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INTRODUCTION

The management of trauma in the Harborview Medical Center Emergency Department is supported by multiple specialties including Emergency Medicine, General Surgery, Neurosurgery, Orthopedic Surgery, Oral and Maxillofacial surgery, Otolaryngology, Urology, Radiology, Burn and Plastic Surgery, and Pediatrics. Many of the protocols used in the ED were created by the HMC Trauma Council and based on best evidence and expert opinion.

Working successfully as Trauma Doctor requires organization, anticipation, clinical judgment, and a firm understanding of ATLS. Some residents complain that managing trauma patients is based solely on protocol. Indeed, ATLS was born in response to the lack of protocol surrounding trauma care, and requires one to evaluate patients in a detailed, step-wise fashion. However, blindly following protocols without careful clinical consideration can create problems of its own. The objective of this brief text is to provide the Trauma Doctor resident with an overview of Harborview’s approach to trauma care, while offering some insight into how to be most effective in the Trauma Doctor role. It is a Harborview-specific supplement to your ATLS training. It also assumes a basic familiarity with patient flow and team organization here.

WORKFORCE

Attendings. There are 3 ED attendings on the trauma side each day, with shifts that begin at 6 am, 2 pm, and 10 pm.

Trauma Docs. YOU EM residents alternating with R2 general surgery residents with shifts that begin at 6 am, 2 pm and 10 pm.

Team Members These are interns, residents, and fellows who spend 1 or 2 months in the ED. Their programs include Emergency Medicine, surgery (UW, Madigan, Virginia Mason, and Swedish), Family Medicine (UW, Swedish and Madigan), OMFS, Podiatry (Swedish), and Pediatric EM fellows (Children’s). At times we also have Special Forces Medics, military personnel who occasionally work at HMC to gain experience between deployments. While we sometimes refer to all of these people as “interns,” remember that some are further along in their training.
The Trauma Team needs to have a minimum of 3 residents. So, when you are Trauma Doc you will have 2 or more team members.

**Nursing.** Check the staffing board to learn the names of the nurses on for your shift. Circulators and Stat nurses may also help when things are busy. Verbal communication with nursing is crucial to excellent patient care and is even more needed with computerized order entry.

**Medical Assistants (MAs.)** There is 1 for the Trauma Side. They can draw blood but not start IVs. They run hemoglobins, do EKGs, do urine dip and tox, set up chest tubes and other equipment, restock supplies, do crutch training, and other patient-oriented tasks.

**Social workers.** Involve them early for: any patient <18 years old, any patient who was assaulted (domestic violence or otherwise), patients who need help with housing, transportation, meals, substance abuse, mental health referrals. They work closely with families around grief and loss; if they ask you to talk to a family, please do so promptly. For critical patients, the social worker will accompany you to a Family Room and will field the family’s questions after you leave.

**Physical Therapy.** A physical therapist is available in the ED during normal working hours to help with musculoskeletal complaints including back pain and neck strain. You can place referrals in the computer and put the print out in a tray near their desk after hours.

**ED follow up:** If you send tests that need follow up after the patient leaves the ED (ie HIV testing, STD testing, urine cultures, wound cultures), you will need to flag our follow up nurse Val in the discharge process. Positive blood cultures are automatically called back to Val but urine cultures are not and need to be put in for review. In First Net, under "ED disposition" go to "ED review needed" and select "yes" which will give you a text box for details on what needs follow up.

**Follow up appointment scheduling:** Fill out a UW Medicine referral sheet and place it in the Patient Services Specialist box near where you drop off labs.
BRIEF TIPS: PRIOR TO YOUR SHIFT

Though difficult, it is highly recommended that you arrive 15 to 30 minutes prior to your first evening shift if you start on nights. This is time for you to:
1. Take stock of your team members’ skill levels. 2. Organize a team plan, outlining your expectations and how you want things done. 3. Organize Resus 2 and make sure equipment is stocked and ready to use.

BRIEF TIPS: START OF SHIFT

At change of the trauma doc shift, the departing Trauma Doc presents the patients: brief history, what workup is done, what is still remaining, and expected disposition. It is best to do a group sign out with all other trauma team providers from students to attendings. At 7 am and 7 pm you will “run the board” with all staff: incoming and outgoing nurses, doctors, and students. Many medical errors occur around hand-offs, so make sure you take as much responsibility for the “old” patients as the new incoming ones. It is important to then actually see and evaluate all patients signed out to you (see more on sign-out.)

As early in the shift as possible, organize your approach to the very ill trauma patients that will be placed in Resus 2 when they arrive. This may include early discussions with the charge nurse, MA, Resus 2 nurse and your trauma team. Outline your expectations. Emphasize that you require silence during the initial part of a trauma patient’s work-up. This means no talking at all until the paramedic or airlift nurse have given report AND you have completed and called out your primary survey. A huddle of team members to go over your approach to cases and assign tasks is vital prior to a sick patient’s arrival.

Touch base with the General Surgery R3 to coordinate your approach to traumas. Obtain his/her pager number and be clear when they wish to be called regarding consults (ie on arrival, after work up etc).

Assess for potential equipment shortages with the R1s and MAAs (if not done prior to shift). Have MA order any missing equipment. Common items that are missing: size small cervical collars, box splints, Kocher clamps (for pelvis sheeting), Steinman pins, pediatric supplies.

Assess pediatric equipment. While one should not open all Broslow drawers, it is reasonable to occasionally do a spot check of a random drawer.

Rehearse with your team worst-case scenarios. What is your plan if a patient is dropped off on the ramp pulseless, apneic, and with multiple GSWs to the chest? Who will manage the airway? Who will place the IV? Who will place a central line if needed? Who can place chest tubes quickly?
BRIEF TIPS: DURING YOUR SHIFT

Have a plan for each trauma before the patient arrives. Know who is doing what. If possible have one person write the history and physical (as you call it out) to aid the person who will be documenting electronically.

Mobilize resources: if multiple traumas are coming in or your team is behind, call for back up. Get the GS R3 to bring down their R1, R2 and students. Call the Burns/plastic surgery intern. Ask the Blue zone or “10th” attending to help as well.

Keep Resus 2 clear whenever possible. If three beds are taken up in Resus 2, it is time to work with the charge nurse to move less sick patients to other locations. If four beds are taken up, it is imperative to have a bed open and set-up for the short notice trauma patient.

No trauma patient should leave Resus 2 for radiology unless you are satisfied they are stable. Trauma Series and any post procedure films should be read, ABG and first hemoglobin results back if there is any question about stability. If there is a pelvic fracture or suspicion of renal trauma, a Udip should be performed prior to CT to determine which CT scan to do. As part of the secondary survey, before CT, log-roll the patient, inspect back, palpate spine, do rectal exam for tone and guaiac if indicated, and remove the backboard.

Always perform a thorough primary and secondary survey before a patient leaves for films. Range all joints, palpate entire body, remove the collar and inspect the neck, open the mouth, roll the patient.

Change out the cervical collar to a Miami J (the type we carry at Harborview) if it is very uncomfortable OR if it is going to be on for a long time such as in a known cervical injury or a patient who won’t be examinable for a while.

