise of that compartment (perfusion for the extremities, respiration for the chest) an escharotomy should be immediately performed. This can be done with a scalpel or a bovie, and should open the full thickness of the burn down to the subcutaneous fat (Figure 9.2). The full thickness burn should be insensate, so this can usually be done with minimal sedation. Note that this is NOT a fasciotomy, and the addition of a fasciotomy is RARELY required for an isolated burn injury and significantly increases morbidity.

Figure 9.1: Rule of 9's chart for estimating burn body surface area involved

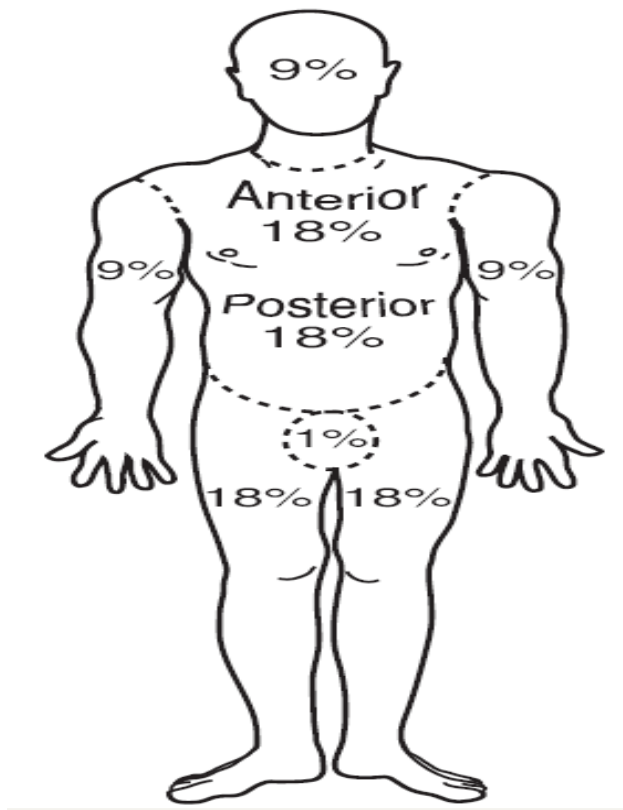
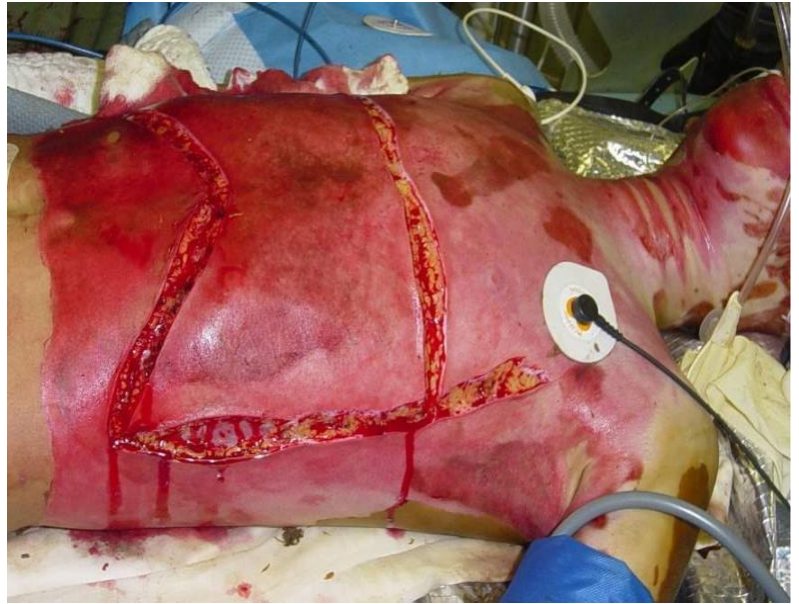
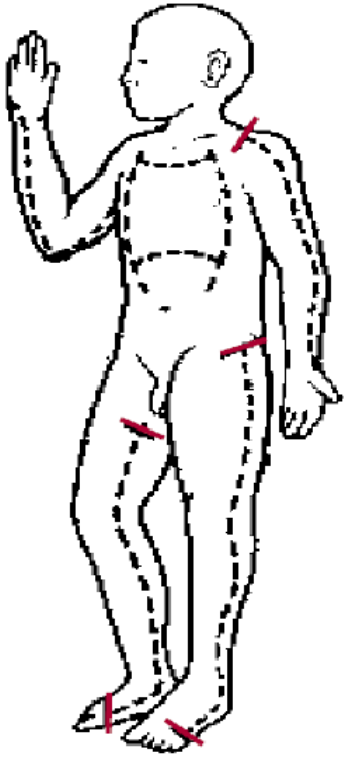


Figure 9.2: Diagram of locations for burn escharotomy incisions (left) and image of a properly performed chest escharotomy (right)



## X. Pediatrics

You will take care of pediatric patients, period. We have a relatively high volume of sick and injured kids, from neonates to adolescents. These patients are outside the usual comfort zone for most of us, but we have and continue to provide outstanding pediatric care. There will likely not be a pediatric specialist deployed here, so use reference books and telephone/email consults liberally. We have the basic pediatric supplies, and those who have come before you have accumulated a variety of pediatric equipment. We need to continue to push the “higher-ups” to routinely equip the FST with pediatric supplies, but we will continue to make do with what we have.

- IV Access: Find the people most experienced (and best) at obtaining peripheral and central access in children of all ages. Identify these people and call them early for any IV access issues. We’ve found kids with profound sepsis or hypovolemia will require central access.

- o For small kids (<2 years or so) the 20g Pediatric IJ works well in any position (neck, subclavian, or femoral). Avoid femoral artery sticks or lines in these patients – there is a significantly higher incidence of complications than in adults. Intraosseous lines are another underutilized access site – particularly early in the resuscitation. Your first choice site for an IO line should be the anterior surface of the tibia, several cm below the knee (Figure 10.1). Another option that is often overlooked is the saphenous vein cutdown (Figure 10.2)

- o For bigger kids the 16gauge single lumen catheter (box looks like the 7fr 3-lumen arrow kit) works well. A useful tip for easier subclavian line placement in small children is to approach it more medially (Figure 10.3), so your needle is entering the larger venous confluence behind the sternum.

- Arterial Lines: A-lines are very difficult to get and are not very useful. Typically you can follow the pulse oximeter for oxygenation and get a central venous gas to monitor pCO<sub>2</sub> with a VBG. Any kid who is septic or hypovolemic is nearly impossible to get an a-line in. Please don’t try to prove yourself to the writers of this volume or to your teammates. You will struggle and quite possibly destroy the artery. You don’t really need it.

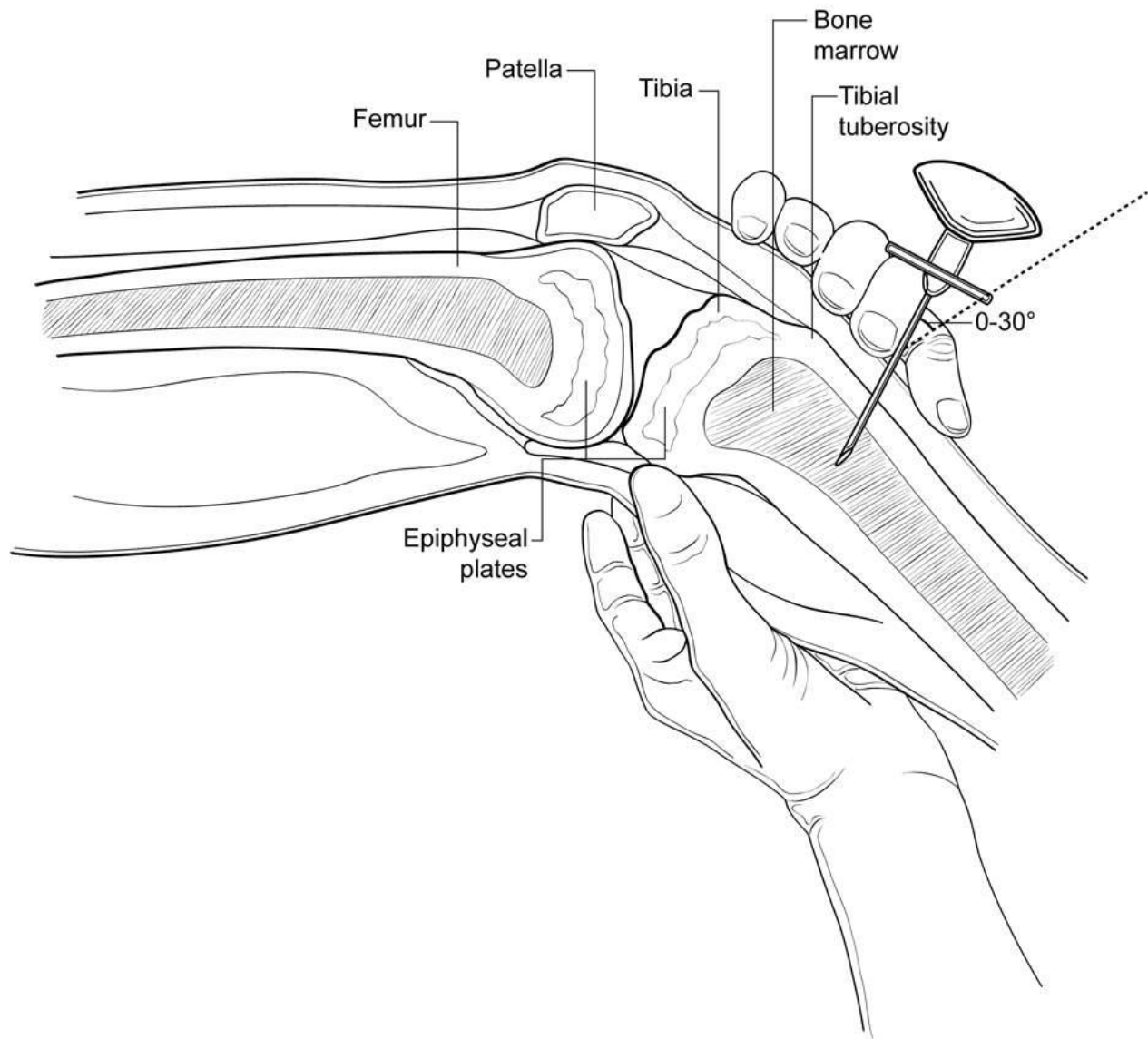
- Blood Products:

- o Red Cells-10cc per kg per transfusion
- o FFP-10cc per kg per transfusion
- o Platelets-5cc per kg per transfusion

