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Preface

The Faculty and Staff of the Trauma Program at the University of Kentucky Hospital are pleased to present the new Trauma Protocol Manual 2011. This latest revision has been updated and expanded to include more resource material relevant to the variety of disciplines involved in the care of the multi-injured trauma patient. The UK Trauma Program strives to deliver timely and effective care to the injured patient utilizing evidence-based guidelines and protocols. This manual outlines expectations and standards of care appropriate for Level 1 Trauma Center designation.

To further enhance trauma care internally and in our service region, the Trauma Protocol Manual will be published on-line via the Department of Surgery Website, the Trauma Program Website and the University of Kentucky CareWeb. These sites may be accessed at the web addresses listed below. New and/or updated protocols/guidelines will be posted on the website. The UK Trauma Program recommends periodic review of the site to monitor for latest revisions. The protocols/guidelines are formatted so that they may be downloaded and printed. Hardcopies are available in the Trauma Program Office (H213) or by calling 859-323-5022. Faculty and house staff may obtain CD version by contacting Trish Cooper (3-5037) in the Trauma Program Office.

Please direct inquiries to Lisa Fryman, RN, Trauma Nurse Coordinator/Program Manager at 859-257-1231 or lisa.fryman@uky.edu. Specific protocol discussion may be directed to Faculty by calling 859-323-6346.

Dept of Surg, Trauma & Critical Care: www.mc.uky.edu/surgery/General/trauma.asp
Trauma Program: www.mc.uky.edu/TraumaServices
University of Kentucky CareWeb: www.hosp.uky.edu/careweb
SECTION 1: INTRODUCTION

BLUE SURGERY (TRAUMA/EMERGENCY) SERVICE

INTRODUCTION:
The Blue Surgery (Trauma/Emergency) rotation is sponsored by the Division of General Surgery, Section of Trauma and Critical Care. The length of the rotation depends on the year of post-graduate training. The rotation is designed specifically to provide all residents with experience and didactic knowledge in comprehensive care of the injured adult (> 15 years of age) and adults requiring emergent general surgical intervention.

ROTATION OBJECTIVES:

1. Provide clinical experience, instruction, and knowledge in the initial assessment/evaluation, resuscitation, surgical intervention, and management of all injured adults.

2. Provide clinical experience, instruction, and knowledge in the initial assessment/evaluation, resuscitation, surgical intervention, and management of adults with emergent general surgical illness and/or requiring emergent surgical intervention.

3. Provide clinical experience, instruction, and knowledge in the management of critically ill patients.

ROTATION REQUIREMENTS:

I. Patient Care Responsibilities

A. Trauma Patients*
The majority of trauma patients are admitted via the Emergency Department (ED). There will be direct inter-facility transfer of injured patients from referring the referring hospital to the ICU or floor. Occasionally, direct admits to the OR will bypass ED evaluation. Trauma patients can present as a referral from another hospital and physician, direct from the accident scene via helicopter (scene call), or unannounced by ground ambulance from Fayette County or the surrounding county EMS.

*Refer to attached "Trauma Admission Policy"

Trauma Expect: Patients referred and accepted by the trauma service from another hospital (ground or air transport) are considered trauma expects. Trauma expects can be referred for EM evaluation. Unless referred for EM evaluation, the Trauma/emergency surgery residents are immediately responsible for supervision of trauma expect patient care upon that patient's arrival in the ED.

Local EMS Transports: Patients transported by local EMS providers become the responsibility of the Trauma/emergency surgery residents by one of two mechanisms:

1. Trauma consult called by the ED
2. Trauma Alert* called by ED.

*The Trauma Alert system is discussed below under a separate heading.
Initial assessment and evaluation of the multiply injured patient should proceed according to ATLS protocol. A review of your ATLS provider manual is highly recommended. Resident roles and responsibilities during the initial evaluation are outlined in the attached documents. Role assignment is pre-designated depending upon experience, skill proficiency, and resident knowledge base. The chief surgical resident in house (PGY4 or PGY5) assumes responsibility for the timely evaluation, management, and disposition of the trauma patient. This responsibility also includes the timely notification of the attending physician. Patient disposition should be determined within 60 minutes of ED admission. The entire diagnostic evaluation/disposition should not exceed 120 minutes. Should it become obvious at any point during the initial evaluation that the patient will require surgical intervention, it is imperative that the OR be contacted immediately. A surgical resident will accompany hemodynamically unstable patients outside the ED for all diagnostic procedures (i.e., CT scan, angiography, etc.). Physicians are not required to accompany “stable patients”. It is the responsibility of the ED nursing staff to insure that all trauma patients will be accompanied by an RN during procedures done outside the ED. There is a policy that governs the RN responsibilities for transport.

1. Trauma Alert System
The trauma alert notification system was designed to provide rapid and efficient mobilization of personnel and resources essential for resuscitation, evaluation, diagnosis and treatment of the multiply injured patient. The trauma alert system is divided into three levels in order to maximize the efficiency resource allocation.

**Trauma Alert**
A trauma alert will be called based on the outlined mandatory and/or potential criteria (see attached document). Patients receiving a trauma alert may be arriving via ground ambulance, air medical transport, or could be present in the ED and experience an acute deterioration in condition.

**Trauma Alert Red**
A second level of trauma alert called ‘Trauma Alert Red’ is present in order to provide immediate OR access for patients that have a high likelihood of requiring emergent life-saving surgical intervention. ‘Trauma Alert Red’ is reserved for injured patients with a prehospital report of hypotension following blunt injury and for patients who have sustained penetrating injury to the neck, thorax and/or abdomen. An operating room will be held for 30 minutes after the trauma alert red has been called. The chief surgical resident is responsible for the decision to release the OR suite as soon as possible after patient arrival.

**Trauma Alert Rotation**
Responsibility for trauma alert resuscitations will alternate weekly between emergency medicine and the trauma/emergency surgery service. The rotation schedule will be printed each month. When emergency medicine is supervising trauma alerts, only a senior surgical resident needs to attend the alert. This will allow the surgery team to be available in cases where immediate surgical intervention is required. This rotation applies only to trauma alerts. The trauma team will respond to all trauma alert reds and to all pediatric trauma alerts.

2. Trauma Labs
There is a document outlining laboratory values that will be ordered when ordering trauma labs. A trauma panel is available. The labs ordered are based on the severity of the injuries. Blood Alcohol and urine drug screens are mandatory. Any questions regarding the necessity for additional lab values should be clarified with the chief surgical resident and communicated to the nurse. Refer to policy on trauma labs in the ED Policies/Procedures Section.
3. Documentation

**Trauma Admit Form**

The trauma admission form is to be completed **IN FULL** on **ALL** injured patients admitted to the trauma service or receiving consultation from the trauma service. This includes **ALL ED and OPERATING ROOM MORTALITIES**. Critical errors and frequently missing data are as follows:

1. Injury time.
2. Loss of consciousness.
3. Laboratory results including ETOH and urine drug screen results.
4. Procedures.
5. Primary diagnosis in detail (MVC is not considered an adequate medical diagnosis and will not be accepted).
6. Trauma service admitting attending physician. The trauma attending on service not the on-call attending physician should be listed as the admitting physician.
7. Referring physician and referring hospital.
8. For aeromedical scene work, the county where the scene work occurred.

The trauma admission form, upon completion, will be added to the medical record. This precludes writing an admission narrative H&P. The original goes to the patient's medical record. The yellow copy should be placed in the Trauma Coordinator's mailbox in the general surgery corridor. Any missing trauma admit forms are the responsibility of the chief surgical resident on-call that day. Any trauma admission form submitted incomplete will be returned to the chief resident for completion within 24 hours. Missing data elements will be noted for completion. **THE TRAUMA ADMIT FORMS SHOULD BE COMPLETED IN LEGIBLE ENGLISH.**

Documentation should not stop with the completion of the trauma admission form. Any and all significant changes in patient condition while in the ED should be documented completely and legibly in the medical record.

**Daily Census**

A daily census will be the responsibility of the off-going chief resident and his/her team. Updated census information should be complete for morning rounds. All patients admitted to or consulted by the service should be represented on the census. ED and OR mortalities should be listed on the weekly M&M list.

**Procedure Documentation**

All procedures (deep lines, chest tubes, arterial lines, intubation, DPL, LP, cutdown, etc.) should have a procedure note completed in SCM in detail.

a. The attending physician will be notified prior to performing a procedure. We realize there are emergent situations that necessitate immediate performance of procedures that would preclude prior attending physician notification.

b. Procedure notes should be completed for all procedures regardless of whether the attending is present or absent. Procedures such as Intubation, bronchoscopy, Groshong catheter removal, suture of lacerations, etc. should be documented. These procedure notes are used to provide necessary and complete documentation in the medical record for procedures performed.
c. All procedures performed in the ED by trauma service residents should have a note completed. There has been some confusion about procedures performed in the Emergency Department after hours and on weekends. The supervising attending physician for emergency department patients is the attending surgery physician listed on the call schedule not the blue surgery attending on the service. There are occasions when the blue service attending is present after hours and on weekends and should be listed as the supervising physician. The latter circumstances should be obvious.

A brief written note should appear in the progress notes that documents the procedure and indicates that a more detailed note will follow. For all procedures the following information must be provided:

- Name:
- Diagnosis:
- Reg Number:
- Indication:
- Date of Procedure:
- Resident Surgeon:
- Location:
- Attending Surgeon:
- Service: (performing the procedure)
- Preparation:
- Anesthetic:

**Progress Notes and Medical Chart Documentation**

Please remember that the medical chart is a legal document. Think before you write. Do not ventilate disagreements in the medical record. The attending faculty assumes the liability for your actions and your words. Daily progress, as well as any and all acute changes in patient condition should be documented in the chart completely, accurately and legibly with the appropriate date and time.

**4. Trauma Admission Orders**

Computer trauma order sets **ARE TO BE USED FOR ALL** trauma service patients. There are formatted order sets for 1) ICU admission, 2) Mechanical Ventilation, 3) Admission to the FLOOR, and 4) TRANSFER from the ICU to the FLOOR. REMEMBER, PATIENT ADMISSION AND/OR TRANSFER CANNOT PROCEED WITHOUT COMPLETED ORDERS. PLEASE INSURE THAT ORDERS ARE COMPLETED IN A TIMELY FASHION.

**B. General Surgical Emergency Patients and UKMC Inpatient Consults**

The vast majority of emergency general surgery patients are admitted via the UK Emergency Department (ED). Occasionally, there will be direct inter-facility transfer from referring hospitals to the ICU or floor that will bypass ED evaluation. Emergency general surgery patients present either as:

1. A referral from another hospital and physician. *Trauma/Emergency Surgery residents are immediately responsible for supervision of general surgery referrals accepted from another hospital upon that patient’s arrival in the UK ED.
   * Patients accepted in transfer by other general surgery services (Green and Gold) or Green and Gold patients that present in the ED for evaluation are and remain the primary responsibility of the Green or Gold Surgery service chief resident.

2. A consult from the ED attending. The Trauma/Emergency Surgery service is responsible for the evaluation of ALL general surgery UK ED** consults.
**The Trauma/Emergency service should and will evaluate all ED general surgery consults. After 6:00 am and before 5:00 pm, it is permissible to triage appropriately to other general surgery services (Green and Gold) but only after appropriate evaluation and reasonable diagnostic possibilities have been established. The Blue surgery attending must approve the transfer. The triage or transfer of service should be arranged between the chief surgical residents and/or between service attendings not between junior house officers.