Keep in constant communication with the charge nurse. Tell them about potential dispositions (discharge, admit to floor, admit to ICU, and which service) ASAP.

Patients who have had SBP at any point < 90, Base Deficit > 6, Lactate > 4: prioritize getting them to the ICU. Only critical extremity films should be obtained at this time. Spine images should be obtained by CT not plain film (see chest CT protocol below.)
BRIEF TIPS: POST SHIFT

Sign out time is crucial: be thorough, and detail everything that needs to be done on a patient. Your team is responsible for your patients until you have signed out. This may be delayed if the oncoming team is extremely busy or is taking care of a new patient.

Sign out ALL patients physically in the ED, even if technically discharged or awaiting admission. Try to keep up with electronic charting during the shift. See separate document about workflow regarding electronic notes.

The default is that you and your team (outgoing) should complete outstanding patient care tasks, including suturing, procedures, review of labs and films, and the calling of consults. The oncoming team can assume responsibility for a task, but only if they are completely freed up to do it promptly.

PRE-HOSPITAL CARE

Medics:

The trauma doctor provides medical control for medics from throughout the region who are transporting trauma patients to Harborview. Seattle Medics almost always contact the TD via the radio. Outlying Medics may contact the TD via telephone, and at times may simply call the charge nurse. When communicating with the Medics, be aware that different units carry different medications, and are limited in manpower. Keep all communication, especially on the radio, brief and formal. Refrain from detailed questions regarding mechanism or exam unless it will clearly change how you prepare for the patient. That being said, make sure you always obtain the following:

- Age/gender
- Vital Signs
- Lowest BP
- Intubated? Access?
- GCS
- Broselow (if pediatric)
- Mechanism
- Pelvis stable/sheeted? (if blunt trauma)
- Difficult Airway? Surgical Airway?

In Seattle, if contacted by Medic 44, this is the MSO (Medical Supervising Officer). Often the MSO contacts the TD when there are multiple casualties, or significant penetrating trauma. If there are 3 or more significant traumas, ask the MSO if he/she has activated an MCI (Mass Casualty Incident), and call the attending and charge nurse to the radio room.
Airlift Northwest:

The TD provides medical control for all trauma patients transported by ALNW, whether or not they are being taken to Harborview. The ALNW dispatchers will contact HMC if a helicopter has been dispatched for a field response. Anticipate that fairly soon, you will be summoned to the Med-Con radio to receive a report.

As with the medics, ALNW reports will be brief, and their interventions limited. Also bear in mind that while in flight, procedures such as intubation can be extremely difficult. Finally, be cognizant that when accepting transfers that will be transported by air that gas expands as pressure decreases (Boyle’s Law). Thus, small pneumothoraces have the potential to become significant if not decompressed prior to flight. This is particularly true if flying over the mountains (Cascades or Olympics) in which case the helicopter will reach altitudes from 8,000 to 10,000 feet. Generally, in Western Washington, the helicopters will fly less than 2500 feet and gas expansion is less of an issue. The fixed wing aircraft can be pressurized, thus mitigating most of the effects of altitude. In short, strongly consider having a chest tube placed before flight if there is any suspicion of pneumothorax.

The same information always asked of the medics should be asked of the flight nurses (see above).

Other Air Medical Transport companies (such as LifeFlight) may send trauma patients. Typically these are not from the field, and you will have been in contact with the referring facility. However, you will not hear an in air report and will have less of an idea about when the patient is arriving.

AMR (American Medical Response) and other ambulance companies

Patients coming by regular commercial ambulances, not medics, are generally low-mechanism, though well-appearing patients with high mechanism do arrive by AMR too. These are staffed by EMTs, who have much less medical training than medics. They can monitor vital signs but do not start IVs or give any meds. Be aware that sometimes these patients are sicker than originally billed—be vigilant. You may also receive patients via AMR Critical Care Transport. These units are staffed by ICU nurses, but are used only for transfers between hospitals, not patients fresh from the field.

The Transfer Center

All inter-facility transfers should go through the Transfer Center, which is monitored by RNs via a recorded line. If you are contacted directly by an outside provider, refer them directly to the Transfer Center. If a provider is
desperate, dealing with a critically ill patient, it is reasonable to accept the patient then contact the TC yourself directly. Otherwise, do not accept a patient unless the provider goes through the TC. The reason is that there are several transfer criteria the TC nurses are familiar with, and certain calls that are only supposed to be taken at the specialty attending level. Some issues to consider with transfers:

Obtain as much detail about injuries and mechanism as possible. Do not ask for additional imaging or tests to done unless absolutely critical prior to transport. Think ATLS. Always obtain initial and recent vitals, GCS, and lowest BP.

Request that the hospital send the films electronically and send the reports with the patient. Ask for copies of the films if they are not connected to this system. It is very helpful to review these films with the radiologist before the patient arrives. This allows you to decide what needs to be repeated versus what is sufficiently imaged already. All intubated patients will need a CXR on arrival to make sure the tube was not displaced in transit, and most patients with ICH will be ready for a repeat scan to check progression.

In general, patients should be transported on a backboard with a collar if high mechanism. If the patient has had adequate imaging of their entire spine, this is negotiable. Patients should be transferred with c-spine immobilization unless it is very clear the patient’s head or neck was not involved (i.e. an isolated ankle fracture in which the patient did not hit their head does not need a collar). This may be frustrating to the outside provider. If an outside provider has “clinically cleared” the cervical spine, review Canadian C-spine criteria: clinical clearance (i.e. no radiograph) is not appropriate for high-mechanism trauma, anyone with distracting injury, intracranial hemorrhage, or intoxication.

Patients being transferred should not come by private vehicle (POV). There have been too many instances of patients stopping to eat (when needing operative repair), or showing up days later. However, beyond our strong recommendation, we cannot force patients to come by ambulance.

If a referring provider does not wish to follow your advice regarding spine immobilization, mode of transport, etc., simply explain your rationale. Ultimately it is his/her decision.

Choosing Mode of Transport

Time and distance, of course, are crucial considerations when choosing mode of transport. It should be noted that the Puget Sound’s unique geography and traffic patterns often turn small distances into long transports. This holds true
especially on the Olympic Peninsula, the San Juan Islands, and during high traffic times, places as close as South King County and Snohomish County.

In addition to saved time, using ALNW has other advantages. Clearly, our medical control allows real time, in-line communication, which helps in preparation. Also, the ALNW flight nurses are regularly taught and trained by our ED and Trauma surgeons and thus are well versed in resuscitation goals. See the ALNW Orientation materials for further details.

Preparing for an Incoming Trauma Patient

When you receive report from a Medic unit or Airlift about a patient en route, it is important to begin formulating a plan even before leaving the radio room. It is important to ask these questions:

Does the patient have an airway? Is he/she intubated, or were the Medics simply asking permission to intubate? Always be prepared for a failed intubation.

Does the patient meet criteria for a trauma team team activation (see below)?

Do you have enough resources/ manpower? Are there subspecialists who should be bedside upon patient arrival (i.e. Ortho, neurosurgery).