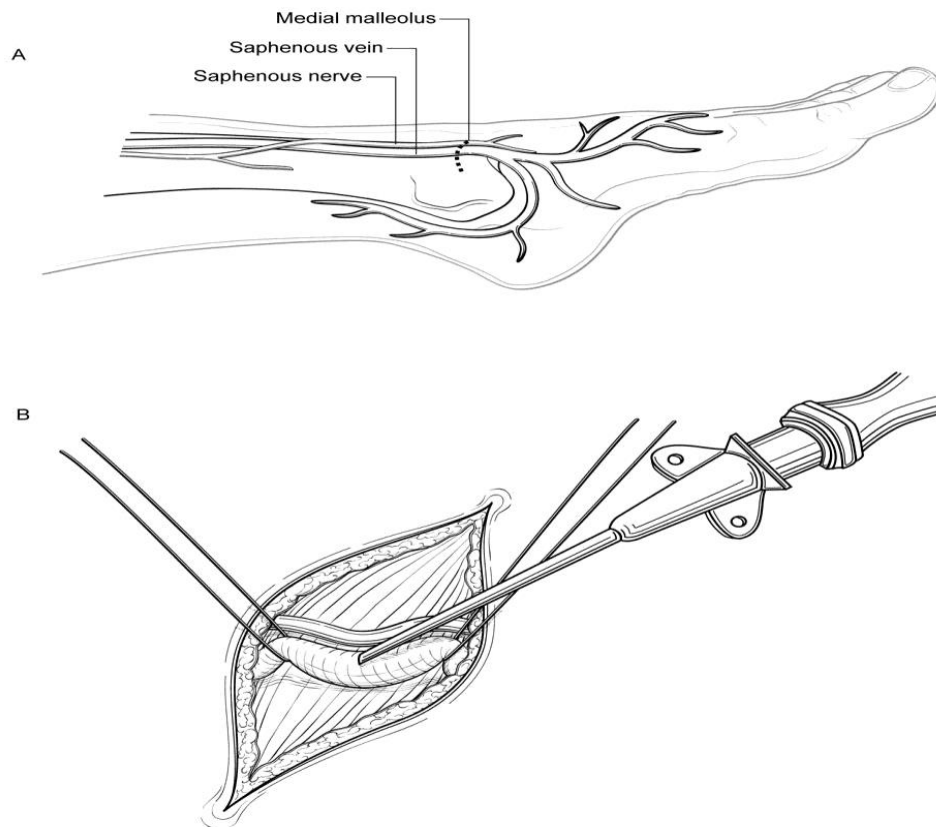
- The Harriet Lane Handbook: This is an invaluable part of practice in the ICU. It is helpful for lots of things non-surgical, especially medicines.

- The Broselow Tape: A must-have for all trauma cases and ICU admissions. Don’t get started without it.

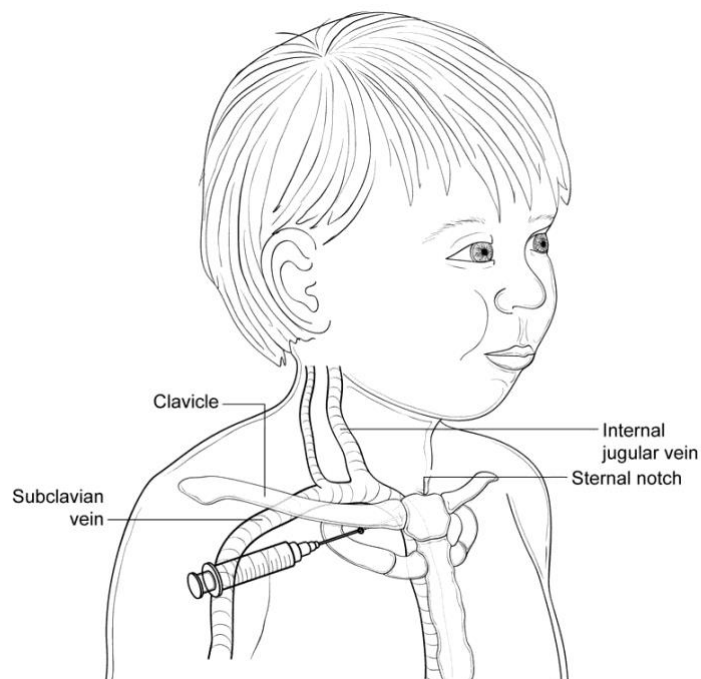
- Ventilators: Our Impact ventilators work well for most children, but they will not reliably deliver very low tidal volumes (for infants). Pressure Support is very well tolerated. General rule of thumb is higher rates and 8cc-10cc per kg per breath if using A/C or SIMV. (1yr: 35-40 breaths per minute, 12 yr: 22 breaths per minute)
- Sedation and Pain Control: Versed and Fentanyl are well tolerated and the kids chew this stuff up. Don't be surprised to be giving adult-size doses of both as gtt. **No prolonged or higher dose propofol infusions in children.**



**Figure 10.1:** Placement of intraosseous line in the anterior tibia



**Figure 10.2: Anatomy (A) and Technique (B) for saphenous vein cutdown procedure.**



**Figure 10.3: Medial approach (between clavicle and first rib) for subclavian line placement in children.**

## **XI. Thoracic Trauma**

Your management of thoracic trauma at the FST will differ significantly from civilian practice. First and foremost – you ARE the thoracic surgeon. Always call for help if you are going into the chest – very few of us are as expert or as comfortable with the thoracic cavity as we are with the abdomen. Although about 95% of civilian thoracic injuries can be managed with a chest tube only, in combat injuries you are much more likely to have to operate.

You should be able to rule out a major thoracic injury in a matter of minutes – physical exam, a quick CXR, and the pericardial FAST should tell you everything you need to know. If the patient is stable and has no real respiratory difficulty, then there is no need to go jumping right to a chest tube. Even patients who arrive with a “needle thoracentesis” – they often are placed in the subcutaneous tissue and many times placed for no real indication in the field. Get the CXR and then make a decision. However, if there is hypotension and/or respiratory distress and a wound somewhere on the chest, then put the tube in immediately. The CXR is your only truly critical trauma xray, so try and get it done as soon after patient arrival as possible.

If your patient needs a thoracotomy – it is usually because of high chest tube output. **DO NOT MAKE THE CARDINAL SIN OF TRAUMA SURGERY: THE WRONG INCISION.** In this case, the wrong incision means placing the patient in lateral decubitus and doing a posterolateral thoracotomy. This is an approach for elective cases where you know exactly what you are going after. If you are positioning the patient in anything but supine for an exploratory trauma operation, then stop and think again. If you do a posterolateral thoracotomy for bleeding, and get into the chest only to find out that the bleeding is coming from the abdomen, or the mediastinum, or the opposite chest, or the neck – what are you going to do? Keep the patient supine, place a roll under the operative side to elevate it a bit, and do an anterolateral thoracotomy. Then you maintain the option of going into the other chest, the abdomen, the mediastinum, and the neck.

Some other operative tips: Chest tubes are often placed in the ATLS area, which is fine for pneumothorax or small hemothoraces. If the patient has a good size hemothorax then I would recommend taking him to the OR to do the chest tube. This is to make sure the tube is adequately placed but also to ensure complete drainage of the blood. Retained hemothoraces are a common and often painful problem to deal with – so set yourself up for success at the first try. If you make your chest tube incision slightly larger than normal (4-5 cm) then you can stick a poole sucker into the thoracic cavity to evacuate the blood. You can also irrigate thoroughly and use the poole sucker to break up and evacuate any formed clot. Then place your chest tube. You will need an extra one or two interrupted sutures to close the incision, but you have avoided a future VATS or thoracotomy. And if you discover over 1000-1200 cc of blood, or continued high volume bleeding – then you are already in the OR and ready to do a thoracotomy to stop the bleeding. For the majority of lung injuries, the linear staplers are your friend. If a pneumonectomy is required, then **DO NOT** waste time trying to dissect out the

hilum and take the structures individually. Put a TA stapler across the hilum (Figure 11.1) and do a rapid stapled pneumonectomy. Remember that this will put a huge strain on the right heart, so keep communication going with your anesthesia provider and have volume and pressors ready.

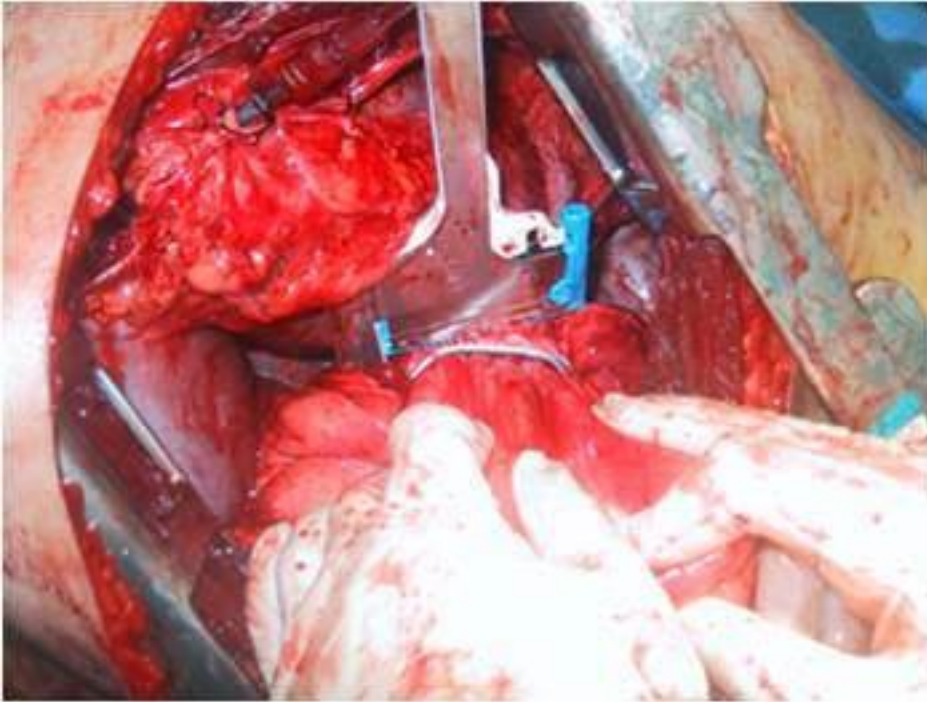


Figure 11.1: Rapid stapled pneumonectomy using a TA stapler

### **Some Additional Thoracic Trauma Pointers:**

- Comminuted rib fractures:
  - .. Debride only unattached bone
  - .. Round off sharp corners
  - .. Watch your fingers, particularly when placing chest tubes
- Pericardial windows should be performed liberally for any question of cardiac injury, especially during laparotomy for thoracoabdominal trauma.
- Don't oversew a penetrating injury to the lung that is both bleeding and leaking air; positive pressure ventilation will force the air into the pulmonary veins. Stapled tractotomy or wedge resection works great.
- A negative FAST does not preclude tamponade. Particularly when the acoustic window is compromised by lung injury or hemothorax. See pericardial window above. Patients with



physiologic tamponade do not need a pericardial window, they need a median sternotomy (or emergent thoracotomy). We do not have a sternal saw – but the Lebsche knife works fine.

- Myocardial contusions can occur without pericardial disruption and contusions can slowly leak blood
- Pediatric chest tube size (French)=age+10
- Putting the non-injured lung in a dependent position in someone with traumatic hemoptysis can result in drowning in blood.
- There is almost never a good indication here for independent or single lung ventilation. You will have problems with the double lumen tube, you will have difficulty performing bronchoscopy, and you will want to change back to a single lumen right when the patient is most unstable. Simple is almost always better.
- A chest tube can let a patient exsanguinate without creating a mess during a laparotomy. Make monitoring the reservoir part of the reporting routine. Large volume hemothoraces are often better drained in the OR than in ATLS.
- Just because it comes out of the chest tube doesn't mean there is an intrathoracic source of bleeding. Livers and spleens will bleed along the path of least resistance, including through a diaphragmatic defect and out of the chest tube.
- The primary ATLS treatment for a sucking chest wound is intubation. The chest tube is secondary.
- A clot adherent to the heart is doing its job: leave it alone until the situation is conducive to repair.
- The most important thing that goes into the chest when inserting a chest tube is your finger.