During regular working hours (8:00 am to 5:00 pm, Monday through Friday), all ICU surgical consults and in house UK emergency consults (including emergent Kentucky Clinic consults) are the responsibility of the Trauma/Emergency Surgery service. After regular working hours and on weekends, in-house UK or in-house VA emergency general surgery consults and VA ED consults are not the responsibility of the Blue Surgery service residents. These patients are the responsibility of the General Surgery ESS resident. The only exception to these rules is elective general surgery consults directed specifically to one of the Blue (Trauma/Emergency) Surgery attendings.

The chief surgical resident in house (PGY4 or PGY5) assumes ultimate responsibility for the timely evaluation, management, and disposition of all general surgery emergency patients. This responsibility also includes the timely notification of the attending physician.

**NOTIFICATION OF CONSULTANTS**

Consultant(s) evaluation is frequently required for the complete evaluation and treatment of the multiply injured patient. Timely consultant notification and patient evaluation are necessary to minimize emergency department length of stay and to insure high quality patient care. The Section of Trauma and Critical Care has established the following guidelines. We expect the Trauma/Emergency Surgery service residents to adhere to these guidelines. Consultants should be notified promptly following completion of the secondary survey (<20 minutes after patient arrival) or sooner if their services are required (acute neurosurgical, face team, cardiothoracic, or orthopedic intervention). Consultants should respond to a page within 10 minutes. Consultants should be present for patient evaluation within 20 minutes of notification. Consultation should be performed by an upper level resident (PGY2 or higher) or faculty. Interns should not be notified for ED patient evaluation unless all other members of the consultant team are involved in priority patient care that precludes their presence.

**TRAUMA SERVICE WARD**

A single geographic location for all trauma patients will improve patient care, facilitate rounds, reduce phone calls, and reduce housestaff workload. Fifth floor west has been designated as the trauma/emergency surgery service ward. Overflow will be to the designated Orthopedic trauma ward on 5 South. Patients with multi-system trauma and significant or predominant orthopedic injuries should be admitted to 5 South. The admitting office is aware of the trauma service ward but may need prompting or direction for admission to 5 West and 5 South.

**ADMISSION OFFICE NOTIFICATION POLICY FOR THE BLUE SURGERY SERVICE**

The decision regarding hospital admission, level of care (ICU, floor, telemetry), and admitting service can be made rapidly (<20 minutes) for the vast majority of patients. With the exception of patients taken directly to the OR, the trauma/emergency surgery service will insure that the admitting process is initiated at the completion of the secondary survey or within 20 minutes of patient arrival. Admitting office notification should occur as soon as possible for a patient taken directly to the OR. Prompt notification of the admitting office will allow bed hunting/assignment to proceed simultaneously with ED evaluation thereby avoiding needless bed assignment delays. A working diagnosis, sex, and hospital area (ICU, telemetry, floor, etc.) are all the information needed to initiate a bed search. Once a bed has been assigned and before the patient is transferred from the ED, admitting must have the patient's name and the name of the admitting service attending
physician. Admitting office notification can be accomplished in one of two ways: 1. You may give a verbal order to the ED nurse caring for the patient; or 2. You may enter the information directly in the computer. Do not call admitting because this is time-consuming and inefficient!

II. Call Coverage Responsibility

Call coverage teams will consist of Senior Surgical Resident (PGY 4 or 5), a midlevel surgery resident (PGY2 or 3), and an intern. Night call and work hours will conform to the ACGME work hours and night call standards. During some months additional senior, midlevel and first year residents (EM, Pulmonary, Anesthesia, OB/GYN, PM&R, Family Medicine) will rotate on the service. These additional resident resources will be integrated into the service to provide additional coverage in compliance with ACGME work hour standards.

A. Referring Physician Calls
Receiving referring physician calls is a necessary part of resident education. Calls from a referring physician (including UKMDs) are the responsibility of the chief resident (PGY 4 or 5). Any other resident or intern receiving such a call should immediately forward the call to his/her chief resident.

The chief resident should gather the following information:
1. Physician/referring hospital name
2. Patient name/age
3. Chief complaint/mechanism and time of injury
4. Preliminary diagnosis
5. Vital Signs including EMV and fluid volume administered.
6. Mode of transport/ETA.

During the initial discussion with the referring physician, the chief can and should make appropriate recommendations and suggestions regarding patient care prior to transport in order to ensure optimal transfer (e.g. additional IV access, immobilization, splinting, mode of transport - ground vs air medical).

After accepting patients for transfer*, the chief surgical resident will notify ED triage and relay the following information on all expects:
1. Patient name/age/sex
2. Referring Physician and Hospital/ETA
3. Residents to be paged on arrival and pager number
4. Patient history/chief complaint
5. Specific diagnostics/interventions to be prepared

*The air medical dispatcher will contact ED triage for all patients being transported by the air medical service.

Referring physicians should be treated in a polite and courteous manner. REMEMBER THAT THEY ARE ASKING FOR OUR ASSISTANCE. MANY REFERRING HOSPITALS DO NOT HAVE THE RESOURCES TO CARE FOR THESE PATIENTS. ALL patients referred by an outside physician are to be accepted in transfer by the chief surgical resident unless otherwise instructed by the Trauma/Emergency surgery service attending on call (NO EXCEPTIONS).

B. ICU Call
Primary ICU calls for Blue Surgery Service patients are the responsibility of the PG2 or PG3 on call. The Critical Care Nursing Staff have been instructed to direct all calls to the PG2 or PG3 on call. Interns receiving ICU calls will refer them to an upper level resident.

C. Floor Call
Primary floor calls are the responsibility of the Blue Surgery Intern on call. Questions or problems regarding floor patients should be directed to the chief surgical resident on call.
III. Patient Rounds

Patients rounds should occur twice daily on all Trauma/Emergency Surgical Service patients and consults.

A. Morning Rounds
The chief surgical resident assumes primary responsibility for the timing and conduct of rounds. In general, daily morning rounds begin at 6:00 am (7:00 am on weekends) in the Trauma ICU unless otherwise notified. Residents from each call team are to be present for rounds. Given that this is not always possible; a resident from each of the call teams should be present so that information transfer occurs in an orderly fashion. The intensivist (Surgical Critical Care) residents will make AM ICU rounds with the Blue Surgery Service.

B. Attending Rounds
Daily attending rounds will arranged between the faculty on service and the senior surgical residents. Residents should present patient information in a clear, concise, and detailed format facilitating the completion of rounds in a thorough but timely fashion.

C. Discharge Planning Rounds
Discharge planning with the Trauma Case Manager will occur Monday through Friday at 9:30am in physician dining area. These rounds are mandatory for the surgical intern on-call. These rounds are multidisciplinary, facilitate patient care, and insure timely patient discharge. The rounds will be done in conjunction with the orthopedic trauma service case manager and social worker.

IV. Patient Discharges and Service Transfers

A. Hospital Discharge*
Patient discharge from the hospital should be timely and efficient. This process is facilitated by discharge planning rounds. Timely and cordial interaction with the nursing staff that provide discharge teaching and with the social worker who arranges extended care (i.e. Nursing Home, Rehabilitation, Coma Center, Home Health, etc.) is critical. The Trauma Case Manager will be responsible for coordinating discharge of the multiply injured patients. When patients are identified for discharge, the nursing staff should be notified on the day prior to discharge. Discharge orders and prescriptions will be completed the evening before or by 8:00am on the day of discharge. The following critical errors are often made in patient discharges:

1. Patients are not scheduled for subspecialty appointments prior to discharge (i.e. Neurosurgery, Orthopedics, ENT, Plastics, etc.)
2. Patients are not given adequate supplies or medication**. This is poor patient care, results in unnecessary patient calls, and is unfair to the patient and their family. Please make sure that patients are given adequate medication and supplies to make it to their first clinic appointment. Pre-printed prescriptions should be used.
3. Appropriate labs and X-rays are not being ordered for the first clinic visit.
4. The first blue surgery clinic appointment should be scheduled 2-4 weeks following discharge unless otherwise specified. Not all patients require a Trauma/Emergency Surgery service clinic appointment. Please check with chief surgical resident, attending physician, or case manager before scheduling a follow-up appointment.
5. The attending physician of record for the discharge summary is the attending on service when the patient is discharged from the hospital.

*Please refer to the attached discharge documents and policies in this manual.
**Trauma service residents will not prescribe narcotic pain medications after hours or on weekends. Patients should be instructed to contact the clinic during regular working hours for narcotic pain medications.**

B. Service to Service Transfers
Multiple or single system injury patients can be transferred to an appropriate subspecialty service when they are stable. Coordination of the transfer process is the primary responsibility of the chief surgical resident. The Blue Surgery Service should function as a consultative service after transfer of the patient when consultation is appropriate for good patient care. (See attached Trauma Admission Policy)

V. Clinic Responsibility

A. Trauma/Emergency Surgery Clinics
There is one clinic for the service. The main clinic for the service is Tuesday 8:30 am – 12 noon. Residents are expected to attend in accordance with the resident duty hour restrictions. All patients seen by a resident should be staffed by an attending physician unless otherwise instructed.

B. Clinic Phone Calls
During weekday working hours, clinic phone calls will be referred to the Trauma Case Manager (TCM). It is the Trauma Case Manager's responsibility to triage these phone calls appropriately. Residents will be contacted by the TCM for prescriptions or medication** renewals. If the patient needs to be seen by a physician, the TCM will notify the chief resident and the ED triage nurse. During evening hours and on weekends all patient phone calls will be directed to the Chief surgical resident on call.

**Trauma service residents will not prescribe narcotic pain medications after hours or on weekends. Patients should be instructed to contact the clinic during regular working hours for narcotic pain medications.**

C. Elective OR Scheduling for clinic patients
The Surgical Residents are ultimately RESPONSIBLE for ALL ELECTIVE SCHEDULING OF OR CASES FOR CLINIC PATIENTS.

1. All cases should be posted by completing the OR Case Posting form. The patient name, procedure, estimated time, CPT code, and attending on service at the time of surgery are the necessary information.
2. An 'Operating Room Case Posting Form' must be completed for all cases. This should be given to the Surgery Clinic Staff who will complete the process.
3. Same Day Surgery Patients and Outpatients should have and H&P*, consent*, appropriate preoperative labs*, and a referral to anesthesia clinic (when appropriate) prior to the day of surgery. (*This should be given to clinic personnel).
4. Patients scheduled for elective admission prior to surgery can have H&P, consent, and preoperative labs completed on the day of admission.
5. The Clinic should be notified regarding the booking of all elective cases, inpatient or outpatient. This allows the clinic personnel to maximize utilization of our OR time.

VI. OR Scheduling
The Trauma/Emergency Surgery service has elective operating room time every Thursday and Friday. Cases must be booked no later than 24 hours prior to Surgery. Do not wait until the last minute to book elective cases. The chief surgical resident is responsible for checking, verifying, and establishing case order. This should be accomplished along with the surgical attending on service.
A. Emergent
The booking of emergent surgical cases is the primary responsibility of the chief surgical resident.

B. Elective*
The booking of elective surgical cases on Trauma/Emergency Surgery inpatients is the primary responsibility of the chief surgical resident. *The clinic personnel must be notified about elective inpatient booking so they can keep our schedule correct.

*Scheduling for clinic patients is covered under clinic responsibilities.

PERSONNEL
Trauma Nurse Coordinator (TNC)
Name: Lisa J. Fryman, RN
Phone: 859-257-1231
Pager: 330-6421

The TNC is responsible for program administration, quality assurance activities, and systems problem solving. The TNC maintains and facilitates the trauma registry for the purpose of research and quality assurance. Trauma admission forms should be forwarded to the TNC. The TNC also coordinates ATLS and other education related activities. Clinically, the TNC evaluates quality of care, especially during the initial assessment and resuscitative phase.