What do I need prepared for this particular patient? Suspected pelvic fracture→have sheet ready with Kocher clamps or towel clamps. Flutter Valves placed in field→Have bilateral chest tube set-ups and 2 Pleura-vacs.

Re-assess skill level of your team. Who can rapidly and competently place chest tubes? Central lines? Femoral Sticks?

Have Resus two ready before the patient arrives. Nothing is more frustrating than a sick patient arriving, and the monitor is missing its three lead, there is no BP cuff, etc. This is particularly important with unstable patients. Interns, MAs, and nurses should help with this. For unstable patients, have ready: thoracostomy trays and 36 French chest tubes on both sides, sterile gowns, Cordis kit, 30 cc syringe with 21 g needle for fem stick, foley, DPL kit.
Have a low threshold for calling a **Full Trauma Team Activation** (formerly trauma code). Criteria:

1. Trauma patient with hemodynamic instability in Field or HMC ED (SBP \( \leq 90 \text{mmHg} \) for age > 5 years or below minimum SBP for age \( \leq 5 \) years, see table).
2. All Gunshot wounds or impalements to the neck, chest, abdomen, pelvis or groin.
3. Trauma patient with difficult or unsecured airway in Field or ED (Includes failed attempts at field intubation, all patients transported with airway rescue devices (King/LMA), all patients with Field or outside hospital cricothyrotomy).
4. Trauma patient with obvious major vascular injury (active arterial hemorrhage, expanding hematoma).
5. All pediatric trauma patients age 5 years or younger requiring intubation in the Field or ED.
6. Transfer patient requiring transfusion to maintain vital signs or any trauma patient in ED for whom transfusion of PRBCs is being initiated.
7. Mass casualty: 3 or more major trauma (ie patients who require Modified Trauma Team Activation) patients expected simultaneously.

*Full trauma team activation is required for any one of these criteria. Full trauma team activation can also be called for any patient not meeting these criteria for whom the ED physician is concerned or needs additional resources for management (ie ruptured abdominal aortic aneurysm).

If you are worried about the patient’s stability, even if they do not meet exact criteria, err on the side of caution. There is nothing worse than being surprised by an unstable patient with no back up.

Don’t forget that patients who appeared stable on arrival may develop Full Trauma Team Activation (TTA) criteria while in the ED. Even if it seems that “everyone is already here” you should still call a Full TTA (formerly trauma code) at that time. Examples include: any blood pressure <90, patient requires transfusion to maintain vital signs, patient needs a surgical airway, emergent intubation of patient <5 years old.

The Full Trauma Team (the people included in Full Trauma Team) includes:
- ED Attending Physician (based in ED)
- General Surgery Attending or Trauma Fellow
- General Surgery Senior Resident (R4/5)
- General Surgery R3
- Trauma Doc (based in ED)
- Anesthesiologist
- Respiratory Care Practitioner
Blood Services Technician
Radiology Technologist (based in ED)
ED Registered Nurses (based in ED)
Pediatric Intensivist (as needed for child < 5 years of age)
Pediatrician (for all children ages 15 years or less)
Obstetrician (for all pregnant trauma patients)

Policy requires that:
- Trauma Team members based in the Emergency Department are immediately available.
- All other in-hospital personnel are to be present in the ED within 5 minutes of notification.
- Team Members not in the hospital are to communicate with the ED Attending or Surgery Senior Resident within 5 minutes of notification, and to be present in the ED within 20 minutes of request for presence.

Always err on the conservative side when deciding whether or not to call a full trauma team activation (formerly known as trauma code). Senior Surgery residents may state that a trauma code is not necessary “because everyone is here.” Resist this temptation – there are more benefits than extra bodies. Furthermore, all patients who meet criteria for a trauma code will later be reviewed at trauma council. Calling trauma codes on appropriate patients is required as part of our state’s trauma designation.

Pediatric Trauma Codes
Use the Broselow tape for medication doses etc.

<table>
<thead>
<tr>
<th>Color: Color</th>
<th>Gray</th>
<th>Pink</th>
<th>Red</th>
<th>Purple</th>
<th>Yellow</th>
<th>White</th>
<th>Blue</th>
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<tr>
<td>Approx (kg)</td>
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<td>6</td>
<td>8</td>
<td>10</td>
<td>13</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>Approx Age</td>
<td>0-2 mo</td>
<td>4 mo</td>
<td>8 mo</td>
<td>1 yr</td>
<td>2 yr</td>
<td>4 yr</td>
<td>5-6yr</td>
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<tr>
<td>Min SBP (mmHg)</td>
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<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>75</td>
<td>80</td>
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<tr>
<td>Heart rate</td>
<td>100-160</td>
<td>100-160</td>
<td>100-160</td>
<td>90-150</td>
<td>90-150</td>
<td>80-140</td>
<td>70-120</td>
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Patients who are going to need general surgery consultation but do not meet Full Trauma Team Activation criteria may need Modified Trauma Team Activation (formerly trauma code yellow). Criteria:
1. All intubated trauma patients except those with confirmed isolated TBI/GSW to head.
2. All stab wounds injuries to the neck, chest, abdomen, pelvis, or groin.
3. All injuries to the extremities with pulse deficit.
4. Trauma patients with altered mental status (i.e. head injury or intoxication) who require diagnostic evaluation of the abdomen.
5. Combined trauma and burns.
6. Two or more proximal long bone fractures.
7. Amputation proximal to ankle or wrist.
8. Pelvic fractures.
9. Multiple rib fractures, flail chest, hemo-or pneumothorax.
10. Pregnancy > 20 weeks gestation (Fundus at umbilicus if GA unknown).
11. Patients with multisystem injury transferred from other facilities who will likely be admitted.
12. Severe mechanism of injury:
   a. MVC with ejection, death of occupant in vehicle, intrusion > 12 inches into patient compartment or >18 inches any compartment,
   b. Adult Falls >20ft, Child (<15yo) fall >10’ or 2-3x/height
   c. auto vs pedestrian or bicycle with significant impact, MCC > 20 mph or with separation of rider from motorcycle.

The Modified Trauma Team Includes:
ED Attending Physician (based in ED)
General Surgery Senior Resident (R4/5) must see the patient prior to discharge
General Surgery R3: must see the patient within 20 minutes of notification.
Trauma Doc (Based in ED)
Respiratory Care Practitioner
Radiology Technologist (based in ED)
ED Registered Nurses (based in ED)

The General Surgery R3 is critical in managing these patients. Inform him/her as soon as you know a modified TTA patient is on the way. Some general surgery residents may not be interested in hearing about the stable patients until they have had their first set of vitals, first hemoglobin, and trauma series. Err on the side of caution for now, and let them know early. This is mandatory in any patient arriving with penetrating chest injuries, no matter how stable they may seem.

WHEN THE PATIENT ARRIVES:

For trauma codes especially, it is crucial to assemble your team before the patient arrives. Make sure everybody you need is available and everyone
understands their roles. This should be detailed down to the MA who puts the patient on the monitor.

This is the time to tell everybody to stop talking—in a loud voice. Once quiet, briefly outline what you know about the patient and what the plan is: “nobody talk until the report is given, and I have called out my exam.”