## **XII. MROE and transfer to other facilities**

There has been increased emphasis on following the Medical Rules of Engagement (MROE) and ensuring accepted patients meet these guidelines. Refer to MMR from CJTF-82 on Policy 14, MROE for RC-EAST for full details. Strictly interpreted, only US or other NATO forces can routinely receive full medical care. ANSF (ANA/ANP/ABP) are only authorized medical care for injuries incurred while conducting military operations; an MVC while off-duty would not make them eligible, even if they sustained life, limb or eyesight threatening injuries. Private contractors (e.g. interpreters, Fluor workers) and the ASG guards are not entitled to any medical care, although for LLE-threatening injuries we will stabilize and then transfer. Despite these strict rules, we are often treating non-eligible patients out of generosity and to maintain good relations on the FOB.

The reason for restricting who we treat is that disposition can be difficult. Utilize Dr Massoud (an Afghan primary care physician who lives on the FOB) to help coordinate transfer to other facilities. The following are guidelines and options for disposition:

- US or Polish: Bagram will always accept these patients, even for routine medical issues such as chronic back pain, TBI follow-up (after initial treatment per the CPGs), kidney stones, etc. Transfer requires a call to the DCCS via the Bagram TOC, dropping the 9-line, and completing the Patient Movement Record (PMR) paperwork.
- ANA: Minimally-injured patients can be released to the ANA battalion physician at FOB Vulcan; call him on his cellphone and he will arrange pick-up at the ECP. Moderately injured ANA can be flown to Gardez (see attachment) by our DUSTOFF crew. Gardez can perform take-backs and washouts, as well as definitive amputation care. They will not routinely take patients on ventilators, and they have no CT scan or neurosurgical capability. Place a call to the USAF liaison physician (usually an ER doc) as a heads-up. Seriously injured ANA will occasionally be accepted at Bagram. Alternatives include the Kabul National Military Hospital (KNMH) or the French hospital in Kabul. These transfers are difficult to arrange but we have used them for head-injured ANA that Bagram has refused.
- ANP: Similar options as ANA, except that minimally-injured patients will typically be sent to Ghazni Provincial Hospital via their ground ambulance.
- Local nationals: While you can try to place them at Bagram, they are almost always refused. The only other option has been Ghazni Provincial Hospital. To arrange this, place a call to Dr Ismael (chief surgeon at Ghazni). He will send his ambulance to the ECP, where a transfer occurs. He occasionally sends severely-injured ANP and sometimes LNs to the FST for treatment as well, so it's useful to maintain good relations with him. Ghazni Provincial does not have ventilators or advanced care. LNs who are expectant can be sent there for the family to be with the patient. Previously we could not send civilian local nationals to Gardez. However, they have now stated that they will accept civilians in addition to ANA/ANP; this provides an excellent option, particularly if they have ongoing medical/surgical care needs.

Non-DOD Contractors: Private guards and other contractors are technically not entitled to US military medical care. We will stabilize, but then it is up to the contract agency to arrange transfer and further care. Enforce this rule! The contracting companies usually have private helicopters and other options for providing care.

### **XIII. Elective Operations**

There is always a strong temptation to perform non-urgent or entirely elective procedures at the FST, particularly during periods when there is little trauma activity. There are many reasonable arguments both for and against doing these procedures at the FST. The bottom line is that you should consider these on a case-by-case basis, and always keep in mind the potential risks and downsides to proceeding. Clear plans for any elective surgery with the FST Commander ahead of time.

**Pro** - Doing elective procedures can keep your team busy and maintain or enhance their skills. It may avoid the need to evacuate a U.S. soldier away from his unit for surgery. It is a great way to “win the hearts and minds” of local communities. You may be the only chance this person has to have a high-quality surgical procedure.

**Con** – Your primary mission is trauma care, and you don’t want to get caught with a MASCAL while in the middle of an elective procedure. Simple procedures can turn into complicated messes that you can’t handle at this level. Sterility is a concern, and this is probably not the place to be implanting prosthetic mesh for an elective hernia repair or similar elective procedure. You also do not have the equipment, surgical and nonsurgical, that you are dependent on using stateside, which can compromise the level of care you think you can provide.

For U.S. or coalition soldiers, elective procedures should be kept to a bare minimum. Laparoscopic hernia repairs, cholecystectomy, etc. are available in Kuwait and Qatar, and they can provide postoperative rest and recuperation until the soldier is ready to return to his/her unit. Simple procedures such as primary repair of a small symptomatic umbilical hernia repair are reasonable to do here – no prosthetic required and the soldier can be on light duty for a brief recovery period with their unit. However – do not do any elective operation on a U.S. soldier unless you have a clear thumbs-up from their chain of command and assurance that they will abide by your requirements for postoperative recovery.

For local nationals, there is more room for consideration since you do not have the easy evacuation option. After assessing the pros and cons above, as well as your current and expected operational tempo for trauma, you can decide how to proceed. Always try first and foremost to transfer their care to a local national facility – there is reasonable surgical care available in Ghazni and surrounding areas. We have done very little of this type of surgery here, and we expect that to continue. It is always possible that in the future there may be an expansion of the humanitarian mission of the FST and an increase in performing non-trauma elective cases. Until then, focus on trauma and urgent care issues.

## **XIV. MEDEVAC**

Moving critically ill patients, especially intubated patients, to Bagram can be very dangerous. We have done what we can to provide a system that makes it as safe as possible. Flights out of Ghazni are by helicopter - not a nice fancy airplane with room to walk around and perform patient care. Monitoring and ability to do interventions, particularly during night flights, is very difficult. It is not uncommon to keep patients overnight to avoid night flights to and from Bagram, which can be a safety risk for both patient and medevac. An unstable or borderline patient is much better off spending another night in our ICU than risking a helicopter ride to Bagram.

All medevac flights are coordinated through the DUSTOFF TOC, located in our FST. They will assist with the generation of the 9-line and communications with CJTH. Prior to transfer the patient must be accepted by the Bagram DCCS. After that, a brief patient history, and current assessment is given to the flight medics at Bagram. All patients going to Bagram need a Patient Movement Request (PMR) completed and signed. Personnel in the TOC should notify you once the medics have left Bagram, which is about a 45 minutes flight.

For local national (Afghani military) patients flying with our DUSTOFF to FOB Lightning (Gardez), no PMR is needed, but make sure to contact the physician for acceptance. Nighttime communications with Gardez are difficult at best as their cell phone towers are turned off after 1900.

One brief point is the timely extubation of patients. It is not uncommon for patients to have a big surgery, remain intubated in the ICU, then need a flight to Bagram that night. Aggressive and early extubation should be the rule in the ICU, with at least several hours of post-extubation observation before transport. If your patient does remain intubated, the flight medics will insist the patient is sedated and paralyzed just prior to flight. Losing an ETT during flight is a difficult situation to handle given the small space in the helicopter and dark setting.

Again, communication is the absolute key to successful transition of care from here to Bagram. The sicker or more complex the patient, the more critical it is to communicate with the next provider in the chain. The phone number for Bagram is posted on the board in the DUSTOFF TOC – use it! You should call Bagram and speak with the trauma doc on-call sometime before the patient leaves Ghazni. We can't emphasize enough how much these person to person phone calls have helped smooth out the transfer process and avoided bad situations for the patient and physicians.

Finally, proper preparation and “packaging” of the patient prior to helicopter MEDEVAC is key to ensuring a safe and uneventful flight. If there is a significant concern for or a documented spine injury, then they should be transported on a spine board. DO NOT leave them on a spine board for hours waiting for their flight – place them on the spine board when the helicopter

arrives. Ensure all tubes, lines, iv sites, etc. are well secured. ALL patients are at risk of hypothermia, even in the Afghani summer heat. Use the HPMK (Hypothermia Prevention and Management Kit) for all transfers – place the patient inside the HPMK blanket, and also make sure to put the heat-loss resistant foil cap on their head. There is an incredible amount of noise, dirt, and flying debris the patient will be exposed to on the flight-line and in-flight. ALL patients should have ear plugs and protective glasses/goggles placed before they leave the FST for helicopter transfer.

## **XV. Intensive Care Unit**

We have a two bed ICU/recovery area here. Trauma and General Surgery patients admitted to the ICU/recovery remain the primary responsibility of the surgeon. Our only other specialist is an Orthopaedic Surgeon, who will assist with the coverage of ortho patients, but typically defers complicated medical decisions to the Trauma or General surgeon.

There are only two ICU nurses and three clinical nurses within our team. The typical patient load has not overloaded our staff, but keeping patients for extended hours or days can wear out your nursing staff and deplete your resources (i.e. oxygen). Take this into consideration, especially when caring for or accepting local nationals. If you do not have anywhere to transfer them, your staff and supplies may be exhausted.

We have used the ATLS for ICU patients during MASCALS, awaiting transport to Bagram. While the equipment and supplies are available to care for up to six critical (ventilated) patients, you are limited by nursing staff experienced to care for these patients. Try to put the most critical in the ICU, and those needing less monitoring in the ATLS with another experienced nurse.

We have adequate but limited ICU supplies and capabilities – meaning we are not nearly as robust as stateside or even role 3 facilities. The impact ventilators are fine for standard ventilation, but will not do advance modes of ventilation such as APRV. Any patient at high risk of ARDS or with worsening pulmonary status should be evacuated as soon as possible to role 3. For patients not eligible for role 3 transfer, you may not have any options for transfer with the limited ICU capabilities of the local hospitals. We have all of the basic narcotic and sedative agents – fentanyl, morphine, propofol, versed and pumps to run continuous infusions. Available pressor/cardioactive medications include levophed, dopamine, dobutamine, epinephrine, vasopressin, and phenylephrine.

## **XVI. Forward Anesthesia Care**

Anesthesia supports ATLS in the trauma bay. Usually, one provider is present to assist with any type of airway difficulties that may occur, placement of central lines, arterial lines, or difficult IV placements. The medication RN prepares Succinylcholine, Etomidate, Fentanyl, Versed, and Rocuronium for each trauma. Propofol or Ketamine is available if desired. Versed was minimally used in most circumstances. Make sure the medics insert 16 ga IVs or greater.

Otherwise the Belmont Rapid Infuser becomes problematic to use at maximum flow rates. The advantage of being present in the ATLS is that resuscitation can be initiated early.

Fluid resuscitation is paramount in the multi-trauma patient. The FST has PRBCs, FFP, Cryoprecipitate, Factor VII, and donors for whole blood. Platelets are not available. The JTTS guidelines for fluid resuscitation were followed in most circumstances (1:1 PRBC: FFP) with the exception of platelets. Once a Medevac is announced start discussing with the Surgeon about thawing FFP. The thawing process takes at least 30 min. The FFP was thawed prior to patient arrival if the Medevac report noted multiple gunshot wounds or limb amputations. The result was more effective fluid resuscitation management. One thing to remember is that once 8-10 units of 1:1 replacement therapy has been reached a decision to start a whole blood should be discussed with the surgeons especially, if coagulopathy is persistent or worsening. Usually after several units of whole blood coagulopathies, tachycardia, and hypotension begin resolve. The whole blood drive requires multiple resources from the FST. The first unit will take at least 30 min to arrive. Plan accordingly.