Trauma Case Manager (TCM)
Name: Amie Hawkins, RN and Darcy Tekulve, RN
Office: 859-323-5318

The TCM is responsible for:
1. Discharge planning
   - determines patient disposition early and makes appropriate referrals to outside agencies accordingly.
   - directs consultation of Rehabilitation Medicine and Physical Therapy as necessary.
   - along with nursing, identifies patients needing Home Health Referrals, outpatient equipment needs, and teaching needs.
2. Liaison between the Blue surgery service and nursing
   - keeps nursing abreast of the current plan of care and keeps medicine abreast of the nursing plan of care.
   - along with nursing, makes adjustments in the nursing plan of care to meet patient outcomes.
   - during weekdays takes all patient clinic calls and triages appropriately.
   - arranges for appropriate consults to PT, OT, RMS, and Psychiatry.
   - develops and monitors protocols related to the care of trauma patients.
   - assists interns in discharging patients by completing the discharge face sheet and arranging clinic appointments.

TEACHING CONFERENCES

I. Trauma and Critical Care Conference

A. Trauma/Critical Care Conference*
There is a mandatory weekly trauma/critical care conference. All team members are expected to attend unless patient care responsibilities preclude attendance. The conference schedule is available from any of the trauma service faculty.
LEGAL RESPONSIBILITY
Many trauma patients become involved in civil or criminal cases. Consequently, residents often receive a subpoena to testify in these cases. Under most circumstances, the responsibility to testify in court belongs to the attending faculty member that supervised the case. Please bring all subpoenas involving testimony in these cases to the immediate attention of the Chief, Section of Trauma and Critical Care or to the Chief, Division of General Surgery. All other medical practice/legal issues should be brought to the immediate attention of the Chief, Division of General Surgery.

TRAUMA/EMERGENCY SERVICE PROTOCOLS
There are a number of protocols that govern the treatment and care of Trauma/Emergency Surgery Service patients. The surgical residents are expected to be familiar with these protocols and to adhere to them. All of the protocols are contained in the attached package for your review.
SECTION 2: ED POLICIES AND PROCEDURES

Trauma Admission Policy

This policy is designed to clarify protocols for trauma patient admissions to the University of Kentucky Hospital. A major trauma patient is any patient with significant injury to two or more systems or who, on the basis of mechanism of injury, has a high potential for injury to two or more systems. Major trauma patients also include those with evidence of physiological compromise that cannot be attributed to only or organ system.

All trauma patients with injury to more than one system, or who are otherwise included under the definition of major trauma, will be admitted to the Trauma Service for a period of no less than twenty-four (24) hours. Admission to Services other than the Trauma service does not preclude close consultation with the Trauma Service; alteration in the condition of the patient will require evaluation by the Trauma Service and any appropriate consultative service.

If after twenty-four hours the patient has a single system injury without injury to another system, transfer to the appropriate service will be instituted. The Trauma Service may be requested to function as a consultative service on the patient after transfer of the patient to another service.
Title/Description: Adult Trauma Alert (patient >14 years of age)

Purpose: To effectively manage major trauma patients, the Trauma Alert Team must assemble quickly and mobilize the resources essential to diagnosis and treatment.

PROCEDURE: To effectively manage major trauma patients, the Trauma Alert Team must assemble quickly and mobilize the resources essential to diagnosis and treatment.

I. Criteria for Adult Trauma Alert

In order to ensure that critically injured patients receive appropriate medical care, the Trauma Service has developed criteria to guide medical professionals in rendering trauma care.

A. Mandatory Criteria

1. Trauma Alert Red

A Trauma Alert Red will be issued for any trauma patient:

- Any with documented hypotension (Systolic B/P < 90)
- GSW to neck, chest or abdomen.
- GCS < 8 with mechanism attributed to trauma.
- Patient with respiratory compromise or obstruction:
  - Indicates intubation of trauma patient from the scene
  - Includes intubated patients transferred from referring hospital with ongoing respiratory compromise
  - Does not include intubated patients from referring hospital who are stable from a respiratory standpoint
- Transfer trauma patients receiving blood to maintain vital signs
- Emergency Medicine Attending discretion

2. Trauma Alert

A Trauma Alert will be issued if a patient exhibits one or more of the following criteria:

- Any intubated trauma patient
- Respiratory rate < 10 or > 30
- Glasgow Coma Scale (EMV) ≤ 12
- Penetrating trauma to head
• Stab wounds to neck, chest, abdomen, back or pelvis
• Combination of 2nd or 3rd degree burn > 15% BSA and multiple trauma
• Spinal Cord Injury – Suspected or known
• Pregnant trauma patient ≥ 24 weeks gestation
• Age ≥ 65 with significant chest, abdomen, pelvic or extremity injury
• 2 or more proximal extremity fractures, open fracture and/or pelvic fracture
• Amputation above ankle or wrist
• Emergency Medicine Attending discretion

B. Potential Criteria (High index of suspicion for major injury)

The characteristics of the accidents or injuries listed below indicate that patient condition may necessitate a Trauma Alert.

• Evidence of high energy dissipation:
  a. Falls > 20 ft.
  b. Rollover MVC
  c. Crash speed change > 40 mph
  d. Motorcycle crash speed > 20 mph & separation of rider
  e. Pedestrian struck by motor vehicle
  f. Ejection of patient
  g. Same vehicle occupant fatality
  h. Intrusion into vehicle > 12 inches
  i. Blast injury
• Multiple system trauma involving more than one surgical specialty
• Pre-existing cardiac, pulmonary, or systemic medical disease
• Patient age > 55 years
• Victim extrication time > 20 minutes

II. Initiation of Trauma Alert

A. The Trauma Service authorizes the following individuals to initiate a Trauma Activation, if any mandatory or potential criteria are met during transport or upon arrival:

• Pre-hospital ambulance and Air Medical personnel
• Emergency Department charge nurse
• Surgical resident
• Emergency Department physician, Trauma Service senior resident, or attending may initiate a Trauma Alert at his/her discretion regardless of mandatory criteria met.

B. Authorized personnel will initiate the appropriate Trauma Activation when:

• A patient who exhibits one or more mandatory criteria is scheduled to arrive at hospital < 15 minutes.
• A patient who exhibits one or more mandatory criteria arrives without previous notification.
• A patient’s condition deteriorates acutely while in the Emergency Department.
Only the Senior Trauma/Emergency Physician can deactivate a Trauma Alert and dismiss Trauma Alert personnel from the Emergency Department. The Emergency Department Charge Nurse will document Trauma Alert deactivation on the Nursing Care Record and will ensure appropriate documentation on the Trauma Alert Log completed by the clerical staff in order to prevent unwarranted patient billing.

III. **Trauma Alert Activation Process**

A. **Notification**

1. When authorized personnel request a Trauma Alert Red/Trauma Alert the ED charge nurse will:
   - Notify the ED Patient Relations Assistant (PRA) of Trauma Alert Red/Trauma Alert.
   - Document the patient’s name, time, and Trauma Alert indicator on the Trauma/Critical Care Flow Sheet.

2. The ED PRA will call the paging operator via STAT number and instruct him/her to issue a Trauma Alert or Trauma Alert Red supplying estimated time of arrival (ETA) and brief patient descriptors for mechanism of injury.
   - Notify the Blood Bank by phone (Trauma Alert Red/Trauma Alert only)
   - Document all notifications in the Trauma Alert Log and denote Trauma Alert Red or Trauma Alert.

3. When the paging operator receives instructions from the ED PRA, he/she will activate the Trauma Alert pager system to notify Trauma Team members.

   The Trauma Alert resuscitation management will be by Emergency Medicine with Trauma Service chief resident available. All Trauma Alert Reds will be managed by the Trauma Service.

B. The Trauma Alert Team consists of:

1. **Emergency Medicine Rotation**
   - Emergency Medicine Attending
   - Emergency Medicine Residents
   - Trauma Chief Resident
   - OB Chief Resident (OB cases only)
   - Emergency Department Nurses
   - Emergency Department Technicians
   - Emergency Department Paramedics
   - Radiology Technologist
   - Respiratory Therapist
   - CT Scan Technologist (notified)
   - Operating Room Charge Nurse (notified only)
   - Ultrasound Technologist
2. Trauma Service Rotation

- Trauma Attending (Trauma Alert Red only)
- Trauma Chief Resident
- Trauma Service Primary Call Resident
- Anesthesiologist (Trauma Alert Red only)
- Emergency Medicine Resident
- Emergency Department Nurses
- Emergency Department Technicians
- Emergency Department Paramedics
- Radiology Technologist
- Respiratory Therapist
- CT Scan Technologist (notified)
- Operating Room Charge Nurse (notified only)
- Ultrasound Technologist

IV. Trauma Alert Responsibilities

A. Trauma Team Physicians

When physicians assigned to the Trauma Team are notified that a Trauma Activation is in effect they will:

- Report to the ED within five minutes of notification.
- Assume roles outlined in Trauma Resuscitation Roles and Responsibilities.

As the Trauma Charge Physician the Trauma Chief Resident/Senior Emergency Medicine Physician will coordinate response activity.

The Trauma Service Primary Call Resident will notify capacity command center staff of potential admission.

B. Trauma Alert Emergency Department Nurses

When a Trauma Activation is issued the ED charge nurse and primary patient care nurse will:

- Designate a Trauma Nurse #1 and a Trauma Nurse #2.
- Designate a Trauma Nursing Care Technician.
- Designate a Blood Bank runner.
- Assign other personnel roles and responsibilities as designated in the Trauma Resuscitation Roles and Responsibilities.
- Assist with preparation of trauma resuscitation room for patient.
- Document the names and arrival times of Trauma Team personnel.
- Obtain Trauma Alert package with documentation forms.
C. Trauma Alert Radiology Personnel

When a Trauma Activation is issued the Radiology technologist assigned to the team will:

- Deliver a portable Radiology machine to the Emergency Department within five minutes.
- Perform and process radiographs of trauma patients as quickly and efficiently as possible.
- Notify appropriate radiologist that the trauma patient’s radiographs are ready.
- CT scan technologist will supply contrast for potential scanning and ensure CT scan availability for the patient.

D. Blood Bank Personnel

When the Blood Bank is notified by the ED clerk that a Trauma Activation has been issued Blood Bank personnel will:

- Prepare in a cooler 4 units of 0 negative blood, 0 positive is acceptable for males, within 10 minutes of notification.
- Prepare requested number of units of type-specific blood within 15 minutes of receiving patient’s Type & Cross sample. When type-specific blood is prepared Blood Bank personnel will notify ED that blood is ready.
- Prepare requested number of units of cross-matched blood within 45 minutes after receipt of patient blood sample. When cross-matched blood is prepared Blood Bank personnel will notify ED that blood is ready.

E. Operating Room Personnel

When the Operating Room is notified via the pager that a Trauma Activation has been issued Operating Room personnel will:

- Determine Operating Room availability.
- Evaluate potential need for Operating Room Scrub and Circulating Teams.
- Evaluate potential need for Anesthesiology Team (attending and senior resident/CRNA).

In the event of a Trauma Alert Red, an operating room will be designated and held for 30 minutes in anticipation of emergency operative intervention. The Attending Anesthesiologist will respond to the Emergency Department within 5 minutes of Trauma Alert Red notification to assist with airway management if necessary and to evaluate the patient for pending operative intervention.

F. Laboratory Personnel

When the laboratory is notified by the ED clerk that a Trauma Activation has been issued laboratory personnel will:

- Expedite analysis of all trauma labs.
- Call Emergency Department to report all panic level laboratory results. All other laboratory results will be reported to the ED via the computer.
G. Trauma Alert Respiratory Therapy Personnel
When a Trauma Activation is issued the Trauma Team Respiratory Therapist will:

- Report to Emergency Department within 5 minutes of notification.
- Assist physicians with airway management and ventilatory support.
- Obtain, set up and manage ventilator.