Upon patient arrival, stand at the head of the bed and let the Medics or ALNW give their report before you begin talking. Immediate priority should be the primary survey, getting the patient on the monitor, assessing access. Often, the adjuncts to the primary survey can happen simultaneously: blood draw, foley, ABG, etc. The trauma series is important but it should not be called for before the patient enters the room. Often, the docs are pushed out of the way before the primary survey can occur. As interested as we are in the trauma series, it does not come before A, B, C or D.

As part of the primary survey, pay particular attention to the chest (breath sounds, palpate for crepitus), the abdomen (including looking for seatbelt sign), and the pelvis (checking for instability) Do not let more than one physician check the pelvis if there is question of instability.

Call out your exam. Be loud and firm! Never un-sheet a pelvis until the AP pelvis is back and there is no significant fracture. That said, never leave a patient sheeted for prolonged period without examining their perineum and anterior soft tissues (to look for open components, genital trauma, etc.) Don’t take down a traction splint of the femur unless pain meds are on board and ortho is ready to place a Steinman pin. Other types of splints should be removed and replaced with box splints to facilitate radiology.

Restrain and expose early.

Always do the rectal before the foley, and make sure the rectal is done by an MD (I have seen foleys enter the urethra and exit the rectum.)

Do not let a patient leave Resus 2 for CT until the trauma series is read, proper access is obtained, and the patient is deemed stable.

Roll the patient, palpate the spine, and remove the board before they leave for studies.

WORK-UP: Patients with Full trauma team activation

These are the patients you will have the most help with, and the least input in how to manage, so I will not go into much detail. The most important thing is
to keep the room calm, make sure your interns have roles established prior, focus on the primary survey, and keep close tabs on how the work-up progresses.

**The key to caring for these patients is preparation and more preparation!**

Assign roles to all team members; know exactly where each team member will physically be, and who will be able to do what if unforeseen events occur. Who will intubate if the ETT is pulled out? Who will place chest tubes? Who will place a central line? Who will prep the chest? Etc.

Any unstable patient, or patient who at some point was unstable but who has improved, should have the general surgery R3 and R5 at bedside to help decide the immediate work-up. If the patient is stable upon arrival (but was unstable in the field) the primary survey and adjuncts to the primary survey will proceed as usual. In addition to dealing with immediate life threatening injuries (pneumothorax, hemothorax, etc), the R3/R5 will decide how to evaluate the abdomen.

**Evaluation of the Abdomen in Unstable Patients:**

In patients with questionable stability (or the presence of seatbelt sign), this will usually be either a FAST exam or a DPL. If this is positive, the patient will go to the OR. Patients undergoing DPL will need both gastric (OG tube) and bladder (foley) decompression (you should do the OG tube and an intern or nurse should do the foley.) Most patients will get a FAST exam done by a radiologist or EM attending or resident. A positive FAST in an unstable patient should prompt an exploratory laparotomy. A negative FAST exam does not rule out intra-abdominal injury, does not assess for hollow viscous injury, and does not rule out an intra-abdominal source of hemorrhagic shock. Strongly consider a repeat FAST exam if initially negative; alternatively, the patient can have abdominal CT once they have stabilized.
As a general rule, do not allow a patient to leave Resus 2 to go for studies until their vital signs are normal, their trauma series is read, and they are stable. Some would argue a patient should also not go to CT until the urine has been dipped, because in some patients this will determine whether or not to perform delayed renal cuts or CT cystogram. However, if the patient appears uninjured, has a normal trauma series, and has never been hypotensive, he/she probably does not need a foley—they can simply urinate later. Some general surgery R3s will insist on urine prior to CT, however in reality, the radiology resident will protocol the abdominal CT while the patient is on the table. Almost always, some renal abnormality will be seen even without delays if there is a clinically significant renal injury. See below: criteria for delayed renal cuts and cystogram.

Get an ABG on all patients of questionable stability. If the base deficit is > 6, or lactate >4, these patients should get to the ICU early for resuscitation.

**Pediatric Blunt Abdominal Trauma protocol:**

In order to avoid excessive radiation in our pediatric patients the following protocol was developed.
Trauma intubation:
Intubation of NON-CODE Trauma patients (i.e. those patients in which there is NOT a full activation) is shared by anesthesia and emergency medicine on alternating weeks. If you have a trauma patient that is not a full activation trauma who needs to be intubated, please consult the schedule (posted at the charge nurse computer, in the radio rooms and at the big trauma tracking board) to determine who should be called. As always, if a patient needs emergent intubation and cannot wait for assigned service, then the airway should be secured by the first available trained provider. **Anesthesia should be called for ALL trauma codes.**

Massive Transfusion Protocol:
In any unstable patient consider the use of the Massive Transfusion Protocol:

- **Why:** Pre-emptive, to prevent exsanguination and coagulopathy
- **Who:** Consider in patients you anticipate will receive > 4 PRBCs in next 2 hours (30% TBV) and/or > 6 units in next 3 hours (50% TBV)
- **What:** 6 PRBC, 4 FFP, 1 apheresis platelets, 1 pool cryoprecipitate
- **When:** Available in 15 minutes

No need for EHP (emergency hemorrhage panel) results, do not wait.
Then What: Transfuse ALL blood products and then order EHP followed by transfusion of individual components based on EHP.

EHP Goals:
Fibrinogen > 100 mg/dl (1 cryopool increase fibrinogen by 45mg/dl), Platelet count > 75-100k- (1 apheresis platelet increase platelet count 30-60k) 
INR < 1.7 and once fibrinogen > 100mg/cl - transfuse 4 Units FFP.

NEUROSURGICAL EMERGENCIES

Patients who may need emergent craniotomy are “Type A.” Criteria:
● Unequal, or bilaterally dilated (blown) pupils
● Trauma patient with observed neurologic deterioration:
   1. pupillary change, or lateralizing motor signs
   2. posturing (extensor or flexor)
   3. change in mental status not attributable to other causes (ie sedation)
● Transfer patient with known mass lesion (acute SDH or EDH) with “midline shift” or obscured basal cisterns or neurologic deterioration as defined above.

For such patients, call the Herniation Red Phone (910-2743) as soon as you know about the patient. This applies to patients who are not yet arrived as well as ED patients. Make sure images are available for transfer patients.

If NS agrees, a Type A patient can have a typical primary survey followed by head CT and “CT Trauma Series,” a limited CT scan of neck, chest, abd, and pelvis. This expedites transit to the OR with NS. If no crash craniotomy is planned (based on the head CT) then usual CT scans should be done instead.

WORK-UP: STABLE PATIENTS

Intubated patients cannot reveal much on history and physical exam. Thus, their work-up relies heavily on labs and imaging:
1. ABCs, expose, restrain
2. 2 large bore IVs or Cordis
3. Trauma series
4. Trauma labs with ABG
5. Secondary survey (Head to Toe exam)
6. Rectal, Foley, OG or NG tube
7. CT of head, neck, chest, abdomen, and pelvis with reformats of thoracic, lumbar, and sacral spine
8. Plain films of any extremities with evidence of injury (consider filming joint above and below area of injury)
9. Urine dip: if + for blood, send for formal UA
10. Urine tox
Some of these protocols are part of a multi-layered safety net which may not seem to make sense in an individual patient. They are meant to provide an additional tool to identify potentially sick patients when resources are limited and the ED is busy. Unless there is a compelling reason and the decision is discussed and agreed upon by all of those caring for the patient, the general protocols should be followed.