Factor VII is a useful tool to bridge the gap until whole blood arrives or as an adjunct to 1:1 replacement therapy. The usual dose is 100 mcg/kg which may be repeated in 20 minutes. Unless the 100 mcg/kg dosing was not used initially. On average 1 vial (5 mg) reversed most coagulopathies on patients weighing less than 80 kg. Patients > 80kg, but < /= 90 7.5 mg was effective. Patients >90 kg 10 mg usually corrected the coagulopathy. Remember Factor VII is very expensive approx \$4000.00/5mg dose. To order Factor VII from Bagram a letter of justification is required. Make sure to always have 10 doses on hand.

In July of 2010 Fabius Tiro's were installed in the FST and the Polish Hospital. Passive scavenging is being used for each location since no central suction is available. Be sure that the hoses do not become kinked to prevent excessive waste gas spilling over into the operating room. The Tiro's provide all modes of ventilation. As compared to the Narkomed M the bellows is pneumatic and no minimal oxygen flow is required when the machine is on. The result is much less oxygen is wasted. Make sure to keep track of all the anesthesia supplies. It is your responsibility to ensure that all supplies and medications are at adequate par levels to sustain patient care. The supply chain is slow. So order items early and often if needed.

Isoflurane and sevoflurane are both available. The decreased barometric pressure in Ghazni related to the altitude requires a higher percentage of anesthetic gas. When using Isoflurane to maintain anesthetic depth 1.5%-2% concentration was required. Since the required concentration of isoflurane was higher than normal sevoflurane was not used to minimize wasting of supplies. Early on it was noted that in order to maintain a normal physiological CO2 level the ETCO2 need to be 25-28 mmHg. The physiologic CO2 level is approximately 10 mmHg higher than ETCO2.

Temperature control was initially difficult to maintain since every patient was prepped from nipple to groin. Full underbody blankets were ordered and helped tremendously to eliminate hypothermia. Upper body and lower body Bair Hugger Blankets are also available. The

Belmont Rapid Infuser warms at flow rates higher than 10 ml/min. No other fluid warming devices are available.

Currently, the Polish have 3 anesthesia nurses. The skill level equates to a 1-2 year CRNA student. In Poland the anesthesia nurse administers medications and charts vital signs. The Anesthesiologist intubates, extubates, and manages any intraoperative issues. However, each anesthesia nurse has different skill levels. During our rotation Magda was the most independent. She was effective at intubations, intraoperative management, and extubations. I was present for all aspects of care to ensure no problems arose that she couldn't handle. The other anesthesia nurse was basically an assistant. She was not interested in intubating or managing cases independently. The third anesthesia nurse did not want to do anesthesia because she did not want to practice in the model that was established. I recommend speaking with the new team on arrival to verify comfort levels or even if they are interested in providing anesthesia care.

## **XVII. Discharge and Recovery**

US and Polish soldiers with "routine" medical/surgical problems should be sent to Bagram. For instance, the US standard of care for suspected appendicitis includes a CT scan; while a simple appendectomy could be easily performed here at Ghazni, don't short-change the servicemember. Likewise, non-emergent hernias should be referred out (typically to al Udeid for laparoscopic repair). Routine sprains and aches can be managed locally, as long as the member's unit is alright with restricted duties and no outside-the-wire activities. **Do not send a soldier back to duty who cannot meet the minimal requirements for deployment!** This includes being able to run for cover, wear body armor, and fire a weapon. The large majority of coalition troops who are battle injuries will take a trip to Bagram, even if just for CT scanning and brief evaluation.

Evaluation for TBI deserves special mention. Become familiar with the CPGs and other guidelines for dealing with concussions, because these are commonly seen in our troops who are injured from IEDs while riding in MRAPs. A low MACE score (<25) does not make the diagnosis of TBI by itself – symptoms such as transient LOC, visual or hearing changes or other neurological findings are also required. Likewise, a low MACE score does not automatically mandate a head CT. Follow the flowchart and re-test the individual when symptom-free and after 72 hours. Troops with mild TBI can be managed locally on the FOB, but if symptoms persist more than 7-10 days they should be referred for neuropsychiatric evaluation. Soldiers with mild TBI but resolution of symptoms and normalization of their MACE can be returned to duty without further follow-up; this is the majority of the otherwise non-injured soldiers we are treating. Again, review the CPGs for TBI management!

## **XVIII. 655 Forward Surgical Team Orthopaedic Care**

Orthopaedic Care at FOB Ghazni in a role II capacity presents unique challenges and opportunities. The pattern of injuries seen will range from the worst extremity trauma with the fewest resources available to manage the injuries, to routine primary care musculoskeletal complaints.

To review current capabilities, this FST's resources include a portable diagnostic X ray machine that most of the time is unable to be positioned to capture an entire long bone on a single film, and no fluoroscopy. Treatment for fractures includes plaster, portable temporary traction devices, Hoffmann II External Fixation trauma sets, 1 Synthes small frag DCP set, and K-wires. Resupply of small frag screws and equipment takes 2-3 months. There is no US supplied power drill; one is currently borrowed from the Polish medical facility. In addition, a Polish External Fixation set has also been borrowed that provides a few more tools besides the hand drill and wrench provided in the Hoffman II trauma sets.

These limited resources guide the type of orthopaedic trauma care rendered at the FST. The main goals for extremity trauma care are:

1. first, to save life
2. second, stabilize extremity injury

A patient in shock and undergoing massive resuscitation will likely benefit from expeditious amputation of a severely injured limb that is creating an ischemic burden on the patient's struggling physiology. This has been observed many times here—removing a mangled limb that ordinarily could undergo length preserving methods, is amputated above the zone of injury in a patient struggling in shock, and the patient's physiology immediately begins to respond and recover.

The second goal, stabilize extremity injury, is accomplished by stabilizing, but not reducing, skeletal fracture, ensuring vascular supply to the distal segment, and debriding necrotic and contaminated soft tissue to stabilize the wound. Anything more than this is usually unnecessary and leads to frustration due to lack of resources normally used in orthopaedic surgery.

Adequate reduction is accomplished at role III, where fluoroscopy and a greater amount of treatment options are available. In coalition forces as well as any patient accepted at role III, vascular shunting is used to stabilize disrupted vascular flow. In patients being transferred to non-US facilities, however, vascular repair is necessary. Finally, exploration and debridement of contamination and necrotic tissue is the mainstay of treatment to stabilize the wound. The biggest challenge will not be how much debridement and irrigation to do, but how to dress the wound for transport.

This leads into disposition of patients after initial treatment at the FST. I have found that I typically will do less intervention on coalition patients going to BAF/role III, significantly more for ANSF patients going to Ghardez Military Hospital, and challenged by civilian patient transfers back to civilian hospitals. For patients anticipating transfer to role III, helicopter



transport is approximately 45 minutes. Wounds for the most part can be left open, packed or dressed with combat gauze/ABD's, and approximated only as needed for hemorrhage control, as the patients will be having their wound re-examined in 2-6 hours from when their surgical treatment is completed at the FST. Wound vacuum's have not been used and are not available. A field-expedient wound vacuum with lap sponges and JP drains is an option, but has not been used, as it is difficult to adapt the construct to the portable suction machines, which are at a premium in a multiply injured patient or when there are more than one patient.

Joints/arthrotomies can be closed over a drain. If the patients have no signs of compartment syndrome, then prophylactic fasciotomies have been avoided, because the patient is only in air transport for 40-45 minutes and out of a treatment facility for 60-90 minutes.

For patients transferring to Ghardez, some interesting challenges are presented. Please reference the attached addendum from the Ghardez Site Visit for full details. This "role III" facility is Afghan medical standards. The concepts of damage control orthopaedics, though regularly taught, are not universally accepted. External Fixation is look upon as definitive, not temporary treatment. As an example, Ghardez's surgeons could not understand why a femoral external fixator is placed more vertical (ease in transport) vs. more lateral, because they would tend to leave the external fixator on for definitive treatment and want to avoid quadriceps tendon adhesions/scarring. In addition, repeat wound inspection and debridement may not occur for up to 4-5 days after the patient arrives at their facility. As a result, recommendations include placing external fixation constructs and pin positions as if they were to be used for definitive treatment. Wounds were managed more aggressively at the FST, and these wounds may require re-approximation of part of the skin with packing, essentially requiring re-inspection of wounds, but also preventing significant exsanguination for an open fracture or large soft tissue defect. I would not recommend closing wounds, as the wounds will be looked at as definitively treated, and will not be re-opened for a second look debridement. Amputations should be aggressively debrided and cleaned; sacrificing some length for a more definitive, clean wound bed and eventual closure is beneficial, as repeat IND and amputation revision may not occur within 24 to 48 hours. In addition, the American advisors at Ghardez stated a written out plan accompanying the patient is very influential among the Afghan surgeons in guiding the patients' follow on care. If an ANSF patient undergoes treatment at the FST and can be returned to duty, the ANA brigade surgeon can pick up these patients and disposition them from FOB Vulcan.

The most perplexing disposition problem is treatment of patients transferred to civilian medical facilities. Open wounds may never be closed re-evaluated or closed. Unreduced fractures may never be reduced. External Fixation is likely to be definitive fixation for these patients. It is in these patients that boundaries may need to be pushed to give the patient the best chance of healing and recovery. For instance, normally nerve repair would be delayed until a second or third inspection of the wound for delineation of zone of injury in the severed nerve endings. However, if a nerve is not repaired on the initial treatment at the FST, it is unlikely to ever be repaired in the civilian medical treatment facility. A balance between open wound management and "closure" of wounds is the most challenging decision. A patient with an infected wound

from too early closure versus a patient who develops infection of a large open wound bed due to inadequate and infrequent wound care with no antibiotic coverage are both left in a precarious situation. From the small amount of follow up allowed on civilian patients, near-complete closure of a thoroughly debrided and heavily irrigated wounds that were packed seem to fair well. On the other hand, we have had a patient return 5 weeks later for follow up who sustained a near-complete distal forearm amputation that was initially treated with ex-fix, exploration, and wound care, with the same dressing and packing on his wounds that were placed at initial treatment at the FST prior to transfer to Kabul.

In regards to severe fracture patterns, these patients will not have access to orthopaedic reconstruction care. An amputation of a severely mangled limb that may have been successfully salvaged in the US military system may serve the patient better in regards to early healing and avoidance of infection.