V. Trauma Alert Quality Assurance
A. The Trauma Coordinator will review all Trauma Alert Red/Trauma Alert records for completeness of information and for details of the response efforts (trauma indications, arrival times of Trauma Alert Team members).

B. The Trauma Coordinator will submit a quarterly report and summary of all Trauma Alerts to the Trauma Patient Care Committee.

C. The Trauma Coordinator will present specific issues or concerns related to a case(s) for discussion and action planning. If the committee determines that response was sub-optimal, the Chairman will notify the department director or service chief of the area that delivered sub-optimal service.

D. All Trauma Alert Red activations will be reviewed utilizing the following criteria:

- Response of trauma team members
- Appropriateness
- Forward progress/conduct of resuscitation
- Time to OR
- OR preparedness
- Patient outcome

Formerly ED08-101

**Persons and Sites Affected**

- Enterprise
- Chandler
- Good Samaritan
- Kentucky Children’s
- Ambulatory
- Department ED

**Policies Replaced**

- Chandler HP
- Good Samaritan
- Kentucky Children’s CH
- Ambulatory KC
- Other

**Effective Date:** 12/89  |  **Review/Revision Dates:** 02/10

**Approval by and date:**

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<tr>
<td></td>
<td>Penne Allison, RN, BSN, MSOM, Director</td>
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<td>Signature</td>
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<tr>
<td>Name</td>
<td>Roger Humphries, MD Medical Director</td>
<td>Date</td>
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# Adult Trauma Activation Criteria

## Trauma Alert Red

**Criteria**

- One or more of the following:
  - Confirmed SBP<90 at any time
  - Gunshot wounds to the neck, chest or abdomen
  - GCS <8 with mechanism attributed to trauma
  - Intubated patients transferred directly from scene
  - Patients with respiratory compromise or obstruction
    - Includes intubated patients who are transferred from another facility with ongoing respiratory compromise
    - Does not include intubated patients from referring facility who are stable from a respiratory standpoint
  - Transfer trauma patients receiving blood to maintain vital signs
  - Emergency Medicine Attending discretion

**Response/Resources activated:**

- Trauma Surgery Attending
- Trauma Surgery Chief Resident
- Anesthesiology Attending
- Emergency Medicine Resident
- ED Nurses
- ED Technician
- ED Paramedics
- Ultrasound Technologist
- Radiology Technologist
- CT Scan Technologist
- Respiratory Therapist
- Blood bank cooler of uncross-matched blood
- Operating Room Charge Nurse notified
- Operating Room made available
- Chaplain

## Trauma Alert

**Criteria**

- One or more of the following:
  - Any intubated trauma patient
  - Respiratory Rate <10 or > 30
  - GCS < 12
  - Penetrating head trauma
  - Stab wounds to neck, chest, back, abdomen or pelvis
  - > 15% BSA with 2nd or 3rd degree burns and multiple trauma
  - Spinal Cord Injury – Suspected or known
  - Pregnant trauma patient > 24 weeks
  - Age > 65 with significant chest, abdomen, pelvic or extremity injuries
  - 2 or more proximal extremity fractures, open fractures and/or pelvic fractures
  - Amputation above ankle or wrist
  - Emergency Medicine Attending discretion

**Potential Criteria**

- Age > 55 with significant mechanism of injury
- Falls > 20 feet
- Rollover MVC
- Ejection of patient
- Extrication > 20 minutes
- Motorcycle crash speed > 20 mph & separation of rider
- Motor vehicle crash speed > 40 mph
- Same vehicle occupant fatality
- Pedestrian struck by motor vehicle
- Intrusion into vehicle > 12 inches
- Blast injury
- Multiple system trauma involving more than 1 surgical specialty

**Response/Resources activated:**

- Emergency Medicine Attending
- Trauma Surgery Chief Resident
- Emergency Medicine Resident
- OB Chief Resident *if applicable
- ED Nurses
- ED Technicians
- ED Paramedics
- Radiology Technologist
- Ultrasound Technologist
- Respiratory Therapist
- CT Scan Technologist
- Blood Bank cooler of uncross-matched blood
- Chaplain

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Revised February 17, 2010
SUBJECT: Pediatric Trauma Alert (patients < 14 years of age)
PURPOSE: To establish guidelines for rapid assembly and mobilization of resources prior to and upon arrival of critically injured pediatric patients.
PROCEDURE: To effectively manage pediatric major trauma patients, the Pediatric Trauma Alert Team must assemble quickly and mobilize the resources essential to diagnosis and treatment.

I. Criteria for Pediatric Trauma Alert

In order to ensure that critically injured pediatric patients receive appropriate medical care, the Trauma Service has developed criteria to guide medical professionals in rendering trauma care.

A. Mandatory Criteria

Trauma Alert Red
A Pediatric Trauma Alert Red will be issued if any pediatric trauma patient exhibiting any of the criteria:

- Gunshot wound to the neck, chest, or abdomen
- Hemodynamic instability (Systolic B/P < 90 for child > 1 year of age or Systolic B/P < 80 for child < 1 year of age) after 2 boluses of 20ml/kg of lactated ringers (LR)
- Any pediatric trauma patient receiving/having received blood transfusion to maintain vital signs
- GCS < 8 with mechanism attributed to trauma
- Patient with respiratory compromise or obstruction
  - Indicates intubation of trauma patient from the scene
  - Includes intubated patients transferred from referring hospital with ongoing respiratory compromise
  - Does not include intubated patients from referring hospital who are stable from a respiratory standpoint
- Emergency Medicine Attending Discretion

2. Trauma Alert

A Trauma Alert will be issued if a patient exhibits one or more of the following criteria:

- Pediatric trauma score < 13
- Respiratory rate < 10 or > 30
- Glasgow Coma Scale (EMV) < 10
- Any intubated trauma patient
- Penetrating trauma to head
- Combination of 2nd or 3rd degree burn > 15% BSA and multiple trauma
• Stab wounds to the neck, back, chest, abdomen or pelvis
• Emergency Medicine Attending Discretion
• Pediatric Surgery Attending Discretion

B. The characteristics of the accidents or injuries listed below indicate that patient condition necessitate a Trauma Alert.

• Age < 14 with significant mechanism of injury
• Evidence of high energy dissipation:
  a. Falls > 15 feet
  b. Roll over MVC
  c. Ejection of the patient
  d. Motorcycle crash speed change > 20 mph with separation of rider
  e. Motor Vehicle crash speed > 40 mph
  f. Same vehicle occupant fatality
  g. Pedestrian struck by motor vehicle
  h. Blast injury
• Multiple system trauma involving more than one surgical specialty
• Extrication time > 20 minutes
• Two or more proximal extremity fractures
• Amputation above ankle or wrist level

II. Initiation of Trauma Alert

A. The Trauma Service authorizes the following individuals to initiate a Trauma Activation if any criteria are met during transport or upon arrival:

• Pre-hospital ambulance and Air Medical personnel
• Emergency Department charge nurse
• Surgical resident
• Emergency Department physician, trauma service senior resident, or trauma attending may initiate a Trauma Alert at his/her discretion regardless of mandatory criteria met

B. Authorized personnel will initiate a Trauma Alert when:

• A patient who exhibits one or more criteria is scheduled to arrive at hospital < 15 minutes.
• A patient who exhibits one or more criteria arrives without previous notification.
• A patient’s condition deteriorates acutely while in the Emergency Department.

Only the Senior Trauma/Emergency Physician can deactivate a Trauma Alert and dismiss Trauma Alert personnel from the Emergency Department. The Emergency Department Charge Nurse will document Trauma Alert deactivation on the nursing care record and will ensure appropriate documentation on the Trauma Alert Log completed by the clerical staff in order to prevent unwarranted patient billing.
III. Trauma Alert Activation Process

A. Notification:

1. When authorized personnel request a Trauma Alert Red/Trauma Alert the ED charge nurse will:
   - Notify the ED Patient Relations Assistant (PRA) of Trauma Alert/Trauma Alert Red.
   - Document the patient’s name, time, and trauma alert indicator on the Trauma/Critical Care Flow Sheet.
   - Page the Pediatric Surgery attending, chief resident, and resident. Place 6661 for Trauma Alert Red & 6662 for Trauma Alert as return # to communicate a pediatric trauma alert.
   - Page the Emergency Surgical Services (ESS) at #1234

2. The ED PRA will call the paging operator via STAT number and instruct him/her to issue a Trauma Alert/Trauma Alert Red supplying estimated time of arrival (ETA), and brief patient descriptors for mechanism of injury, and:
   - Notify the Blood Bank by phone (Trauma Alert Red/Trauma Alert only)
   - Document all notifications in the Trauma Alert Log and denote Trauma Alert/Trauma Alert Red.

3. When the paging operator receives instructions from the ED clerk, he/she will activate the Trauma Alert pager system to notify Trauma Alert Team members.

B. The Pediatric Trauma Alert Team consists of:

- Pediatric Surgery Attending (Required for Trauma Reds)
- Pediatric Surgery Chief Resident
- Trauma Surgery Chief Resident
- Anesthesiology Attending (Required for Trauma Reds)
- Emergency Department Nurse(s)
- Emergency Medicine Attending & Residents
- Emergency Department Paramedics
- Emergency Department Technician
- Respiratory Therapist
- Radiology Technologist
- Ultrasound Technologist
- CT scan Technologist
- Blood Bank Cooler of Uncrossed matched blood
- Operating room Charge Nurse notified
- Operating room made available
- Chaplain

The Pediatric Chief Surgery Resident and intern will respond within five minutes (15 minutes if out of house). Because the Pediatric Surgery Chief Resident may take call from home, the Trauma Service Chief Resident also responds to the Pediatric Trauma Alerts to provide direction of the
resuscitation until the Pediatric Surgery Chief Resident arrives, or to provide assistance to the Pediatric Surgery Chief Resident. Care of the patient and direction of the resuscitation will be assumed by the Pediatric Surgery Chief Resident upon his/her arrival.

IV. Trauma Alert Responsibilities

A. Trauma Team Physicians

When physicians assigned to the Trauma Team are notified that a Trauma Activation is in effect they will:

- Report to the ED within five minutes of notification.
- Assume roles outlined in Trauma Resuscitation Roles and Responsibilities.

As the Trauma Charge Physician, the Trauma Chief Resident/Senior Emergency Medicine Physician will coordinate response activity. The Trauma Service Primary Call Resident will notify capacity command center staff of potential admission.

B. Trauma Alert Emergency Department Nurses

When a trauma Alert is issued, the ED charge nurse and primary patient care nurse will:

- Designate a Trauma Nurse #1 and a Trauma Nurse #2
- Notify the Pediatric Charge Nurse of the patient’s pending arrival
- Designate a Trauma Nursing Care Technician
- Designate a Emergency Department Paramedic
- Designate a Blood Bank Runner and send for blood when Trauma Alert Red or Trauma Alert is initiated.
- Assign other personnel roles and responsibilities as designated in the Trauma Resuscitation Roles and Responsibilities
- Prepare trauma resuscitation room for patient
- Document the names and arrival times of Trauma Alert personnel

C. Trauma Alert Radiology Personnel

When a Trauma Alert is issued, the Radiology technician assigned to the team will:

- Deliver a portable Radiology machine to the Emergency Department within five minutes.
- Perform and process radiographs of trauma patients as quickly as possible.
- Notify radiologist that trauma patient’s radiographs are ready for evaluation.

The radiologist will respond within five minutes and assist with rapid interpretation of radiographs.