High mechanism but stable and not intubated:

1) ABCs, expose, restrain if altered LOC
2) 1 large bore IV
3) Trauma series
4) Trauma labs, ABG if respiratory distress or questionably unstable
5) Secondary survey (Head to Toe exam)
6) Rectal exam for tone and guaiac
7) Foley if pelvic ring fracture or won’t be able to urinate
8) CT Head if
   a) LOC
   b) altered mentation
   c) intoxicated
   d) amnestic for event
   e) anticoagulated
9) CT Neck if
   a) A head CT is being done
   b) Patient > 65 years old
   c) Known or strongly suspected ICH (intracranial hemorrhage)
   d) Pelvic fracture or multiple extremity fractures
   e) Skull fracture
   f) Major axial loading (i.e. diving accident)
   g) Acute neurologic symptoms (includes paresthesias)
10) C-spine XR if no CT C spine done
11) Chest CT if
    a) abnormal mediastinum
    b) admission is likely
    c) age >65
12) General surgery consult for abdominal diagnostics if
    a) abdominal pain
    b) intoxicated
    c) altered mental status
    d) distracting injury
    e) LOC
    f) evidence of abdominal injury such as seatbelt sign
13) TLS films (not needed if you do reconstructions of T spine from chest CT or L spine from abdominal CT)
14) X-ray extremities with evidence of injury/pain
15) Urine dip: if + for blood, send for formal UA
16) Urine tox

When to obtain a head CT: Have low threshold to obtain head CT if there are signs of significant blunt force to the head, even if no loss of consciousness. In the chaos following a major trauma, it can be difficult for a patient to reliably report whether they lost consciousness. Furthermore, when facial trauma is present, head CT with maxillofacial screen can detect potential facial fractures.

**Harborview Adult CHI Imaging Algorithm**

**CHI and any of the following,**
- GCS ≤ 14
- History of LOC with multi-system trauma,
- Intubated, altered mental status,
- Abnormal neurologic or cognitive exam,
- Intoxicated & evidence of head trauma,
- Suspected skull fracture
- Anticoagulants/Antiplatelet (excluding ASA) & evidence of head trauma,‡
- Evidence of elevated ICP

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**History of LOC and any of the following,**
- Dangerous Mechanism §
- Headache
- Vomiting
- Age > 60
- Drug/alcohol intoxication
- Visible trauma above clavicle
- Seizure
- Amnesia
- Evidence of Concussion (Perseveration, Dizziness, Vertigo)

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**References**
3 - Criteria recommended by HMC Neurosurgery

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When to obtain a CT-Angiogram of the neck:
- Cervical hemorrhage of potential arterial origin
- Expanding cervical hematoma.
- Carotid bruit, patient < 50 years
- Cerebral infarction on CT or MRI
- Unexplained central or lateralizing neurological deficit, TIA or Horner’s syndrome.
- High Energy mechanism with any of the following:
  a) LeFort II or III fracture
  b) Complex mandible fracture
  c) Punctate hemorrhage in the brainstem, corpus callosum, and/or basal ganglia (with GCS < 6)
  d) Cervical spine subluxation
  e) C-spine fractures extending to the transverse foramen
  f) Any fracture of C1, C2 and C3
- Hanging or strangulation resulting in cerebral anoxia (i.e. LOC)
- Skull base fracture involving the carotid canal.

**Evaluation of the Abdomen:** In general, truly stable patients with high mechanisms can either have an abdominal/pelvic CT or be admitted for serial abdominal exams without a CT scan. In a patient who is difficult to examine (i.e. intoxicated or intubated) the CT scan is generally performed. Due to census issues, we rarely admit for serial exams. Possible exceptions are in patients we are particularly concerned with exposing to radiation, i.e. pediatric and pregnant patients. See flow diagram above.

**Evaluation of chest/full spine:**
If the initial CXR has “indeterminate mediastinum” then traumatic aortic dissection is a concern. A “coned mediastinal view” or “CXR in reverse trendelenburg” (these are synonyms) may resolve the issue. If this view remains abnormal, a CT chest (dissection protocol) is needed. Additionally, there is increasing evidence that patients who have multiple injuries and/or are critically ill get to the ICU quicker, and have less missed injuries if they have a chest CT. See flow diagram below:
1. If a CT/CTA of the chest is already indicated for other reasons (eg clearing the aorta) then this algorithm does not apply.
2. No additional imaging required if adequate thoracic spine imaging is already performed (including outside imaging.)

*Approved by Harborview Trauma Council June 2009*
TRAUMA PATIENTS UNDERGOING CT CERVICAL SPINE AND CT OF THE ABDOMEN

Is there a high likelihood that the patient will be admitted (intubated/obtunded, unstable, multiple or complex injuries)?

YES

CT Chest with Thoracic Spine Reconstructions

NO

Is there high suspicion of severe DJD, DISH, Ank Spond Age > 65

YES

Thoracic Spine CT

NO

Thoracic Spine Radiographs

Evaluation of Hematuria:

The radiologist will look at images on the scanner and do delayed renal cuts if indicated. Indications are below, but you do not need to order this separately from trauma CTAP:

**Blunt Trauma**
- Gross hematuria (visibly blood tinged urine)
- Adult with microhematuria (≥ 1+ rbc on dipstick or > 30 rbc / hpf on UA) AND a period of hypotension (systolic < 90 mm Hg).
- Child (< 15 yrs) with ≥ 3+ rbc on dipstick or > 50 rbc / hpf on UA

**Penetrating Trauma**
- Stable patient with any degree of hematuria and injury thought to be near urinary tract.

Order CT-cytogram if:

**Blunt Trauma**
- Pelvic ring fracture AND (≥ 3+ rbc on dipstick or gross hematuria)
- Gross hematuria without pelvic ring fracture: write “CT-cysto if indicated” on the requisition. The radiologist will then do CT-cysto if there is free intraperitoneal fluid within the first 24 hours post injury in the absence of another explanation (such as prior DPL or other intraperitoneal injury by CT)

**Penetrating Trauma**
- Stable patient with any degree of hematuria, penetrating injury of the pelvis, and no indications for exploratory laparotomy

Fractures limited to the acetabulum without obturator ring involvement do not need cystography.

**Low-Mechanism Work-up**

1) ABCs, Secondary survey
2) Roll and palpate TLS spine; remove backboard.
3) CT Head if LOC or altered mental status or anticoagulated
4) C-spine series unless meets Canadian C-spine criteria below; do CT of C-spine instead if major axial load (i.e. diving accident), known traumatic ICH, acute focal neuro symptom, skull fracture, age >65.
5) T spine and/or LS spine films if tender or not examinable or distracting injury.
6) X-ray extremities with evidence of injury/pain
7) Urine dip: if + for blood, send for formal UA. Follow Hematuria work-up described above.

Falls from standing may be “low mech” or may be considered “isolated injury.” Someone who trips and falls, and comes to the ED because their wrist
or ankle hurts, who is examinable and sober, doesn’t need a “low mech” work-up. They just need their specific complaint addressed.