As far as directing orthopaedic trauma care, it is important to support and allow the other surgeons to direct most of the trauma care. On rare occasions, the orthopaedic surgeon may be asked to lead an ATLS code, especially in helping guide the Polish medical teams, but this should be the exception rather than the rule. While keeping in mind the ABC's for each patient, having the orthopaedic surgeon focus on diagnosis and treatment of the "D's" and "E's" frees up the other surgeons to manage the resuscitation and other life-saving measures needed for the patients and results in better orthopaedic care and less missed (or ignored) injuries. Good communication and frequent consultation amongst treating surgeons is recommended to develop appropriate treatment and evacuation plans for the patients. In the OR, it is not unusual to have bilateral amputations plus an injured hand with another open joint somewhere on the patient's body. It is not recommended that the orthopaedic surgeon perform all of the procedures alone. The best approach is to divide the surgeons into teams and tasks, with the orthopaedic surgeon present for frequent guidance or questions and moving around to the injuries that require the specific knowledge and skill set of the orthopaedic surgeon. This may mean that the orthopaedic surgeon may start a knee disarticulation, only to hand off the wound to another surgeon while the orthoped moves on to treat an open wrist injury, while also available for directing length preserving principles for 2 other surgeons performing a below-knee traumatic amputation-revision on the other lower extremity. Sometimes it may be 2 patients simultaneously in the OR with orthopaedic injuries, and these same principles will apply in regards to the orthopaedic surgeon.

Other issues for consideration: with the use of MRAP's exclusively for ground transport in RC East, a triad of injury pattern has been noted—calcaneal fracture/pilon fracture, vertebral body burst fractures, and head injury/concussion. Initial diagnosis and management of spine injuries is quite common at the FST. With radiography, AP and Lateral films will allow for diagnosis of significant spine fractures that require treatment, save at the cervico-thoracic junction. Since management options of spine injuries are severely restricted at role II, judicious use of spine films are advised only when needed to help improve diagnosis or may affect treatment in some manner. Spine boards and C-collars are readily available for transport. If the patient is coalition and would get a CT scan in the States, then transfer the patient to role III to ensure they get a CT scan. For patients with midline pain, normal-appearing XR's, a rule-out CT scan

usually results in the patient being returned back to the FOB in 3-5 days if the scan is negative. A delta-frame external fixation construct is often used for treatment of the regularly seen pilon/distal tibia fractures. Ensure that enough pin-to-bar adapters and centrally threaded pins are available, as these are not normally supplied in the Hoffman II trauma set. As an alternative, 2 centrally threaded pins through the calcaneus with a clamp on each side and 2 wings placed on the anterior side to make use of bar-to-bar adapters, with the posterior set of wings used as a “kickstand.”

I recommend sending some form of typed or written copy of an operative report to include injuries diagnosed, methods of management in (or out) of the OR, and recommended follow on plan. This is well received at Bagram, Ghardez, and civilian medical facilities.

In regards to non-urgent orthopaedic trauma care, the same types of training and sports-related injuries occur amongst all personnel stationed at the FOB. Multiple knee and shoulder-injured patients will seek consultation. The previous orthopaedic surgeon noted that he could not walk around the FOB without running into a patient he had treated, and my experience holds this also to be true. Disabling LBP does well with a 3-5 day course of Prednisone 20mg PO BID. Judicious use of CSI injections alleviate debilitating joint symptoms and allow for return to duty. Many finger-tip/nail bed injuries will present and can be managed without need to evacuate the patient. Most people will present early in their course of injury, and basic splinting for 1-2 weeks as needed can alleviate many symptoms. A readily available printout or handout of peri-scapular strengthening, rotator cuff rehab, cervical and lumbar stabilization exercises, anterior knee pain/chondromalacia rehabilitation, and ankle proprioception exercises, all have come in very handy. More serious injuries can be routinely medically evacuated to Bagram (CT Scanner available) or LRMC (MRI available). The use of crutches are variable—sometimes necessary but hard to use on gravel. CAM walkers are a very useful treatment modality.

While the desire to provide non-traumatic/elective surgical care is strong and built into the nature of most surgeons (especially “if we have the time to do so”), it is recommended to resist the urge to engage in such care the FST. Role II is not equipped with material, resources, facilities, and personnel to support the level or standard of care expected of US surgeons to deliver elective care. It is difficult enough to render trauma care to the standards that we are used to back in the US. Remember, “first, do no harm” is our guiding principle, and the answer for elective care for both NATO and local national individuals is to help coordinate or refer for the care that is needed.

In summary, many standard and severe orthopaedic injuries will present, but treatment options are limited to supporting stabilizing life, stabilizing (not reducing) skeletal injury, and removing contamination and stabilizing soft tissue injury. Besides utilizing the orthopaedic skill set, communication and transportation to the next level of care is essential in accomplishing appropriate orthopaedic care and management.

## **XIX. Unit Meetings, Events, and Lectures**

It is a good practice to have a daily mandatory meeting of the entire FST to discuss any new events, plans, issues, etc. This provides a daily routine and greatly aids in command, control, and unit cohesiveness. We have done these meetings at 1000 hours daily, with no meeting on Sunday. Once per week we also have an “executive staff” meeting to discuss more global issues with each section and the unit as a whole. This should include the surgeons, anesthesia providers, chief nurse, head OR nurse, executive officer, and senior NCO. We have done these on Tuesdays right after the 1000 morning meeting. There are also various FOB meetings to discuss issues such as housing (Tuesdays, 1400, Polish Mayor’s Cell), force protection (Saturdays, 1400, Polish Mayor’s Cell), etc. Make sure the FST has a representative at these meetings to have insight and input into issues that will affect our people and operations. There is also a meeting of all of the local U.S. unit Commanders on Friday afternoons at 1500 (usually in the ADT compound); the FST Commander should try to always attend this meeting.

We have established a weekly medical lecture series which is accredited for CME and CE credits for attendees. The topics are wide-ranging and should focus on basic aspects of combat trauma, deployed medicine, and professional development. This lecture is typically attended by the FST personnel, the PRT clinic personnel, Polish medical personnel, and a variety of medics from the various units on the FOB. Gearing part of the lecture toward the pre-hospital and medic level care is encouraged and is greatly appreciated. We have a projector which can be connected to any standard laptop for delivering the lecture using Powerpoint. The lecture is held on Tuesday afternoons at 1500 in the “Big Daddy’s” facility on the PRT compound.

## **XX. U.S. – Polish Collaboration at FOB Ghazni**

As you will quickly realize, FOB Ghazni is run by the Polish Army and the U.S. military personnel are in the minority on this base. The Polish have a large medical contingent stationed here (approximately 40 people) to provide routine and emergent care to their soldiers and to other military and civilian personnel in the area. They shipped a field hospital building in from Poland that is located on the other side of the airfield from the FST. One of the major projects during our time here has been working with the Polish medical unit to get that facility to fully operational capability.

Their current personnel includes two general surgeons, an orthopaedic surgeon, a radiologist, and several primary care physicians. In addition, they have a large contingent of nurses, techs, and medics. They do not currently have an anesthesia provider, but they have several anesthesia nurses who can work in the OR under the supervision of our anesthesia provider. Their facility has a 3-4 bed ATLS section, a 4 bed ICU, a large inpatient ward, a 2 bed OR, and a primary care clinic. They have basic xray capability and have a full-size ultrasound machine. The facility is currently functional for outpatient clinic visits and urgent care. The OR is not yet fully functional due to sterilizer problems, and there are several other equipment issues for the ATLS section that need to be resolved before major trauma can be brought there. For now, all trauma patients and all surgical cases are managed at the FST.

We have developed a solid collaborative working relationship with the Polish physicians and medical personnel. However, there are significant difficulties that do arise due to the language barrier and the differences in practice patterns between our units. We try to address these issues as they happen and have frequent meetings with their leadership to resolve important problems or concerns. They have several personnel who speak excellent English and are invaluable in keeping the lines of communication open.

We have divided the call schedule with the Polish physicians to evenly distribute the trauma. For all U.S. patients, we provide all emergency care and surgery, with the Polish standing by to assist as needed. For all Polish patients, they will take the lead and we will stand by to assist as needed. For all other patients (local nationals, other coalition forces), we simply alternate days of call coverage – one day the U.S. covers, the next day the Polish cover. Call coverage is for 24 hours, from 0900 to 0900 the following day. For patients that the Polish take care of that need transfer to Bagram, we will typically help arrange the Medevac and speak with the DCCS at Bagram.

When this collaboration began, there were problems due to the markedly different approaches to trauma between our units. The main disagreement from the U.S. perspective was the slower approach and less sense of urgency among the Polish surgeons for evaluating severely injured patients and for moving to the OR promptly. The Polish do not strictly follow ATLS, and their level of trauma experience and surgical expertise is highly variable. As we have worked together more and discussed these issues, we seem to have gravitated toward a more similar and agreed upon approach. However, as both of our units turn over to new personnel these same issues may arise again. Always work to maintain our collaborative practice, but do the right thing for the patient. Major disagreements or problems should be brought to the attention of the FST Commander immediately.

## **XXI. Deployment and Life at Ghazni**

1. Ft Dix, CST. This is maybe 5 days of education spread out over nearly 5 weeks. When I went, there was 2' of snow and I was training for the Afghanistan high desert. For you, it will be NJ in the summertime, training for winter over here, so it makes no sense. You will quickly realize the different standard in education and training in the Army. Ignore the threats about hiking with loaded rucksacks on Day 1; there was no formal PT or exertion required, and no formations. You stay in barracks, and as a Major you may have 1-2 roommates. The instruction is mindless, with many hours spent sitting in a classroom while the instructors make you (the students) read the slides verbatim, out loud. You actually fire fewer rounds than during USAF qualifying, although you must carry your weapons (and helmet and IBA) to most training lanes. You will be issued an IBA for temporary use, but the helmet, rucksack and load-bearing gear are yours to keep for the deployment. You may never leave the base or drink alcohol, but you may travel to the BX, commissary, military clothing, etc., once you figure out how to ride the bus circuits. There really is nothing within talking distance other than the DFAC and the gym. You

must plan on leaving directly from CST for the deployment, meaning you bring all your crap and keep it in your room.