CT Scan technologists will respond within five minutes, supply contrast for potential scanning, ascertain scanning needs, and ensure CT Scan and abdominal ultrasound availability for the patient.
D. Blood Bank Personnel
When the Blood Bank is notified by the ED clerk that a Trauma Alert has been issued, Blood Bank personnel will:

- Prepare four units of 0 negative blood (0 positive is acceptable for males) within ten minutes of notification.
- Prepare requested number of units of type-specific blood within 15 minutes after receipt of patient blood sample, and notify ED when blood is ready.
- Prepare requested number of units of cross-matched blood within 45 minutes after receipt of patient blood sample, and notify ED when blood is ready.

E. Operating Room Personnel
When the Operating Room is notified via the pager that a Trauma Alert has been issued, Operating Room personnel will:

- Determine Operating Room availability.
- Evaluate potential need for Operating Room Scrub and Circulating Teams.
- Evaluate potential need for Anesthesiology Team (attending and senior resident/CRNA).

In the event of a Trauma Alert Red, an operating room will be designated and held for 30 minutes in anticipation of emergency operative intervention. The Attending Anesthesiologist will respond to the Emergency Department within five (5) minutes of Trauma Alert Red notification to assist with airway management if necessary and to evaluate the patient for pending operative intervention.

F. Laboratory Personnel
When the laboratory is notified by the ED clerk that a Trauma Alert has been issued, laboratory personnel will:

- Expedite analysis of all trauma labs.
- Call Emergency Department to report all panic level laboratory results. All other laboratory results will be reported to the ED via the computer.

G. Trauma Alert Respiratory Therapy Personnel
When a Trauma Alert is issued, the Trauma Alert Team Respiratory Therapist will:

- Report to Emergency Department within five minutes of notification.
- Assist physicians with airway management and ventilatory support.
- Obtain, set up, and manage ventilator.

V. Pediatric Trauma Alert Quality Assurance

A. The Pediatric Trauma Coordinator will review all Trauma Alert Red/Trauma Alert records for completeness of information and for details of the response efforts
(trauma indications, person who initiated alert, arrival times of Trauma Alert, and ancillary personnel).

B. The Pediatric Trauma Coordinator will submit a quarterly report and summary of all Trauma Alerts to the Pediatric Trauma Patient Care Committee.

C. The Pediatric Trauma Coordinator will present specific issues or concerns related to a case(s) for discussion and action planning.

If the committee determines that response was sub-optimal, the Chairman will notify the department director or service chief of the area that delivered sub-optimal service.

D. All Pediatric Trauma Alert Red activations will be reviewed utilizing the following criterion:

- Response of trauma alert members
- Appropriateness
- Forward progress/conduct of resuscitation
- Time to OR
- OR preparedness

All Pediatric Trauma Alert activations quality monitoring results will be forwarded to the Chief of Pediatric Trauma.

Formerly 08-23
University of Kentucky Hospital
Level I Trauma Center

Pediatric Trauma Activation Criteria

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<tr>
<th>Criteria</th>
<th>Trauma Alert Red</th>
<th>Trauma Alert</th>
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<tbody>
<tr>
<td>One or more of the following:</td>
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<tr>
<td>• Gunshot wounds to the neck, chest or abdomen.</td>
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<td>• Confirmed age specific hypotension at any time.</td>
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<td>• Any pediatric trauma who remains HDUS after 2 Boluses of 20 ml/kg Isotonic Crystalloid.</td>
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<td>• Any pediatric patient receiving/received blood transfusion.</td>
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<td>• GCS &lt;8 with mechanism attributed to trauma.</td>
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<td>• Intubated patients transferred directly from scene.</td>
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<td>• Patients with respiratory compromise or obstruction Includes intubated patients who are transferred from another facility with ongoing respiratory compromise. Does not intubated patients from referring facility who are stable from a respiratory standpoint.</td>
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<td>• Emergency Medicine Attending discretion.</td>
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*HDUS (Hemodynamically Unstable)

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<td>&gt;1</td>
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Response/Resources activated:

- Pediatric Surgery Attending
- Pediatric Surgery Chief Resident
- Trauma Surgery Chief Resident
- Anesthesiology Attending
- ED Nurses
- ED Technicians
- ED Paramedics
- Ultrasound Technician
- Radiology Technician
- Respiratory Therapist
- CT Scan Technician
- Blood Bank cooler of uncross-matched blood
- Operating Room Charge Nurse
- Operating Room made available
- Chaplain

Criteria

One or more of the following:

- Trauma Score <13.
- Respiratory Rate <10 or >30.
- Glasgow Coma Score < 10.
- Any intubated trauma patient.
- Stab wounds to the neck, back, chest, abdomen or pelvis.
- Penetrating trauma to the head.
- >15% BSA with 2nd or 3rd degree burns and multiple trauma.
- Emergency Medicine Attending discretion.
- Pediatric Surgery Attending discretion.
- Age ≤14 with significant mechanism of injury.
- Falls > 15 feet.
- Rollover MVC.
- Ejection of patient.
- Extrication > 20 minutes.
- Motor vehicle crash speed changes >40 mph.
- Motorcycle crash speed > 20 mph & separation of rider.
- Same vehicle occupant fatality.
- Pedestrian struck by a motor vehicle.
- Blast Injury
- Two or more proximal extremity fractures and/or open fractures.
- Amputation above ankle or wrist.
- Multiple system trauma involving more than one surgical specialty.

Response/Resources Activated:

- Emergency Medicine Attending
- Pediatric Surgery Chief Resident
- Pediatric Surgery Attending - notified
- Trauma Surgery Chief Resident
- Emergency Medicine Residents
- ED Nurses
- ED Technicians
- ED Paramedics
- Radiology Technician
- Ultrasound Technician
- Respiratory Therapist
- CT Scan Technician
- Blood Bank cooler of uncross-matched blood
- Chaplain

Revised August 2008
SUBJECT: Trauma Resuscitation Roles and Responsibilities
PURPOSE: To establish guidelines for staff roles and responsibilities during trauma resuscitation of the critically injured patient.

PROCEDURE:

Trauma Attending/Trauma Fellow

A. Provides guidance and oversees trauma resuscitation.
B. Performs and/or assist with procedures.

Trauma Team Leader

A. Assigned to the Trauma chief resident/Emergency Medicine Resident present or EM Attending depending upon assigned rotation schedule. *Trauma Alert Red and Pediatric Trauma Alert Red patients will be managed by the Trauma Attending or Pediatric Surgery Attending with the assistance of Emergency Medicine Service.
B. Designated as Trauma Team Leader in charge of trauma resuscitation and decision-making under the guidance of the Trauma Attending or EM Attending depending on rotation schedule.
C. Responsible for:
   - Overall patient evaluation and management.
   - Ensuring completion of primary and secondary surveys.
   - Communicating assessment findings to recording RN.
   - Determining priority of procedures and necessary tests.
   - Determining need for and timing of operative intervention when indicated and contacting the OR.
   - Determining the need for appropriate consultations.
   - Making physician assignments.
   - Dismissing ancillary personnel when services are no longer needed.
   - Deactivating Trauma Alerts when appropriate.
   - Ensuring traffic control.
D. The Trauma Team Leader may assume or delegate the role of evaluation and management depending on patient acuity.
   - The Trauma Team Leader maintains responsibility at all times.
   - The Trauma Team Leaders’ role may not be delegated to first-year residents.
Emergency Medicine MD or MD #2

A. Assigned to the EM resident, Anesthesiology Attending or Trauma Resident.
B. Responsible for:
   - Airway management and assuring cervical spine immobilization.
   - Coordinates initial assessment.

Primary MD or MD #3

A. Assigned to second-most Senior Resident, preferably second-year or higher.
B. Responsible for:
   - Assisting Trauma Team Leader in patient evaluation and management.
   - Performs primary and secondary assessment.
   - Performing necessary procedures under the direction of the Trauma Team Leader.
   - Coordinating orders.

MD #4

A. Assigned to third-most Senior Resident, preferably first-year or higher.
B. Responsible for:
   - Assisting in patient evaluation and management under the direction of MD #3.
   - Contacting CT Scan and Radiology Special Procedures, as needed, under the direction of the Trauma Team Leader.
   - Coordinating orders and completing Trauma H & Ps under direction of MD #3.

Emergency Department Charge Nurse

A. Pre-notifies physicians, primary patient care nurse, circulating nurses and financial counselor of impending arrival.
B. Responsible for:
   - Delegating responsibility of checking equipment and supplies within the Trauma Resuscitation area.
   - Assisting with traffic control.
   - Acting as family liaison as needed.
   - Disseminating prehospital patient report to appropriate MD's/RN's.

Primary Patient Care Nurse

A. Prepares Trauma Resuscitation area prior to patient arrival, and ensures that needed equipment/supplies are readily available.
B. Responsible for ensuring documentation from admission to time of disposition or report to oncoming RN including:
• Notification and response times of all medical and ancillary personnel.
• EMS/Air Medical report.
• Mechanism/time of injury & patient history.
• Vital signs; cardiac rhythm strips.
• Ongoing assessment/re-evaluation.
• Procedures performed by physicians.
• Nursing process.

C. Directs nursing team members as needed and assumes overall nursing responsibility for patient to include:

• Assists with initial assessment.
• Confirming labs are obtained and sent.
• Ensures patient is placed on Cardiac monitor.
• Monitors VS – Gives 5 minute updates.
• Ensures PIVs are functional & insertion of additional IV’s as needed.
• Obtains Labs from arterial puncture.
• Accompanying patient outside the ED, as needed.
• Ensuring initial notification of family and providing ongoing clinical updates.
• Notifying Capacity Command Center of bed requirement as soon as possible.

Circulating Nurse/EM Paramedic

A. Responsible for:

• Assisting with initial assessment.
• Obtains first manual BP pressure.
• Assists with medication administration.
• Assisting physicians with procedures.
• Assisting in removal of patient clothing.
• Inserting additional peripheral IV’s and drawing labs.
• Assisting with nursing procedures (e.g. nasogastric tubes, Foley catheters).
• Assisting with administration of colloids/crystalloids (via fluid warmer, as needed).
• Paramedics will not administer colloids.

Emergency Department Nursing Care Technician

A. Responsible for:

• Assisting in set-up of trauma resuscitation area.
• Obtaining blood from Blood Bank as instructed.
• Obtaining IV fluids and blankets from warmer.
• Assisting in removal of patient clothing.
• Processing lab specimens.
• Obtaining additional supplies as directed by nurses.
• Ensuring patient has an arm/wrist identification band.
• Processing patient clothing/valuables.
• Assisting with CPR, as needed.
• Assisting with patient transport.

**Scribe or Documenting Nurse**

A. Responsible for:
   • Documents Resuscitation.
   • Assists with crowd control.
   • Assists with procedures as needed.

**Financial Counselor(s)**

A. Pre-notifies Radiology, Respiratory Therapy, Operating Room, Blood Bank etc. prior to patient arrival.
B. Identifies patient from EMS run sheet, Air Medical records, and/or patient’s family and updates computer when possible.
C. Prepares lab slips, X-Ray requests, EKG requests and ID bracelets.
D. Secures patient valuables in ED safe.

**Respiratory Therapy**

A. Assists with airway management.
B. Ventilates patient.
C. Prepares, monitors and documents all required aspects of mechanical ventilation.
D. Assists during patient transport.