On the other hand, someone who fell and “hurts all over” and/or has altered mental status (intoxication, dementia, etc) has a risk of missed injury and should have a full “low mechanism” workup.

Consider syncope in addition to injuries, for people who have fallen.

The logic is similar for assaulted patients. Someone punched in the eyebrow who comes for sutures, who is sober and didn’t lose consciousness, can just be sutured, and their neck evaluated (see Canadian C-spine rule below.) On the other hand, someone who was knocked to the ground, kicked in the chest or abdomen, or isn’t sure quite what happened, needs a low-mechanism workup (or possibly high mechanism, depending on force/weapons used/number of assailants.) Bike accidents can likewise sound low-mechanism, but the late-night, intoxicated, amnestic bicyclist may have actually been hit by a car.

Patients who are “found down” may have fallen and/or been assaulted. Expand ANY low-mechanism workup to high mechanism if something makes you suspect serious injury is present.

If your low-mechanism work-up identifies an injury that required significant force (such as a 2-column spine fracture), expand to high-mechanism work-up.

Resist the temptation to streamline your work-up because an intoxicated patient is uncooperative or combative. Often with these patients, the precise mechanism of injury is unknown and may be higher risk than initially suspected. If necessary, the patient can be restrained and sedated if it is felt to be medically necessary. Options for sedation include haloperidol, benzodiazepines, and olanzapine (10mg IM).

Clearing the C-Spine

Not every trauma patient needs C-Spine films. However, if you are going to “clinically clear” the c-spine you have to stick meticulously to evidence base. Any patient with a fall, assault, MVC, or visible trauma above the clavicles (laceration, hematoma, contusion) warrants consideration of neck imaging. A widely-accepted, well-validated rule is the Canadian C-spine rule:
For Alert (Glasgow Coma Scale Score = 15) and Stable Trauma Patients Where Cervical Spine (C-Spine) Injury is a Concern

1. Any High-Risk Factor That Mandates Radiography?
   - Age ≥65 Years
   - Dangerous Mechanism*
   - Paresthesias in Extremities
   \[ \text{No} \]

2. Any Low-Risk Factor That Allows Safe Assessment of Range of Motion?
   - Simple Rear-end MVC†
   - Sitting Position in ED
   - Ambulatory at Any Time
   - Delayed Onset of Neck Pain‡
   - Absence of Midline C-Spine Tenderness
   \[ \text{No} \] \[ \text{Radiography} \]

3. Able to Actively Rotate Neck?
   - 45° Left and Right
   \[ \text{Able} \] \[ \text{No Radiography} \]

*Dangerous Mechanism:
- Fall From ≥1 Meter/5 Stairs
- Axial Load to Head, eg, Diving
- MVC High Speed (>100 km/hr), Rollover, Ejection
- Motorized Recreational Vehicles
- Bicycle Collision

†Simple Rear-end MVC Excludes:
- Pushed Into Oncoming Traffic
- Hit by Bus/Large Truck
- Rollover
- Hit by High-Speed Vehicle

‡Delayed:
- Not Immediate Onset of Neck Pain

Clearing the Pediatric C-Spine

In **high-mechanism** trauma, c-spine imaging is needed: either plain films or CT. We try to avoid CT of the c-spine in children because they are more affected by excess radiation than adults – particularly those younger than 5. Most injuries in patients age 8 and younger occur at C3 or above, whereas injuries in those older than age 8 occur most often at C5-6. The following describes how to image the c-spine in children **who need a head CT anyway**:

**AGE 4 & YOUNGER:**
- Head CT will include from C-2 through vertex
- AP and Lateral C-spine radiographs only

**AGE 5 - 8:**
- Head CT will include from C-2 through vertex
- AP, Lateral and Odontoid radiographs only

**AGE 9 & OLDER:**
- Follow adult protocol

In **low-mechanism trauma**, films may not be needed. The Canadian c-spine rule was not validated for children and cannot be applied to them. There is no consensus in the literature. Most authors advocate applying the Nexus criteria (no midline cervical tenderness, no painful distracting injury, no altered LOC, no focal neuro deficits, and no evidence of intoxication) along with the child’s ability to cooperate and communicate exam findings as the basis of the need for films. This is reflected in the table below.

Children have a lower incidence of cervical spine injuries but a higher incidence of spinal cord injury compared to adults. This is because of the size of the child’s head relative to their bodies as well as lack of development of the bony structures of the spine. For this reason, the neurologic examination is essential in detecting spinal cord injuries despite negative plain films or CT scans (see section on SCIWORA below.)
### Summary of indications for radiologic evaluation of the cervical spine

<table>
<thead>
<tr>
<th>Radiologic study</th>
<th>History and physical</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Low risk mechanism of injury, and</td>
</tr>
<tr>
<td></td>
<td>No distracting pain or injuries, and</td>
</tr>
<tr>
<td></td>
<td>Awake and able to verbalize and cooperate with exam, and</td>
</tr>
<tr>
<td></td>
<td>No mental status changes, and</td>
</tr>
<tr>
<td></td>
<td>No neck pain or limitation of movement, and</td>
</tr>
<tr>
<td></td>
<td>No neurologic deficits</td>
</tr>
<tr>
<td>Lateral, AP, odontoid films or CT scan</td>
<td>High-risk mechanisms of injury, or</td>
</tr>
<tr>
<td></td>
<td>Multiple system trauma with severe injuries, or</td>
</tr>
<tr>
<td></td>
<td>Other pain or injuries that distract the patient, or</td>
</tr>
<tr>
<td></td>
<td>Injury above the clavicles, or</td>
</tr>
<tr>
<td></td>
<td>Altered mental status after head trauma, or</td>
</tr>
<tr>
<td></td>
<td>Unable to verbalize or cooperate with the examination, or</td>
</tr>
<tr>
<td></td>
<td>Pain on the top of the head, or</td>
</tr>
<tr>
<td></td>
<td>Neck pain, tenderness, or deformity, or</td>
</tr>
<tr>
<td></td>
<td>Acute neurologic deficit, especially paresthesias, or</td>
</tr>
<tr>
<td></td>
<td>Limitation of neck movement</td>
</tr>
<tr>
<td>CT</td>
<td>Lower C-spine not visualized on plain films, if indicated, or</td>
</tr>
<tr>
<td></td>
<td>Abnormal or suspicious C-spine on plain films, or</td>
</tr>
<tr>
<td></td>
<td>Suspicion of injury despite normal radiographs</td>
</tr>
<tr>
<td>Flexion-extension films</td>
<td>Normal C-spine films, and</td>
</tr>
<tr>
<td></td>
<td>No neurologic deficit referable to C-spine, and</td>
</tr>
<tr>
<td></td>
<td>Continued neck pain, tenderness, or muscle spasm, and</td>
</tr>
<tr>
<td></td>
<td>Able to actively flex and extend neck for the examination</td>
</tr>
<tr>
<td>MRI</td>
<td>Most patients with associated neurologic symptoms and patients who have normal C-spine films with lingering suspicion of neurologic injuries</td>
</tr>
</tbody>
</table>
Excluding Ligamentous Injury in Awake Patients

If a trauma patient experiences midline pain over the cervical spine despite normal radiographs, one must consider ligamentous injury. Options to evaluate for ligamentous injury include flexion/extension films in the ED (requires presence of physician, and the patient has to be able to flex/extend actively without pain), follow up flex/ext film in one to two weeks in the Ortho Spine clinic or PCP (patient must leave with a rigid collar), or MRI. MRI is the test of choice if you suspect an unstable ligamentous injury or cord contusion.