2. Ghazni: Ghazni is the name of both the province and the third largest city in Afghanistan, behind Kandahar and Kabul. The province is located in the eastern part of the country, but it's not a border province with the tribal areas of Pakistan. The region is mountainous, with the FOB located at 7200' above sealevel. The weather is mild and dry, with summer highs around 90F but cool evenings in the 60s. I am told that it snows regularly in the winter, but large accumulation is unusual. The area has seen a huge increase in Taliban activity in the last 6 months, as they start coming in from the border regions (where they spend the winters) and the southern areas where coalition forces are getting more active. The 101<sup>st</sup> Airborne Division recently arrived and is responsible for Task Force East (the eastern provinces), however, the immediate battlespace (Ghazni province) is controlled by the Polish Army. There are approximately 3000 Polish soldiers in-country, and 2000 or so are stationed at FOB Ghazni. The main route through the area is Highway 1, which forms a ring around the country. Ghazni city is about equidistant from Kabul and Kandahar along this road. Recently, large portions of this road have been Black due to elevated IED deployment. Aside from peering over the Hesco barriers, there is no opportunity to see Ghazni city or the surrounding area.
3. FOB Ghazni: The FOB is ringed with distant mountains and sits on the southern border of the city. Along the northern and eastern borders, the city basically abuts the base. The FOB is small, measuring only 0.5 miles in diameter. There is a perimeter road that I run occasionally that is 2.25 miles total distance. In addition to the Polish contingent (who run the base), there are roughly 250 US personnel and another 50 or so ANSF. There is an ANP training camp on the northern side, near the ECP, but I never go there.
  - a. Personnel: Besides the 20-man FST, the other major US units on the FOB are the Texas Agricultural Development Team (TX ADT, about 60 pax), and a Navy-based Provincial Reconstruction Team (PRT, about 100 pax). There are also smaller groups such as EOD, Route Clearance, some CEs, intel, the dustoff (medevac) team, and administrative personnel in the US Mayor's cell. There was a US Special Forces detachment (ODA, 30 pax) here but they have been redeployed elsewhere. We have great relations with everyone, which is really nice b/c they often invite us to BBQs and they are willing to give us supplies, intel and help when needed.
  - b. Security: The base security is provided by the Polish and a contractor called Asia Security Group (ASG) that hires Hezaran personnel. The security can be lax; several times the ambulance from the local civilian hospital has been allowed to drive on the FOB without being searched, pulled up in front of the FST and unloaded patients without us even knowing it. There is an aerial blimp that provides surveillance, and some Polish artillery that almost never fires but scares the crap out of you when it does. The Polish also fly outdated attack helicopters. During periods of more enemy activity US attack helicopters (Apaches, Kiowas) are being stationed here temporarily.
  - c. Rockets: As you know, we were heavily bombarded during the first 3 months of my time here. The 107mm rockets come on a daily basis, and each attack is

followed by about 1 hour of sitting in the bunkers until the Polish announce All Clear over the PA. The FST B-huts were hit by rockets TWICE on separate occasions, and all our personal items and gear were destroyed in the first attack. Typically, the rockets are singles and do minimal damage, but on two occasions they have launched 6-9 rockets near-simultaneously, which is quite unsettling. We have treated 7 FOB personnel with rocket injuries, including performing an ED thoracotomy and a median sternotomy on two different US troops. Fortunately, the coalition (mostly US) response has been more aggressive lately, and the rocket attacks are no longer a daily occurrence.

- d. Communication: The FST maintains two NIPR computers. These can be used just like any government computer, meaning that access to some websites is restricted but most personal email sites are allowed. There is also a NIPR telephone, shared by 20 people, that can be used for morale or calling-card calls. The MWR building is near the DFAC. There are approximately 12 open-access American computers there, as well as VoSIP phones that actually work very well and only cost about \$0.02 per minute. A few people have bought Roshan cell phones. Coverage is intermittent and calling home costs about \$0.40 per minute. The Haji shops sell the phones and the minutes.
- e. Food: There is a single DFAC with decent food, and an Indian restaurant called the Oasis that is actually very good and fairly cheap (\$10 meals) – I eat there only once per week, otherwise my GI tract would revolt.
- f. Exercise: There is a single weight room that is well-equipped but gets crowded in the afternoon; I typically workout around 0600. There is a crowded cardio tent, with 5-8 pieces of equipment in various stages of breaking down. Plans are underway for expanding the cardio tent. The PRT has its own gym that they allow us to utilize as well. I will run the perimeter during the daytime, but it is very rocky and often we are at level II (wearing IBA all day), which makes running difficult.
- g. Lifestyle: The FOB is very relaxed. I rarely carry a weapon, and no one ever says anything to me (unlike Bagram, where they correct you if your socks are too long or too short). It is a blackout base, so you need a good light source at night. Reflective belts are not required. The entire FOB is no-salute, even when the O-8 visits.
- h. Miscellaneous: There are several small Haji shops that sell almost anything you need, including common toiletries. The locals are allowed on the FOB twice weekly for the bazaar, where they sell mostly local junk and trinkets but you can get good deals on jewelry and stone carvings. A must-see is the Midget of Ghazni, who operates out of one of the stalls in the bazaar. There is a barber, but you can get some of the enlisted guys from the other units to cut your hair for cheap as well. There is a post office, and mail arrives irregularly, depending on the security situation on Highway 1. Usually it takes about 7-10 days from the US, but sometimes it can be 5-6 weeks. There is no Finance office here, so you need to bring enough cash (\$200-400) to cover your incidentals. Finance comes down for a couple days every 2-3 months, during which time you can take out up to \$400 as

either a pay-advance or direct withdrawal. To my knowledge, none of the stores take credit cards.

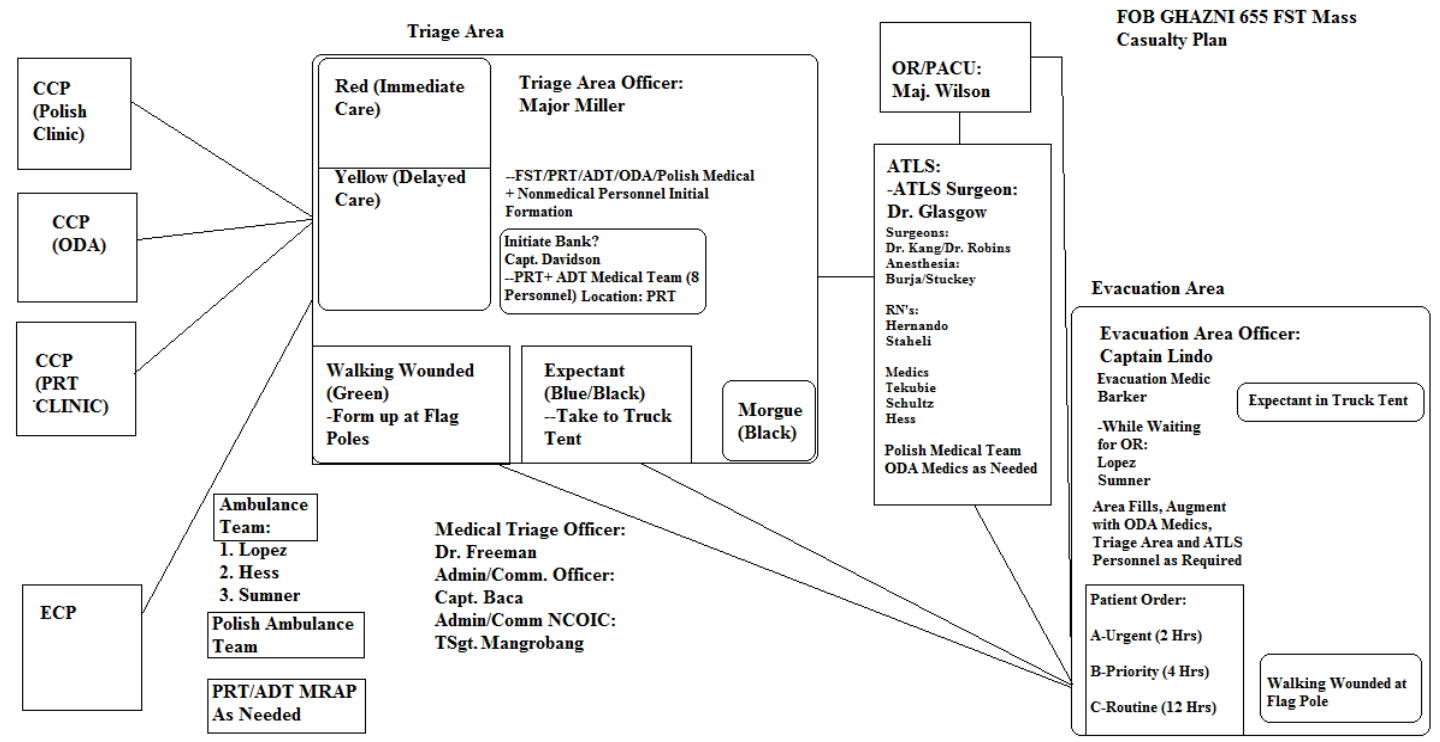
Chain of command: This is somewhat convoluted. We are assigned to the 655<sup>th</sup> Aerospace Expeditionary Squadron (AES), which is based at FOB Sharana. The 655 AES is within the 755 AEG, which is in the 455 AEW that administratively controls all Air Force assets in Afghanistan. The 655 AES has our ADCON, including the paperwork and admin support required by the Air Force. Thus, our name as the 655<sup>th</sup> FST. Our OPCON and TACON are technically overseen by the CJTF-62 MedCom-EAST, which is headquartered at Bagram and Craig Joint Theater Hospital. They control the medical aspect, and provide our resupply and logistical support. The local Polish also have limited TACON over us in regards to local control and interactions on base, but they rarely exercise it. Finally, since 101<sup>st</sup> Airborne controls all of TF-East, they also have input in our activities. They have been the main push behind the co-location at the Polish hospital (refer to that Section).

**A Final Note:** This place can be exhausting, stressful, boring, emotionally draining, and uplifting. Expect to go through some highs and lows during your time here. Use some of your free time to exercise, relax, explore, read something new (and non-medical), etc. Get to know your colleagues and try to have some group functions, especially early in the deployment. Take advantage of any research opportunities while you're here – it's a great way to kill time and to learn from this experience and pass those lessons on. Most importantly, stay healthy and come home safely.



## Attachment A – FOB Ghazni MASCAL Plan

# Mass Casualty Plan



## **Attachment B: Description and Capabilities of ANA Military Hospital - Gardez**

02 July 2010

### **MEMORANDUM FOR RECORD**

**SUBJ: Site Evaluation of ANA Military Hospital near Ghardez, Afghanistan (Orthopaedic Perspective)**

1. The purpose of this memorandum is to outline the level of care and capability of the Afghan National Army Military Hospital near Ghardez, Afghanistan, to assist with decisions of care, specifically from an orthopaedic surgical standpoint, for ANA and ANP personnel seen at role II forward surgical teams in the area of responsibility.
2. Paktia Regional Military Hospital (PRMH) is the “Regional Trauma Center” for the 203<sup>rd</sup> Afghan National Army Corp. It is located on FOB Thunder (ANA), which is adjacent to FOB Lightning (ISAF) near the city of Ghardez, Paktia province. Travel time via HH-60 is approximately 25 minutes from FOB Ghazni. The flight line is approximately 1 minute from the hospital via ambulance. The building is 8 years old, 1 story in height, made of concrete, and in very good and clean condition. PRMH currently receives patients from both FST and ANA medical/casualty evacuations at a 1:1 ratio. Typically FOB Ghazni, FOB Orgun-E, FOB Solerno, and regional COP’s serve as role I and II sources of patients for “Ghardez.”
3. Currently, the hospital has advisory and mentoring USAF medical personnel which includes:
  - a. Emergency Physician
  - b. Senior Level Nurse/Chief Nurse
  - c. Biomedical Service Officer/Hospital Administrator
  - d. BMET technician

These advisors are under instruction to not engage in regular patient care, but to supervise, instruct, and mentor the Afghan military medical personnel. US military personnel are currently stationed at FOB Lightning, which is approximately a 5 minute drive to the hospital and flight line. They have cell phones which work during the day, but cell towers are shut off at night. The hospital has 2 LAN lines, and communication is otherwise directed through the JOC on FOB Lightning for medical mentoring personnel. There are discussions to establish an “EOC” in the hospital, but a timeline for completion has not yet been established. Currently, as much notification as possible is needed for nighttime transfers to PRMH at Ghardez due to the need for an ambulance crew to drive to the barracks near the landing pad in order to assemble a team of medical personnel to respond to the incoming trauma patients.