**Radiology Technologist**

A. Responsible for obtaining radiography studies in a timely manner as ordered.

**Ultrasound Technologist**

A. Performing Focus Abdominal Sonogram Test (FAST) as ordered in a timely manner.
MULTIDISCIPLINARY TRAUMA TEAM
ROLES AND RESPONSIBILITIES

EM/MD #2 (may be EM resident, Anesthesiology Attending or Trauma Resident)
• Airway management
• Cervical spine immobilization
• Coordination of primary survey

Primary MD/MD#3 (may be either 3rd or 2nd year resident)
• Performs primary & secondary assessment
• Performs necessary procedures under Team Leader
• Coordinates patient orders

Respiratory Therapist
• Assists with airway control
• Sets up ventilator

Circulating Nurse/EM Paramedic
• Obtains 1st manual BP
• Assist with procedures
• Medication administration
• Obtain additional IV’s as needed

Primary Nurse
• Prepares Trauma room
• Places pt on cardiac monitor
• Monitors vital signs
• Assists physician with procedures
• Accompanies pt outside ED

Trauma Team Leader
(may be Chief Resident or EM Attending)
• Leads Resuscitation
• Performs or assists with procedures
• Directs ongoing assessment

Trauma Attending/Fellow
• Provides guidance to trauma team leader
• Performs or assists with procedures

Ultrasound Tech
• FAST

Nursing Care Technician
• Set-up of trauma resuscitation area
• Obtains blood from blood bank as directed
• Assists with exposure of patient
• Processes lab specimens
• Assists with CPR
• Collects & Documents pt valuables
• Assists with patient

MD #4 (may be 1st year or higher)
• Assists with evaluation and management of patient under direction of MD#3

Scribe
• Documents resuscitation
• Assists with procedures as needed

Radiology Technologist
• Films as needed

- 35 -
SUBJECT: Trauma Labs

PURPOSE: Describe a standard set of laboratory studies obtained for each trauma patient, and to list specific additional studies for frequently encountered situations. We understand certain cases may require additional studies, to be obtained at the discretion of the treating physicians.

PROCEDURE:
Lab specimen should be obtained via a femoral arterial stick in patients that are: (a) Unstable, (b) intubated, or (c) have major mechanisms of injury. Venous samples are appropriate for patients that are: (a) Stable, (b) non-intubated, (c) have minor mechanisms of injury, and (d) ALL pediatric patients.

Standard Lab Panel for Trauma Alert Red and Trauma Alert Patients
* ABG Panel (ABG, Hct, Na, K, iCa, Glu)
* Type and crossmatch (4 units packed red blood cells)
* Coags (PT, PTT, INR)

Additional Studies for Altered Mental Status (GCS ≤ 14) 1
* Serum alcohol level, urine screen for drugs of abuse

Female Trauma Patients of Child Bearing Age 2
* Urine pregnancy test
* If positive, Kleihauer-Betke test

1. Altered mental status is defined as GCS ≤ 14, not readily explained by pre-hospital medication administration or shock.
2. Female trauma patients without history of prior hysterectomy (Refer to “Evaluation and Management of Injury in Pregnancy,” located in the protocol manual).

______________________________  ________________________________
Medical Director, Emergency Medicine  Trauma Program Director

______________________________
Emergency/Trauma Services Director

Formerly 08-103
SUBJECT: Care of Patients in Need of Immediate Surgery When the Operating Room is at Maximum Capacity

SEE ALSO: OR Policy, OR 01-09, OR Access for Trauma.

PURPOSE: To provide criteria and procedures to manage the needs of patients who require access to the OR at times when the Operating Room is at maximum capacity.

CRITERIA:
Patients meeting the following criteria may access the Operating Room under this policy:

I. Acute Intracranial Bleeding - Rapidly progressing process or lesion leading to herniation or paralysis (ex: acute subdural hematoma, acute epidural hematoma, acute intracerebral hematoma, and/or acute spinal cord compression).

II. Exsanguinating Hemorrhage:
   A. Penetrating neck or chest trauma
   B. Blunt neck or chest trauma
   C. Intraabdominal bleeding (ex: penetrating or blunt trauma, ruptured abdominal viscerae, aortic, or iliac aneurysm)

III. Potential for Acute Arterial Hemorrhage (established diagnosis)
   A. Traumatic thoracic aortic injury
   B. Thoracic aortic dissection or aneurysmal rupture
   C. Leaking abdominal aorta/iliac artery aneurysm

IV. Airway Emergencies Requiring Surgical Intervention
   A. Traumatic disruption of airway
   B. Airway compromise due to obstruction
   C. Intrathoracic and/or lung hemorrhage with respiratory compromise

PROCEDURE:
In conjunction with the OR response, the staff in the ED will respond in the following manner:

I. Trauma Service Responsibilities
   A. **Senior most** surgeon present
      1. Responsible for determining priorities and management of patient care that necessitates immediate OR access and policy activation.
      2. Responsible for notifying OR clerk and charge nurse.
      3. Responsible for notifying ED staff.
4. Designates trauma team roles as scrub or circulator.

B. Remaining surgeons
   1. Responsible for retrieving required carts: i.e. craniotomy, airway, chest, abdominal or vascular depending on need.
   2. Responsible for opening room, setting up sterile field, serving as scrub and circulating personnel until OR personnel arrive.

C. Prior to entering OR room, all staff will apply head covering, mask, and shoe covers.

II. Emergency Department Staff

A. ED Charge Nurse
   1. Responsible for determining need for Trauma Alert Red and for anticipating necessity for accessing the Operating Room.
   2. If aware of OR maximum capacity, assess ED staff, assignments and current activities (if time allows).
   3. Responsible for reassigning ED patients of primary patient care nurse if patient going to OR (may also send NA if ED staffing allows).
   4. Responsible for determining availability and need for additional resources.
   5. Communicates need for respiratory therapist to accompany patient to OR.
   6. Responsible for ensuring that blood bank delivers blood to OR.

B. Patient Care RN
   1. Assumes nursing responsibility for the patient; delegates responsibility to others, when available, to accomplish tasks.
   2. The ED nurse will prepare the patient for transport and accompany the patient immediately to the OR.
      NOTE: Patients directly admitted to the OR via Air Medical Services will be accompanied by the Air Medical staff who will continue resuscitation until relieved by the ED nurse or OR personnel (i.e., Anesthesia).
   3. The ED nurse will facilitate continued resuscitation in the OR until the call team arrives. The ED nurse will be responsible for the following:
      a. Monitoring and preservation of airway patency
         1. Assisting with intubation or surgical airway as necessary
      b. Continued volume resuscitation
         1. Maintenance/titration of volume infusion rate (crystalloid and colloid)
         2. Autotransfusion
      c. Ongoing hemodynamic monitoring
         1. Obtaining specimens for laboratory studies
         2. Administration/titration of drugs
      d. Assisting physicians with procedures
      e. Documentation on ED Nursing Care Record

The ED nurse will remain in the OR until released by the anesthesiologist and/or the arrival of the OR call team.
Quality Monitoring:

**All cases will be reviewed by the Trauma Coordinator and the Multidisciplinary Trauma Committee.

______________________________
Emergency/Trauma Service Director  
Medical Director, Emergency Medicine  

REVIEWED: 8/97, 6/00; 8/08
Optimal Logistics of Initial Trauma Evaluation

University of Kentucky College of Medicine
Section of Trauma and Surgical Critical Care Protocol Manual
Jeffrey Cohen, M.D. 5/29/98

PRE-ARRIVAL
Universal precautions, assemble team, obtain trays for possible emergent procedures (Troc, thoracotomy, chest tubes, plaur-orac)
Obtain as much information as possible from EMS report and discuss scenarios with MORM's present. Have a game plan BEFORE the patient arrives.

PRIMARY SURVEY
Patient is moved to E.D. stretcher, primary assessment of ABCD performed.
Immediate life-threatening are treated accordingly.
Exposure of the patient, manual BP by primary RN, and transfer of necessary IV lines, ventilator circuit, etc.
NO ONE ELSE TALKS EXCEPT THE PERSON DOING THE PRIMARY ASSESSMENT AND TEAM LEADER AS NEEDED

EMS REPORT AND INITIAL STUDIES
Several things happen simultaneously...
One EMS provider gives report ONE TIME while the entire team listens.
Radiology tech performs CXR/Peako (as indicated)
Ultrasound tech/MD performs FAST (as indicated)
RN/tech continue exposure, attaching monitors, IV, vent circuit as indicated

SECONDARY SURVEY
Complete head to toe examination
Logroll if LSB if not already completed
Additional procedures once exam complete: IV/GD, Foley, change from EMS intubation to MM-H, add IV lines, etc.
Team leader prepares for move to next destination: OR, CT, angiography

TRANSPORT & ADDITIONAL STUDIES
Assure labs are drawn/seent
IVF, sedation meds, respiratory therapist present?
Is there family present that we can talk with?
Physicians dedicated to the bedside for transfer of all critically ill patients.
SUBJECT: Nursing Care Record: Trauma/Critical Care

SEE ALSO: 07-12, Nursing Care Record

Purpose:
Provision of guidelines for use of the trauma/critical care nursing record will allow a standardized method for use of the assessment tool resulting in more effective utilization and accuracy of the tool and the data collected.

Rationale:
Effective and timely management of the multiple trauma or critically ill patient demands a rapid, organized, systematic approach to assessment, planning, implementation and evaluation. The trauma/critical care nursing record provides the framework for organization of the approach and provides a documentation tool to facilitate establishment of a permanent record of comprehensive baseline and monitoring assessment data as well as facilitating the documentation of the implementation and evaluation phases of the nursing process. The nursing record organizes specific data points to assist in determination of patient status and detection of potential or actual human response to illness.

Considerations

1. The trauma/critical care nursing record is included in the patient's permanent medical record.

2. Use of the assessment tool is initiated by the nurse when deemed appropriate. The tool must be used with all critically ill or injured patients who require ongoing monitoring and are classified as acuity Level I or II.

3. As assessments, interventions and/or evaluations are completed the corresponding time and information will be recorded in the appropriate area.

4. Evaluative notes will be recorded under the Nursing Evaluation section of the nursing care record.

5. The record must be signed and initialed by all nurses delivering care to the patient including the recording nurse. Assurance of adequate signatures to document care provision is the responsibility of the patient care nurse.

6. A mechanism for quality assurance will be implemented to audit charts for completeness. Staff will receive feedback surrounding quality assurance audit filters regarding form completion.
Requisites

1. Black or blue ball point pen essential.

2. Trauma/Critical Care Nursing Record (sample of form attached).

Procedure:

1. Legibly print patient name in addressograph area.

2. Record demographic information:
   a. Classification
   b. Time of arrival - in military time
   c. Date
   d. Age
   e. Sex
   f. Weight - in kilograms or pounds
   g. Mode of arrival:
      - If Air Med, specify: service.
      - If Lexington Fire Department, specify unit number: EC-1, EC-5, etc.
      - If ambulance, specify: Scott County, Jessamine County, etc.
   h. Recording nurse Specify by name according to
   i. Patient care nurse role assigned. Record MD
   j. Circulating nurse names in appropriate areas.
   k. Physician
   l. Chief complaint/pre-hospital report - include as many details as are available concerning:
      1. Mechanism of injury: driver, passenger, restrained, unrestrained, ejected, rollover, speed traveling, air bag, etc. Description of injury, object (if available) for penetrating trauma - caliber of gun, length or type of knife, removal of impaled objects, etc.
      2. Pre-hospital treatment: IV, intubation, immobilization, meds given and fluids infused (type and amount).
      3. Chief complaints: particularly important with non-trauma admits - e.g., MI, GI bleeding to include duration of pain - treatment administered.
      4. Injury time: Actual time of MVC, GSW, etc. This information is available from patient, pre-hospital personnel, referring hospital, paperwork, etc.
      5. Scene flight: Check box if patient arriving via helicopter directly from injury scene.
   m. Past medical history - check the appropriate box and include any other conditions you identify.

3. Record information in boxes of trauma team response section.
   a. If trauma activation is called, check the appropriate box for trauma alert, trauma alert red or trauma consult.
   b. For each team responder (e.g., trauma attending, trauma chief, trauma resident, emergency medicine resident, anesthesia, neurosurgeon, U/S tech, RT, X-ray, etc.) complete time called and time arrived section under each responder.
   c. Complete name section under each responder by writing in responder's first initial and last name.