Significant ligamentous injury or SCIWORA (see below) is a particular concern in pediatric patients with high mechanism and significant neck pain.

Excluding Ligamentous Injury in Obtunded Patients

Without a reliable clinical exam, this is difficult. Even with normal films, leave obtunded patients in their collar until they are awake. Re-evaluate prior to discharge (i.e. the patient needed to sober up) or leave it to the inpatient team.

SCIWORA (Spinal Cord Injury without Radiographic Abnormality)

SCIWORA: neurologic symptoms attributable to the spinal cord, following trauma, with normal plain films and normal CT. The symptoms may be transient, typically paresthesias or weakness. The onset may be delayed after the trauma, even days later. If a patient has such symptoms, they may need an MRI. Lesions visible by MRI include cord contusion, ligamentous injury, disk herniation, and epidural hematoma. If the patient has difficult to explain neurologic symptoms or an exam that does not make sense, consult Neurology to help determine what, if any, further work-up is needed.

Evaluating the Thoracic and Lumbar Spine

There are no published decision rules on how to clinically clear the thoracic and lumbar spines in trauma. Generally, if there is a high mechanism, the entire spine should be radiographically cleared. If the patient is receiving a CT of the chest, abdomen and pelvis, the images can be reformatted to look at the spine so plain films will not be necessary. Some physicians will argue that if the patient does not have mid-line tenderness when rolled, even in high risk mechanisms, they do not need radiographs of their spine. This approach has not been validated by clinical studies.
In patients with low mechanism, plain films of the thoracic and lumbar spines are only necessary if, when rolled, the patient has significant bony pain, or an obvious step-off.

All patients can be removed from the backboard once they arrive in the ED. Keep everyone in full spine precautions (flat, supine) until you clear their spine clinically (palpate --> clear) or radiographically (films are negative.)

Other Spine Considerations

For any vertebral fracture other than transverse process(es), call the spine pager. Coverage of the spine service alternates between Orthopedics and Neurosurgery.

Presence of any vertebral fracture mandates imaging of the entire spine. If a vertebral fracture is noted on plain films, the area should be further evaluated by CT.

Calcaneal fracture should trigger hip and spine films.

Isolated transverse process fractures are low risk and do not require intervention. The spine service does not need to be consulted for any transverse process fracture.

FACIAL TRAUMA

In any patient with facial trauma, particularly if they sustain fractures, careful attention should be paid to the cranial nerve and ophthalmologic exam. Orbital floor (“orbital blowout”) fractures are associated with ocular injuries about 24% of the time. Sometimes lids are too swollen to examine the eye, but do make a real effort to hold the lids open to check vision and EOM. Lid retractors are available in the ED.

If there are facial fractures other than isolated orbital wall, consult craniofacial service. It is their responsibility to consult Ophtho if needed.

For isolated orbital wall fractures, consult Ophtho if:

1. Patient is comatose (emer gent consult if retrobulbar hemorrhage, proptosis, abnormal pupil, or optic canal fracture)
2. Decreased visual acuity
3. New onset complaints of decreased vision, diplopia (double vision), floaters, or flashes of light.
4. Obvious motility deficit of affected eye in isolated field of gaze, especially if associated with nausea and vomiting.
6. Obvious proptosis/retrobulbar hemorrhage.
7. Abnormal/asymmetric pupil exam.
8. Inability to manually open eyes for adequate vision acuity and exam
9. Eyelid margin and canalicular lacerations.
10. Pediatric patient

Non-specific orbital pain in the setting of trauma, in the absence of one of
the above criteria is not in and of itself an indication for emergent
ophthalmology consultation.

Always palpate the mandible and inspect the mouth looking for dental
avulsion (tooth is gone), luxation (tooth is displaced forward, backward, or
up into gum), subluxation or concussion (tooth is loose), or fractures (of
crown, root, or alveolar bone—diagnosed by films.) OMFS should be
consulted if any of the above is noted. If malocclusion, mandible deformity,
or significant mandible pain are noted, a fine cut maxillofacial CT should be
obtained.

If a tooth is missing and the patient has it handy, replace it immediately into
the socket. If the patient is obtunded or intubated, examine films to look for
a swallowed or aspirated tooth.

If there is a frontal skull fracture that involves the sinuses, Neurosurgery
should be consulted. This is considered an open fracture and antibiotics
(Unasyn) should be given.

Obtain Maxillofacial CT if you are concerned about the mandible
(malocclusion, deformity, significant pain.) If these are not present, CT
Head with Facial Screen is sufficient. A full max/face CT will be done if
fractures are seen by the radiologist.

All mandible fractures (except condylar) are considered open and require
tetanus and antibiotics (Clindamycin 900mg IV is one option.)

A more detailed discussion of Facial Trauma is on the HMC website:
hmced.org. Go to Trauma Care > Special Circumstances > Facial Fractures.

PELVIC FRACTURES

A more detailed discussion of pelvic fractures and set-by-set guide to
sheeting the pelvis on the HMC website: hmced.org. Go to Trauma Care >
Special Circumstances > Sheeting the pelvis.

If a patient arrives with known or suspected pelvic fracture and is sheeted,
don’t remove the sheet until after x-rays. If pelvic fracture is confirmed and
equipment is ready to replace the sheet, take the sheet down and inspect the perineum and buttocks before replacing it.

Do not place a foley if there is blood at the urethral meatus, scrotal hematoma, or perineal hematoma. These patients need a RUG (retrograde urethrogram) first.

In unstable patients with pelvic fractures, control of hemorrhage requires interventional radiology. Make sure access is adequate, serial hemoglobins are done, type and cross is done, and call IR early. The general surgery team will likely use DPL or FAST to make sure there is no concomitant intra-abdominal injury before going to angio.

FEMUR FRACTURES

NEVER take a patient with a femur fracture out of traction unless pain meds are on board AND Ortho is set up and ready to place a Steinman pin. Removing traction splints for improved radiographs is not acceptable. A femur fracture not in traction will not only lead to possible blood loss but will cause significant pain.

If a femur fracture is known or suspected, a portable AP knee film should be taken along with the trauma series. This will identify distal femur or knee fractures that could potentially contraindicate pin placement. Usually, between the AP pelvis and the knee film, femur fractures can be confirmed.

In the patient who is borderline stable, the general surgeons may elect to postpone Steinman pin placement to obtain further studies. In such cases, at the very least, the affected leg should be placed in a box splint to prevent further movement and maintain in a neutral position. Hare splints can be obtained from Medics and are preferable to box splints.

All femur fractures require prompt Orthopedic consultation, and all attempts should be made to have traction pins placed prior to lengthy imaging studies. All patients with femur fractures should have ABIs performed.