4. Services provided by the hospital include an acute care clinic/4-bed trauma bay, 2 bed operative theatre, 6 bed PACU/ICU, one 8-bed general surgery ward, two 8-bed orthopaedic wards, one 8-bed infectious disease ward, one unused ward, pharmacy,

laboratory, radiology, and medical records. Laboratory has no ability to perform cultures. The blood bank holds only whole blood. Blood bank storage will range from 5-30 units of whole blood. Whole blood drives are not uncommon after the need for blood has been identified, but current ANA commanders prefer their personnel not to donate blood unless needed. There is some contention from ANA leadership for active support of ANP patients with ANA-donated whole blood. Radiology capability includes mini-fluoroscopy, radiographs, and limited ultrasound. There is no CT scanner available. There is no radiologist available, through there is an ANA colonel who functions as a radiology technician. Physician staffing for the hospital includes the following:

- a. 2 General Surgeons (non-residency trained)
  - b. 3 Orthopaedic Surgeons (1 experienced, 2 non-residency junior level surgeons)
  - c. 2 Anesthesia Providers (4 months of anesthesia training, 6 months of ICU training each)
  - d. 1 Infectious Disease physician
  - e. 2-3 Dentists—reported to have reasonable level of care
  - f. 2-3 Internists (non-residency trained)
  - g. 1 Optometrist/ophthalmologist—non-operative at the hospital
  - h. 1 Otolaryngologist—non residency trained, non-operative physician
5. Patient flow from PRMH is variable. Cases that require a higher level of subspecialty care will be medically evacuated to the National Military Kabul Hospital, which has a 400 bed capacity and serves as an equivalent role V facility. Most ANP patients who arrive at PRMH will be referred to the ANP Hospital in Kabul when they are stable for transfer. However, unlike American role III care, many ANA patients, if stabilized, will receive their definitive treatment at Ghardez. It is difficult for PRMH to accept civilian patients, as the local civilian hospital in Ghardez often will not accept transfers.
6. Orthopaedic Status of Care: Currently, the hospital is staffed by Dr. Ramaki for 2 ½ days each week (usually Monday-Wednesday), as he splits time at PRMH in Ghardez and at a private hospital in Kabul working with his cousin. He has the most experience with orthopaedic care, and was trained by his cousin, who graduated from the orthopaedic residency in Kabul (also named Dr. Ramaki). The level of care he provides is recognized as being of reasonable quality. Two other orthopaedic surgeons with no residency training work full time. As an example, Dr. Aziz has 2 years of orthopaedic experience and much enthusiasm for his profession. He has spent some time being mentored at FOB Salerno, and had 5 days of mentoring at Ghardez by Dr. Craig Silverton, MD. For more complex cases, the patients are kept until Dr. Ramaki arrives, at which point the “junior” staff will assist Dr. Ramadi with the cases. It was noted Dr. Ramadi is hesitant to offer training to the other orthopaedic staff.
- a. Current operative capability includes external fixation, intramedullary nailing (C-arm, no traction table), and open reduction internal fixation. It was noted that with reasonable reduction, an external fixator will be transitioned from “temporary” to

“definitive” fixation, with a tendency for the surgeons to lean towards external fixation over other methods of treatment. Traction is used on a regular basis, at least for initial management of fractures.

- b. Wound care: There is no guarantee that a wound received will be washed out upon arrival. It was reported that repeat IND may occur 48 hours after arrival, and occasionally at later time intervals. This has implications for initial management of wounds as well for patients with initial stage amputations, balancing length preserving vs. traditional levels of amputation. There is no vascular surgery capability at Ghardez (i.e. do not transfer patients with vascular shunt placement). It was also noted that early primary closure is preferred over repeat IND at PRMH.
  - i. Wound vacuums are available, and have recently started use within the last month. Tendency for the surgeons is still for early closure of wounds.
  - ii. PMMA with antibiotics was introduced by Dr. Silverton. A more formalized supply of PMMA is currently being established. Zosyn is the available antibiotic powder for mixing with PMMA.
- c. **Treatment Plans:** It was noted that treatment plans included with patient transfer are very helpful for the receiving physicians. A detailed operative report with a “Plan for Treatment” was noted to be beneficial to both treating physician and patient. For instance, a recommendation of “repeat IND within 24 hours with placement of wound vacuum” can help guide further care at PRMH.

7. Challenges: Consistency in staffing is a challenge for Ghardez. The concept of daily attendance for shifts and rounds is still in progress, so it is difficult to plan patient management for both physician and nursing staff. Patient ownership is understood differently as well. Surgeons may rotate care of the patient based upon who presents to work for the day. Charting and documentation is also in the initial stages of development. The basic concepts of ATLS and trauma care are not shared as standard methods of treatment for patients. Surgeons do not regularly lead trauma codes or resuscitations.

8. Assessment:

- a. PRMH functions reasonably well as an Afghan “role III” level of care. There are important differences between American and Afghan role III care.
- b. There is not an “orthopaedic training program” currently in place. The first half of the week, patients will be managed by an experienced surgeon, and the latter half of the week, patients will be managed by “junior level” surgeons with no formal training.
- c. Whole blood is available in limited quantities for resuscitation.
- d. Anesthesia care provided is reported to be adequate.
- e. Wound care is not as aggressive as the current American echeloned care model.
- f. Definitive treatment of orthopaedic injuries is likely to occur at Ghardez.
- g. Friday at PRMH is a “down day,” with minimal staffing and activity.

9. Recommendations:

- a. Established and regular training in ATLS would be beneficial for all medical personnel assigned to the hospital.
- b. Placement of external fixation constructs should be made carefully, as the initial construct placed for “provisional stabilization” has a reasonable chance of being used for definitive treatment.
- c. Wound care should include thorough debridement and irrigation, as the wounds may not be re-explored for 1-4 days. Instructions should be given in regards to “packing” placed in wounds.
- d. Documented Treatment Plans should be included with each transferred patient, as they are currently used and considered, and can help with directing and mentoring current surgeons in place at PMRH at Ghardez. These plans could include recommendations for wound care and transition to other suitable forms of definitive fixation.
- e. Medical Evacuation of “Priority” or stable “Urgent” category of patients from role I care directly to Ghardez ANA Military Hospital is appropriate for the area of operations, as Ghardez has the personnel and facilities to provide for this level of care. Patients requiring tourniquets for hemorrhage control or hemodynamically unstable (shock) “Urgent” category of patients would best be served by initial evaluation and treatment at a role II Forward Surgical Team.
- f. Vascular injuries need to be managed at a role II facility with either temporary shunting and transfer to American role III care, or if not available, then definitively treated prior to transfer to Ghardez.
- g. Placement of surgeon mentors (general and orthopaedic) would improve the training and level of surgical care currently provided at Ghardez. Sources for these could come from adjacent role III or forward surgical teams within the area of operations.

# **Attachment C: Improvise, Adapt, Overcome:**

## **Field Expedient Methods in a Forward Environment**

***“In the long history of humankind (and animal kind, too) those who learned to collaborate and improvise most effectively have prevailed”***  
**Charles Darwin**

The ability of modern armies to project fully functional medical assets to the most austere environments is truly remarkable. Despite this, you will never have the level of support, supplies, and modern equipment that you are accustomed to in your home practice. One aspect of military medicine that has not changed throughout history is the ability of talented and dedicated people to improvise, adapt, and overcome. The following is a collection of tips, tricks, advice and improvised techniques from the authors that they have been taught or developed during combat deployments.

### **Tubes and Lines**

**If chest tubes run out or you don't have the correct size for children/infants, an endotracheal tube can be used as a thoracostomy tube.**

**In a pinch – IV tubing can be used to secure an endotracheal tube or cricothyroidotomy tube**

**A Foley catheter can be used as a gastrostomy or jejunostomy tube – tape over the balloon port so it is not inadvertently deflated**

**A triple lumen central line kit can be used for thoracentesis or paracentesis**

**A large central line (cordis) can be placed into the trachea via Seldinger technique for an emergent temporary airway**

**A pediatric central line kit can be used for placing an adult radial or femoral arterial line**

**The finger of a sterile glove with a hole on the end attached to a chest tube can be used as a temporary Heimlich valve**

**Peritoneal dialysis can be performed through a Foley catheter in the peritoneum and an outflow drain (10mm JP) in the pelvis, with custom-made dialysate from your pharmacist**

**Chest tube on a Heimlich valve attached to a foley catheter bag is more convenient than pleuravacs when transporting**

**A rapid emergency airway can be established using a standard IV tubing set – Figure 1.**

**For open ("sucking") chest wounds a vacuum dressing provides an excellent seal and accelerates closure of the pleuro-atmospheric fistula.**

### **In the Operating Room**

**Sterile gloves can be used as sterile light handle covers**

**A sterile gown can be used as a sterile drape for operative procedures**

**A petzl headlamp is great for reading and can be used as a backup OR light**

**An NGT tube or IV tubing can be used as a temporary vascular shunt**

**A Swan-Ganz catheter can be used as a Fogarty catheter in larger arteries**

**If you run out of lap pads anything sterile will work for packing: gowns, drapes, towels, gloves**

**Cardiac pledgets can be made from pericardium or peritoneum**

**Skin staples can be used to temporarily close a cardiac laceration**

**Skin from an amputated extremities can be harvested and used for grafting burns**

**Vein from the amputated extremity can be harvested and used for vascular patch or repair**

**If you are leaving lap sponges in the abdomen, tie them together for easy and COMPLETE removal**

**If liver stops bleeding with compression then take down the ligaments and use sterile ace wrap to wrap the liver instead of packing.**

32-40 F chest tubes can be used as an aortic shunt in damage control mode. Secure with double umbilical tape ties at both ends

External fixator pin driven trans-tibial makes a nice field expedient traction pin.

If no scalpel blades- a nice pair of curved Mayo scissors can open any cavity and create any incision. To start simply pinch the skin transversely and cut-then insert scissors and go.

If you need to leave the chest open after a sternotomy- cut the bottom off a plastic bovie holder in a "U-shape" fashion and wedge between the cut edges of the sternum- then apply vac dressing and ioban.

Use 0-silk to quickly ligate perforated bowel. Grab hole with alic clamp or even sections of bowel and mass ligate. Better than umbilical tapes during meatball surgery as umbilical tapes don't slide and hard to get vascular control.

Makeshift wound vac: use sponges from the OR prep kit, NG tube and Ioban.

Tensor fascia-lata from the lateral thigh can be used as a dural substitute to cover exposed brain

If you need to cut bone and don't have a saw, open the chest tray and use the Lebsche knife. It will work for amputations, sternotomies, cutting ribs.

Make a circumferential wound vac using coban wrapped at both ends on an impervious stockinette.

A bronchoscope or ureterscope can be used as a choledochoscope.

The abdomino-inguinal incision is an excellent option for gaining control of a proximal femoral artery injury or a distal iliac injury. The exposure is much better than you will get via a laparotomy (Figure 2).

If operating in a highly contaminated abdomen and vein not available for an iliac artery repair always keep 1200mg of rifampin in the OR (usually comes in 300mg capsules). The capsules can be crushed and placed in 20ml of normal saline and a dacron graft soaked for 15 minutes prior to insertion.

A sterile glove and x-ray cassette cover can make a cover for the doppler probe and wire for intraoperative vascular evaluations of repairs and distal flow.