4. Initial Assessment
a. Complete initial assessment section by documenting the primary and secondary survey findings. Document time assessment of system occurs in space provided. All sections should be completed in full. If you are unable to assess a particular area or it is not applicable document accordingly.

b. All trauma patients must have a completed Glasgow coma scores, pupil evaluation & trauma score and on arrival and on discharge from the ED.

5. After completion of the initial assessment, shade injured areas on diagram using legend at bottom of page.

6. Document lab draws with time, site, prep and person obtaining labs.

7. Vital Signs
   a. Vital signs should have a PTA set documented. Then the frequency of the vital signs should correspond to the acuity of the patient. Vital signs will include Temp, BP, HR, RR, SpO2, GCS and pupils.
   b. Critical Care monitoring should be documented every hour at minimum e.g. ICP, CPP, CVP, PCWP, etc.
   c. Intake and Output should be documented at regular interval or as ordered by MD.
   d. Drips will be documented at regular interval for dosage and rate or when titrated.

8. Ventilator Settings will be completed initially and when changes occur.

9. Intervention
   a. Procedures - record time of procedures, size of tubes & lines placed along with sites and removal of backboard and/or changing of C-Collar in appropriate spaces. Other procedure data can be entered in the nursing evaluation section.

10. Resuscitation Fluids
    1. Record fluids patient received prior to arrival in shaded area.
    2. Record all fluids patient receives by using
       a. Time
       b. Fluid Type
       c. Crystalloids - liter number (#)
       d. IV site
       e. “Y” for fluid warmer used
       f. Colloids – document Type & unit number (#) & donor number (#)
       g. Totals must be documented

11. Rhythm strip must be posted and interpreted for all patients with chest pain or a cardiac event.

12. Medications
    Document all medication administration by entering time administered, name of med, dose, route, your initials and ordering MD.

13. Nursing Evaluation
    Documentation of evaluation of patient response to interventions should be documented here. Nurses and NCTs should include their initials after documenting and signature should be legible. If additional space is needed use nursing continuation record.
14. **Transport**
Patient transports to diagnostics should be documented in this space.

15. **Discharge Information**
Document D/C vital signs, admitting service, total I&Os and disposition of valuables. Transfer form should be completed if patient is transferred to another facility.

16. **Notifications**
All notifications should be documented by checking the box and inserting time notified in space provided.

17. **Signatures**
All nursing staff involved in care of the patient should sign and initial the nursing care record. All signatures should be legible.

18. **Disposition**
Document time report is called and last name of RN receiving report.

_Time of actual patient movement from the department should be noted as well as destination of patient. If "floor" is checked, enter room number._

19. **Place patient stickers in upper right corner of patient chart on white and yellow sheets. The white copy is to accompany the patient to the in-patient area and yellow stays in ED.**

Formerly ED-07-13
SECTION 3: ED PROTOCOLS

ALGORITHM FOR EMERGENCY DEPARTMENT TRIAGE OF THE TRAUMA PATIENT
Treat and Release, 23-Hour Observation, Regular Admission

ED ASSESSMENT

No history of Amnesia or LOC
GCS = 15, Minimal or no injuries on physical exam
Labs WNIL*, CKR NL,
ETOHH/URUG screen negative
Medically Stable
*Do not repeat labs if they are normal and were completed within 4 hours of UKEO arrival

Discharge home
Consider RTC Blue Surgery
based on history and clinical findings, must be evaluated and cleared by Attending (ED/Blue)

No history of Amnesia or LOC
GCS = 15, Minimal or no injuries on physical exam
Labs WNIL*, CKR NL,
ETOHH/URUG screen negative
Medically Stable
*Do not repeat labs if they are normal and were completed within 4 hours of UKEO arrival

Discharge home
Consider RTC Blue Surgery
based on history and clinical findings, must be evaluated and cleared by Attending (ED/Blue)

Physical Exam, labs, and/or radiographs detect significant injury

Regular Admission

Lab and X-ray investigation should be based on directed physical exam, injuries, and/or abnormal admission labs/x-rays

23 Hour Admission
Diet and Oral analgesics as appropriate
Day of discharge

Direct physical exam
Repeat labs and X-ray should be based on physical exam and/or abnormal labs/x-ray obtained on admission

Physical exam, repeat labs and/or x-ray detect significant clinical abnormality

NO
Discharge home/RTC Blue Surgery Clinic

YES
Convert to regular admission
TERMINATION OF RESUSCITATION 
ON THE BASIS OF PREHOSPITAL CRITERIA

Introduction:

The American College of Surgeons (ACS) position in resuscitative thoracotomy, taught in Advanced Trauma Life Support (ATLS), is simple. In blunt or penetrating thoracic or abdominal trauma, if a patient arrives pulseless and without signs of life, resuscitation ends and the patient should be pronounced DOA (Dead on Arrival). Resuscitative thoracotomy has a poor salvage rate with a high risk of iatrogenic blood borne pathogen exposure and/or injury to health care providers. The patient should be pronounced DOA (Dead on Arrival) when any of the following criteria are met:

1. Blunt Trauma whom arrives pulseless with no signs of life (patients ≥ 15 years old).
2. Penetrating Trauma whom arrives pulseless with no signs of life with prehospital CPR > 15 minutes (patients ≥ 15 years old).

Signs of Life:
1. Reactive pupils
2. Spontaneous movement
3. Organized ECG activity

Trauma Alert Activation should NOT occur initially for patients meeting the pre-hospital criteria. The Emergency Department faculty will evaluate the patients immediately and determine the following.

1. Pulselessness - if a pulse or any sign of life are detected, Trauma Alert Activation should occur immediately.
2. Normothermic (T > 90 degrees F)

If all the above-mentioned physical findings are verified, the patient will be pronounced DOA and no further resuscitation activity should ensue.

The ED Faculty should ensure completion of the Trauma Admission Form in its entirety, completing under diagnosis “Patient pronounced DOA” and noting any injuries diagnosed by gross physical examination (e.g., femur fracture, penetrating head injury, etc.).

The pink copy of the Trauma Admission Form will be forwarded to the Trauma Coordinator for entry into the Trauma Registry. The original copy will become part of the patient’s permanent medical record.

References:
American College of Surgeons’ Committee on Trauma: Advanced Trauma Life Support, ed.8, Chicago, 2008, The College.

Revised 11/08
EMERGENCY DEPARTMENT RESUSCITATIVE THORACOTOMY

Purpose:
Emergency Department resuscitative thoracotomy may be necessary to salvage patients who present in extremis and may otherwise die without aggressive therapy. Emergency Department thoracotomy is not indicated in the resuscitation of all trauma patients who present in extremis. The following protocol is intended to be a guide and is not intended to be all-inclusive or exclusive. Additional patients not covered by this protocol who might benefit from Emergency Department thoracotomy will be rare and case-specific. The procedure is performed in conjunction with other resuscitative efforts and should not be employed in isolation. Under certain conditions, resuscitative efforts might best be accomplished in the Operating Room. An Emergency Department resuscitative thoracotomy should only be performed by general surgery PGY-3, or higher, level residents or attendings.

Indications:
1) Penetrating thoracic trauma that arrive pulseless, with signs of life.
2) Penetrating non-thoracic, non-cranial trauma that arrive pulseless, with signs of life.
3) Cardiac arrest in blunt chest or abdominal trauma after arrival in Emergency Department with an obtainable blood pressure.
4) Suspected systemic air embolism.

Definitions:
1) Signs of life: reactive pupils, spontaneous movement, or organized ECG activity.
2) Aggressive fluid resuscitation: Packed RBC 2 units or Lactated Ringers 2 liters or equivalent volume over 15 minutes.

Procedure:
1) Rapid bilateral antero-lateral Betadine or Chlorahexidine prep while thoracotomy tray opened. Thoracotomy trays are located in Trauma Bay Omni cells.
2) Left antero-lateral thoracotomy incision located beneath nipple in males and in inferior breast fold in females. Incision extends from left sternal border to anterior border of latissimus dorsi and chest entered along the superior aspect of fourth or fifth rib. Care must be taken to avoid injury to heart and lung. A right antero-lateral thoracotomy may be preferred for primary right chest wounds.
3) Insert rib spreader with handle located toward table laterally.
4) Examine pericardium, if tense hemopericardium present (pericardium distended with maroon discoloration) then proceed to step 7.
5) If systemic air embolism is suspected or massive hemorrhage from lung parenchyma or hilum is present, then place Satinsky clamp across hilum medially.
6) Retract left lung with left hand. Locate aorta by running right hand medially along posterior chest wall. Aorta located along lateral aspect of vertebral bodies
and will be postero-lateral to esophagus. Dissect around aorta inferior to pulmonary hilum and apply aortic cross-clamp.

7) Enter pericardium by longitudinally incising pericardium anterior and parallel to phrenic nerve. This is best accomplished by grasping pericardium with forceps and cutting with Metzenbaum scissors. Pericardial incision is carried inferiorly to diaphragmatic reflection and superiorly to level of superior pulmonary hilum. Care must be taken to avoid injury to left atrial appendage and phrenic nerve. This is best accomplished by lifting tip of scissors laterally as incision is made.

8) Manually lift heart from pericardial sac. If hemopericardium present, then examine for cardiac perforation. Teflon pledgetted 3-0 prolene suture on a taper needle is present in thoracotomy suture pack for repair of cardiovascular wounds. If hemopericardium is not present, then begin open cardiac compression. Aortic cross-clamping, if not previously performed, is indicated if no hemodynamic response is noted.

9) Additional exposure may be accomplished by extending thoracotomy incision across sternum into contralateral chest cavity.

Reference:

American College of Surgeons’ Committee on Trauma: Advanced Trauma Life Support, ed.8, Chicago, 2008, The College.

EMERGENCY DEPARTMENT TRAUMA THORACOTOMY TRAYS

TRAY #1

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RSI INTUBATION  
Julia E. Martin M.D.  
Assistant Professor  
Department of Emergency Medicine

**General information:**

Airway control is always the most important objective in the initial resuscitation and stabilization. It takes the highest priority in primary assessment. The trauma team must be prepared for any airway emergency.

RSI involves the use of neuromuscular blocking agents and sedatives to facilitate endotracheal intubation. Rapid Sequence induction technique is used to prevent regurgitation and aspiration of gastric contents. Requires preoxygenation and denitrogenation by using 100% oxygen via non-rebreather face mask to prevent apnea related hypoxia during the procedure. Once paralytic is on board, mask ventilation is not attempted at this point. During induction, a skilled assistant provides manual in-line axial stabilization of the head while a second assistant presses the cricoid cartilage to prevent gastric aspiration. Cricoid pressure is maintained until the cuff on the ET tube is inflated and tube placement is confirmed. Main disadvantage is once anesthesia has been induced there is no turning back. The only contraindication to RSI intubation is a practitioner who is not skilled in airway management. Indication for surgical airway is the inability to intubate the trachea. In neck trauma, intubation may be difficult or impossible and surgical airway may be required.

Short acting agents are used to allow patient to resume spontaneous respirations and to allow close monitoring of neurological status. Oral endotracheal intubation is usually the preferred method. If the head and neck are stabilized by an assistant there is almost no risk of spinal cord injury by oral tracheal intubation.

Always anticipate vomiting. Even patients, who otherwise seem relatively unresponsive, may vomit during attempted intubation without RSI. This may result in loss of airway control and aspiration of gastric contents. Struggling patients increase muscle activity making hypoxemia worse and increase ICP. As a general rule, presume all trauma patient’s have just eaten. Risk for aspiration is greatest during anesthesia induction and instrumentation of the upper airway. This risk is minimized by applying cricoid pressure.