MRI POLICY

Many patients linger in the ED waiting for an MRI. Sometimes the decision to admit or not admit, or choosing an admitting service, hinges on the result. Also, admitting services have learned that MRIs happen quicker for ED patients than floor patients. To address this inefficient use of resources the following policy is written:
1. If the patient has an emergent problem that falls into the established and agreed-up guidelines for emergency MR (see below), the study will be obtained within that time irrespective of location.

2. If the patient is being admitted and does not fall into the established guidelines for an emergency MR
   a. Neurosurgery/neurology determine the MR is needed and place the order
   b. Order is scheduled in radiology and noted as a ED-sourced order. This will be prioritized above routine MR exams already on the schedule.
   c. Patient is then admitted to the appropriate unit irrespective of whether the MR has been obtained.
   d. Patient will come back to MR from the floor/unit with the unit nurse/stat nurse monitoring. The admitting service will write the sedation orders if needed.

3. The goals are
   a. Perform the MR on these patients within 8 hours of the order/requisition being received in radiology.
   b. Send the patient and patient’s family to the admitting unit as rapidly as is feasible.

### Indications for Emergent MRI

<table>
<thead>
<tr>
<th>Indication</th>
<th>Time Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute appendicitis in a pregnant woman</td>
<td>within 1 hr</td>
</tr>
<tr>
<td>Acute aortic dissection (thoracic or abdominal) and unable to go to CT</td>
<td>within 30 minutes</td>
</tr>
<tr>
<td>Acute stroke needing clarification (initial stroke imaging is CT)</td>
<td>5-10 minutes</td>
</tr>
<tr>
<td>Acute cord compression non-traumatic</td>
<td>within 1 hr</td>
</tr>
<tr>
<td>Acute cauda equina syndrome</td>
<td>within 1 hr</td>
</tr>
<tr>
<td>Cord injury-traumatic requiring operative reduction</td>
<td>within 30–60 minutes</td>
</tr>
<tr>
<td>Deteriorating cord function under observation</td>
<td>within 30 minutes</td>
</tr>
<tr>
<td>Ankylosing spondylitis/DISH with neurologic deficit</td>
<td>within 1 hr</td>
</tr>
<tr>
<td>Ankylosing spondylitis DISH without neurologic deficit</td>
<td>within 4 hours</td>
</tr>
<tr>
<td>Possible epidural abscess with cord dysfunction</td>
<td>within 1 hr</td>
</tr>
<tr>
<td>Possible epidural abscess with back pain</td>
<td>within 4 hours</td>
</tr>
</tbody>
</table>

Notes: Patients with neurologic/spinal indications need to be seen by neurology, neurosurgery, and/or ortho spine prior to scheduling to facilitate accurate anatomic localization. All emergent patients must be discussed with a radiologist prior to scheduling.
**Necrotizing soft tissue skin infections:** these patients are by definition very ill and their care needs to be prioritized. Harborview is a major referral center for NSTI’s therefore we get a number of transfer patients with this diagnosis either confirmed or suspected.

In addition to your typical sepsis care; the following antibiotics should be given:
- Clindamycin: 900-1200 mg IV
- Gentamycin: 5 mg/kg IV (Cipro 400 mg IV if Creatinine elevated)
- Penicillin: 4 million units IV
- Vancomycin: 2 g IV (if >70 kg) and 1.5 g IV (if <70 kg)

**DISCHARGING PATIENTS**

Be exceptionally cautious if you discharge a patient transferred from another facility (especially if long distance) or Airlifted. Often, these patients have been sent specifically for subspecialty evaluation. Especially at night and on weekends, the patient is only seen by an intern or junior resident, not by the subspecialty attending. While consult services may feel admission is not warranted, a brief admission to address pain control, exact management plan, scheduled follow up, and safe transportation home may best serve the patient.

Before discharging a patient, be sure to address pain meds, antibiotics, dressing changes, and suture removal. Aftercare Clinic appointments are available (scheduled by the back desk) and can address short-term follow-up for patients **without a PMD** (i.e. suture removal, dressing changes, wound checks, blood pressure checks, repeat of abnormal labs, etc.) Patients who simply need primary care should be given the list of low-cost community clinics as Harborview primary care clinics are full. Check the intern’s documentation to make sure the full discharge plan is documented there.

For all discharging patients, use FirstNet to generate (1) a discharge form for them to sign and (2) prescriptions. A list of community clinics (for patients who don’t have primary care) is available under “patient education.”

Whenever possible, insert discharge instructions (pencil icon next to “patient education.”) If there is no appropriate instruction in FirstNet, look for some in Micromedex Aftercare instructions (link from Healthlinks) or patient education sections of MD Consult or UpToDate. You can also free-text instructions under the discharge diagnosis.
Phone Follow-ups. If you are worried about a patient you are discharging, have Val, our RN, call them the next business day. You flag this in FirstNet under “ED disposition” → Follow-up needed → “yes.”

Vital signs. Any abnormal vital signs must be re-checked and documented prior to discharge. You also need to document resolution of signs or symptoms that may prevent a safe discharge (i.e. ataxia, delirium, vomiting).

Nursing. Inform the nurse when the patient is ready for discharge instructions. He/she may have additional things to check before the patient actually leaves. Patients’ IVs are removed before they leave.

Patients discharged to the Jail require a copy of their ED visit note to go with them. Other patients may NOT get a copy even if they ask; they must call medical records for a copy. Jail patients should not get a specific follow-up date – recommend a particular clinic only, and the staff at jail will schedule.

AMA discharges: patients who are alert, oriented, and logical may sign out AMA. Keep your discussion with them non-confrontational and focus on their well-being. Have them sign the AMA form and invite them to return at any time. Patients who are intoxicated with drugs or alcohol, disoriented, suicidal, or on legal or psychiatric holds may not refuse care. Use restraints and/or sedation as needed to facilitate medical treatment. Discuss all AMA discharges with the attending prior to discharge. Inform the attending of all patients trying to elope. If you sign a patient out AMA, document how they demonstrated their decisional capacity. If you restrain a patient, document why they lacked decisional capacity (intoxication, acute brain injury, etc.)

Discharge Meds: From 0830-1930 weekdays, 0900-1800 Saturdays, the patient can take their prescriptions to outpatient pharmacy. After hours, if they want to leave with meds in hand, tube the prescription to the inpatient pharmacy and have them tube the meds back. However, this sometimes takes several hours. A list of 24-hour pharmacies is available. Jail patients do not need meds – just write what they should get in the “plan” part of your write-up.

Social Work: for patients who need referrals for shelters, drug and alcohol treatment, medical respite beds, or taxis. Get social work involved early since their dispositions can take a long time. Taxis are reserved for people who have a legitimate medical problem preventing them from using the bus and no friends or family who can get them. Offer taxis to women leaving alone after dark. Bus vouchers and clothing may be available if needed.
Minors. Patients less than 18 years who are not emancipated cannot be discharged or sign out AMA unless a parent or guardian is present. Notify social work if none is available.

OCCAM: occam.hsl.washington.edu This is a good resource for trauma protocols at Harborview.