Low dose heparin after an arterial repair (300units/hr) if no major contraindication may prevent thrombosis particularly in the highly reactive brachial artery.

Use ventilator tubing from a disposable ventilator circuit set to perform an on-table colonic lavage or rectal washout

Vascular shunts do not work well in children – repair or ligate. If you repair, use vein graft if possible and use interrupted sutures to allow for expansion with growth.

A sterilized glass marble can be used as a spacer following the enucleation of an eye if no ophthalmologic spacer is available.

A hemostat can substitute for a scalpel handle (clamp the blade) if one is not available.

A 3.0 or 4.0 silk on a Keith needle is invaluable for quick "whip stitching" of large wounds when no other instruments are available. It is also faster, as no needle driver is needed, and can close several layers with one pass as opposed to a stapler.

Train your non-surgical colleagues to first-assist on trauma cases. You may not have another surgeon to assist, or it will free up the other surgeon(s) in a MASCAL scenario.

### **Postop and ICU Care**

Placing irrigation fluid and IV fluid in a box and then running a Baer® hugger hose into the box will warm the fluids

Keep a stock of the meal heating kits that come with every MRE (meal ready to eat). They can be used for warming IV fluids or irrigation

For clearing airway secretions (particularly in children), mix equal volumes of normal saline and bicarbonate solution and administer/suction via the ET tube. An alternative solution is hypertonic saline mixed with albuterol nebs.

A mist tent (face or whole body) to deliver nebulized treatments or humidified air to help relieve upper airway obstruction in infants can be made with wire hangers and clear plastic bags.

If patient warming devices are not available you can use cardboard secured with duct tape to enclose the patient and use a Baer hugger or portable hair dryers to provide warm air.

Lumbar spine support belts or weight-lifting belts can make excellent abdominal binders

Alternative sites for intra-abdominal pressure measurement are the nasogastric tube (instill 50 cc saline) or a needle inserted directly into the peritoneal cavity.

Ketamine is an often overlooked drug that provides excellent procedural sedation with no hypotension.

Dose = 1-2 mg/kg.

Fogarty catheters make great bronchial blockers in the setting of significant hemoptysis with penetrating lung injury or blast lung. Deflate the ETT cuff and advance the catheter to the side of the ETT under direct bronchoscopic visualization until the bleeding bronchial segment is isolated.

## **Miscellaneous**

If you are going on a deployment to an austere environment, try to contact the surgeons who are already there. Find out what critical supplies or items (i.e. prosthetic vascular grafts) they don't have and hand-carry them with you.

One of the first things you should do is perform a thorough inspection of your OR supply room. See what you have and don't have – you'll be surprised on both counts.

Canteens can be marked and used as urinals in a mass casualty situation

Use Excedrin with caffeine far forward to avoid caffeine headaches

Going days without showers – antifungal cream and baby wipes can come in handy

Put ambulatory or minimally injured patients to work in MASCAL scenarios. They can apply dressings and hold pressure, help transport patients, and provide comfort.

Always carry a sharpie marker for labeling dressings, marking injuries, or writing medical records directly on the patient

Use skype for improvised video teleconferencing with stateside colleagues or friends

Most "disposable" supplies can be cleaned and reused; pay attention to what gets thrown away, a lot can be reused, especially suture

Wound irrigation with potable water is equivalent to sterile fluid

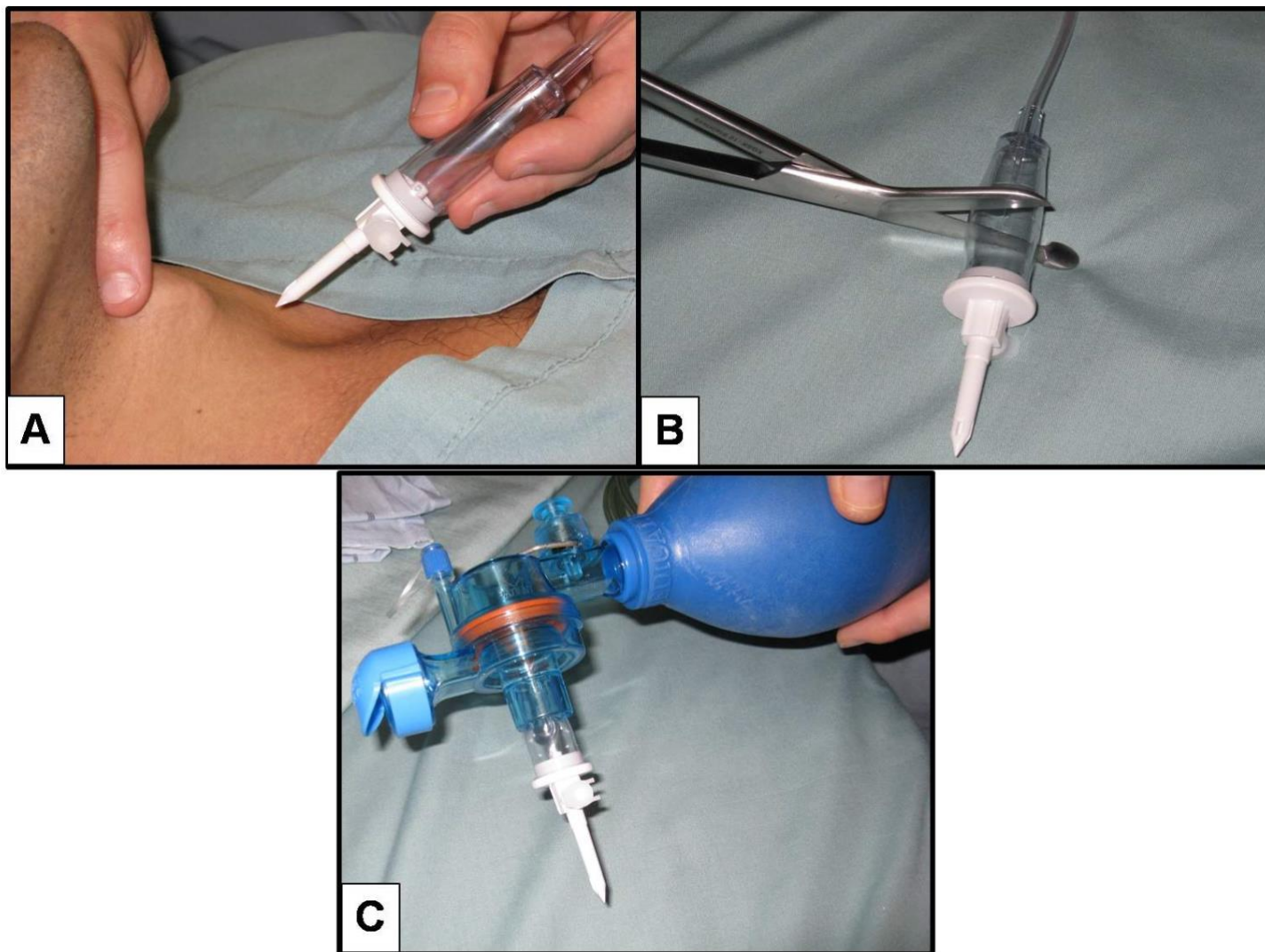
Mail a box or foot locker of critical personal supplies (blankets, exercise clothes, reference books) ahead of you. Every pound less that you have to carry on the long trip is a blessing.

Take pictures, record cases and your thoughts, collect data and participate in the many ongoing deployed research projects.

Always remember who's the boss in combat trauma (Figure 3).

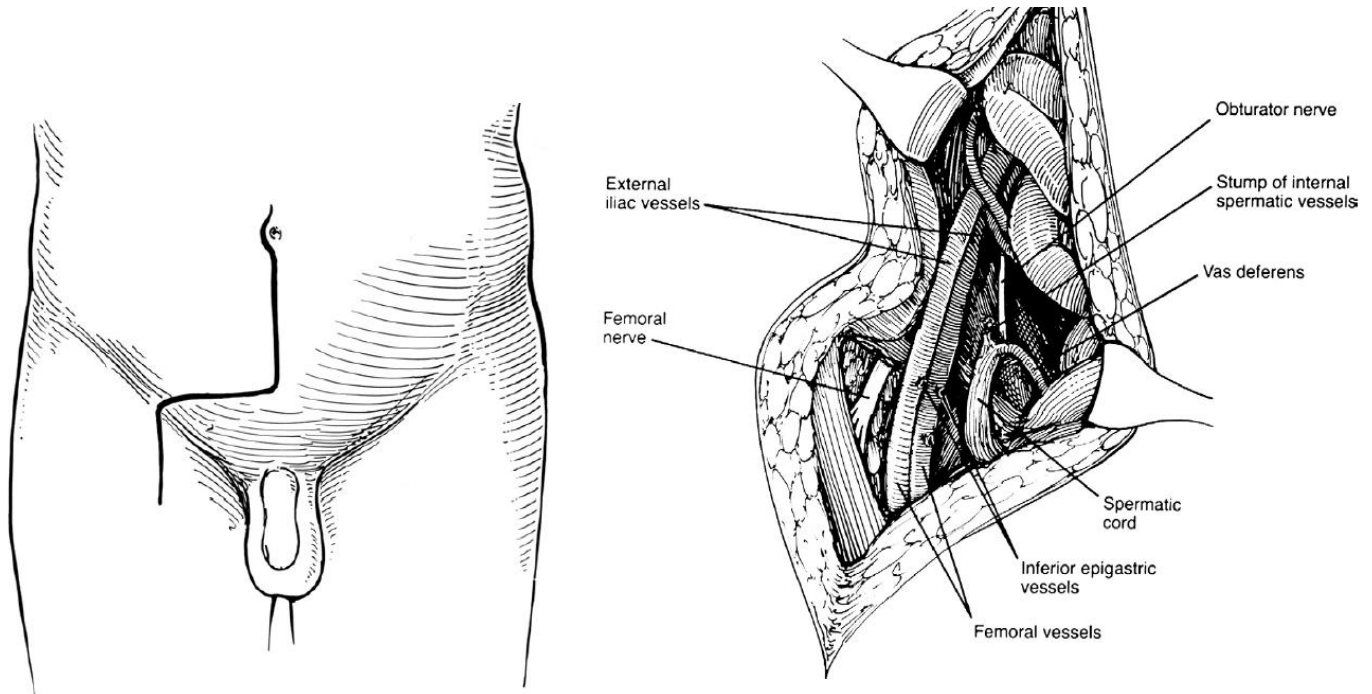
**Finally - SUPPORT YOUR COLLEAGUES, DO THE RIGHT THING FOR THE PATIENTS, AND PASS ON YOUR EXPERIENCE AND LESSONS LEARNED!**





**Figure 1.** Emergent airway technique using standard IV tubing. Insert the spiked end through the cricothyroid membrane or between tracheal rings (A), cut off the back end of the fluid reservoir (B), and this should fit well onto the end of an Ambu bag or ventilator circuit (C).

**Figure 2.** The abdominoinguinal incision provides rapid and wide exposure of the mid to distal iliac vessels and the femoral vessels and is ideal for groin or proximal thigh vascular injuries. A) skin incision, B) surgical exposure gained by division of the inguinal ligament and the inferior epigastric vessels.



**Figure 3.** Sign posted at the Air Force Theater Hospital, Balad, Iraq.