Patients with severe closed head injury are of major concern because intracranial pressure can rise precipitously during intubation. Rapid sequence induction of anesthesia and oral intubation are now recommended for patients with head injuries to minimize the rise in ICP.

Remember, rendering patient apneic, when endotracheal intubation is beyond the skill of the operator, may be rapidly fatal.

**Indication for RSI Endotracheal Intubation of the Acute Trauma Patient:**

- Trauma patients with GCS ≤ 8
- Significant facial trauma with poor airway control
- Airway obstruction
- Closed head injury or hemorrhagic CVA
Burn patients with airway involvement and inevitable airway loss
Class 3-4 hemorrhagic shock
Failure to maintain adequate oxygenation (PaO2 < 60 despite 100% FiO2)
Paralysis due to high spinal cord injury
Need for positive pressure ventilation
Blunt chest trauma with compromised ventilatory effort
Mandibular fractures with loss of airway muscular support

**Evaluation:**

“Talking patient” usually indicates airway is patent for the moment.

Respiratory distress associated with trauma to the upper airway is frequently made worse by blood or gastric contents in the airway and requires prompt action. These patients are often combative because of hypoxia.

When evaluating an awake patient with severe facial trauma ask them if they are getting enough air. If they cannot answer, stick out their tongues fairly easily or are hyperventilating, they should probably be intubated. In unconscious patients, it is probably best to intubate.

Tachypnea may be subtle but an early sign of airway or ventilatory compromise. Tachypnea is often also associated with pain and/or anxiety.

Agitated and combative patients that are not hypoxic or have a significant head injury are better managed with Haldol 5-10 mg.

**Signs of Airway Obstruction:**
- Agitation = hypoxia
- Obtudation = suggests hypercarbia
- Cyanosis = hypoxia
- Retractions and use of accessory muscles
- Snoring, gurgling, stridor = partial obstruction at pharynx
- Hoarseness = laryngeal obstruction

**DRUGS:**

**Sedatives:**

**Versed:**
- Benzodiazepine
- Rapid onset (1-2 min) and short duration (20 min)
- Amnesic
- Anticonvulsant
- Muscle relaxant
- Slight decrease in blood pressure and increase in pulse rate.
- No increase in ICP.
- Dose: 0.1 mg/kg

**Etomidate:**
- Nonbarbiturate, nonnarcotic sedative-hypnotic induction agent.
Good agent in multisystem trauma patient because it evokes minimal change in
HR and CO compared to Thiopental.  (ideal agent in any patient in shock
including cardiogenic and septic shock)
Decreases ICP and IOP during procedure
Rapid onset (<1 min) and short acting (5 min)
Vomiting, esp. with combined with a narcotic
Dose: 0.3 mg/kg

**Thiopental:**
Ultrashort acting barbiturate sedative
Dose: 3-5 mg/kg
Onset 30-40 sec
Last 10 min.
Does not cause increase in ICP but can cause severe hypotension, therefore
avoid in multi-traumatized patients.
Can also induce bronchospasm.

**Fentanyl:**
Narcotic
Little or no histamine release
Rarely causes hypotension
Consider in head-injured patients as a premedication to prevent increase in ICP
(blunts pressor response)
Rapid injection may cause chest wall rigidity.
Dose: 3-5 mcg/kg
Onset in 2 min with 30-40 min duration.

**Paralytic Agents:**

**Vecuronium:**
Nondepolarizing agent
1/3 more potent and pancuronium and duration of action is 1/3 to ½ as long (25-
40 min vs Pancuronium which last 2-3 hours)
Onset 2-3 minutes
Dose not cause the degree of tachycardia seen with pancuronium.
No histamine release.
Defasciculating dose: 0.01 mg/kg
Paralytic dose: 0.1 mg/kg

**Succinylcholine:**
Depolarizing agent, which causes muscle fasciculations which can be prevented
by pretreatment with a non-depolarizing neuromuscular agent.
Rapid onset (30-60sec) with short duration of action (5-7 min).
Dose:
Adult: 1.5 mg/kg
Pediatric (<10 y.o): 2.0 mg/kg
Contraindications:
Burns > 7 days old
Extensive crush injuries > 7 days old.
Paraplegia > 7 days old.
Narrow-angle glaucoma
Neuromuscular Diseases:
Guillain-Barre, myasthenia gravis, Multiple sclerosis, muscular dystrophy, Parkinson’s disease.

Others susceptible to increased potassium:
Renal failure (no real evidence that RSI increases K+)
Rhabdomyolysis

Rocuronium:
Non-depolarizing agent
Onset < 1 min.
Duration 20-30 min.
Dose: 0.9-1.2 mg/kg
Expensive

Adjunctive:

Atropine:
Succinylcholine will cause bradycardia in infants and children therefore they should be premedicated with atropine. Also pretreat any adult who is already bradycardic.
Children < 8 y.o.
Dose: 0.01 mg/kg up to 0.5 mg (minimum dose of 0.1 mg)

Lidocaine:
Dose: 1.5 mg/kg
Some studies recommend intravenous Lidocaine to blunt the pressor response of increased pulse, increased blood pressure, increased intracranial pressure, and increased intraocular pressure associated with intubation, its usefulness is controversial. However, because a single dose of lidocaine is unlikely to cause harm, it seems reasonable to use in the patient who has a known or suspected head injury.
Should be administered 2-3 min prior to intubation.

Procedure:
The 5 P’s of rapid sequence intubation:
Preparation
Preoxygenation
Pretreatment
Paralysis (with anesthesia)
Placement (of the endotracheal tube)

1. Preoxygenation with 100% oxygen for 3-5 minutes via NRB mask (or 3 vital capacity breaths, avoid BVM if possible).
2. Secure IV’s, ECG, pulse oximeter.
3. Prepare intubation equipment: ETT with stylet, suction, BVM, laryngoscope.
4. Premedication:
   Lidocaine (head injury) 1.5 mg/Kg
   Vecuronium (defasciculating dose) 0.01 mg/Kg
   Versed 0.1 mg/Kg
   Atropine (peds) 0.01 mg/Kg
   Etomidate 0.3 mg/Kg
5. Perform Sellick’s maneuver, maintain maneuver until after confirmation of tube placement.
6. Succinylcholine 1.5 mg/Kg (Peds: 2.0 mg/Kg)
7. Wait 30-60 sec, place ETT.
8. Confirm ETT placement by: listening for bilateral breath sounds, chest rise and fall, tube fogging, & positive ETCO2. Final confirmation by CXR.
10. Secure ETT.

### Basic RSI

<table>
<thead>
<tr>
<th>Time (min)</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>-5.00</td>
<td>Preparation and Preoxygenation</td>
</tr>
</tbody>
</table>
| -2.00      | Administer Vecuronium 0.01 mg/kg IV  
              Lidocaine 1.5 mg/kg IV  
              (Fentanyl 3 mcg/kg IV)  
              (Atropine 0.01 mg/kg in kids < 10) |
| -1.00      | Apply cricoid pressure and in-line cervical stabilization |
| -1.00      | Administer Versed 0.1 mg/kg IV  
              or Etomidate 0.3 mg/kg IV |
| -55 sec    | Administer Succinylcholine 1.5 mg/kg IV (2mg/kg if <10 y.o.) |
|            | Intubate |

### RSI without Succinylcholine

<table>
<thead>
<tr>
<th>Time (min)</th>
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<tbody>
<tr>
<td>-5.00</td>
<td>Preparation and Preoxygenation</td>
</tr>
</tbody>
</table>
| -4.45      | Lidocaine 1.5 mg/kg IV  
              (Fentanyl 3 mcg/kg IV)  
              (Atropine 0.01 mg/kg in kids < 10) |
| -4.45      | Apply cricoid pressure and in-line cervical stabilization |
| -3.00      | Administer Versed 0.1 mg/kg IV  
              or Etomidate 0.3 mg/kg IV |
| -2.45      | Administer Rocuronium 0.9-1.2 mg/kg |
|            | Intubate |
References:


INDICATIONS FOR HEAD CT SCAN

ADMISSION NEUROLOGICAL STATUS

GCS = 15 No HX of LOC amnesia, headache or intoxication

Admit for other injuries

GCS = 15 with HX of any one of following**
1. Witness LOC
2. Definite amnesia
3. Witness disorientation in patient with a GCS of 15
4. Headache

Planned surgical intervention within 12hrs of ED arrival

NO

No head CT scan; Admit to floor/ICU as indicated with q4hr neurological checks if indicated

NO

No head CT scan. Discharge with appropriate instructions

YES

High risk for NS intervention
GCS < 15 @ 2hrs post injury
- Suspected open/depressed skull fx
- Basal skull fx signs
- Vomiting > 2 times
- Age > 65

Moderate risk for brain injury by CT
- Amnesia before impact > 30 min
- Ped vs motor vehicle
- Occupant ejected from car
- Fall > 3 ft or 5 steps

Head CT scan before OR (head CT not necessary preop for procedure < 2hrs in length)

NO

No head CT scan*
If admitting for other reason:
- Neurological observation:
  q1hr x 4; q2hr x 4; q4hr x 1
If not admitting for other reasons, consider head CT and discharge if appropriate.

GCS < 15 motor/sensory deficient, anisocoria

Head CT scan mandatory admit to floor/ICU as appropriate

*May require head CT scanning independent of brain injury. Under these circumstances, may be discharged home from ED after normal CT scan. They do not have to be admitted.
Initial Management of Head Injuries

Brain injury is the most common cause of death in trauma. Brain injury is divided into primary and secondary forms. Primary brain injury, which occurs immediately upon impact, can be reduced only through prevention initiatives. Secondary brain injury, which ensues within hours to days later, results from a cascade of cellular events (intracellular calcium, cell membrane permeability changes, depletion of cellular energy, free radical generation, cell signaling molecules) that harms or even destroys neuronal tissue in and around the site of the primary injury.

Secondary injury is exacerbated by 4 major factors: hypoxia, hypotension, hypercarbia and intracranial hypertension. Additional factors which also affect secondary brain injury include: hypocapnea, hyperthermia, glucose imbalance, acute hypo-osmolarity, electrolyte imbalance, anemia, acid-base disorders and coagulopathy. Since secondary brain injury is a major contributor to brain injury mortality and has a negative effect on neurologic outcome, clinicians must work diligently to identify and treat causative factors. Airway maintenance, ventilation, CO₂ control and restoration of circulating volume using isotonic fluid are essential initial treatments. SBP < 90 and SaO₂ < 90% must be strictly avoided in head-injured patients.

Intracranial pressure (ICP) elevations cannot be predicted by CT scan. ICP monitoring is indicated in salvageable patients with GCS ≤ 8 and an abnormal CT scan. Some evidence also suggests ICP monitoring is indicated in patients with a normal CT if GCS ≤ 8 and age > 40, SBP < 90 or bi- or uni-lateral posturing. Though older devices were subarachnoid, subdural or epidural, modern ICP monitors are intraparenchymal or intraventricular. ICP monitoring guides therapy, and if an intraventricular catheter is in place, permits drainage. ICP monitoring also predicts outcome, as patients who respond the therapy for intracranial hypertension have a more favorable outcome.

Normal ICP is 0-15mmHg. Therapy should be initiated to lower ICP when it reaches 20mmHg. More important than ICP is cerebral perfusion pressure (CPP), the difference between MAP and ICP (CPP=MAP-ICP). CPP < 50mmHg must be strictly avoided and recommended CPP is 50-70mmHg, though optimal CPP is unproven. CPP may be increased by lowering ICP or by raising MAP.

ICP may be lowered by removal of noxious stimuli and adequate sedation. Morphine is sedative and analgesic without increasing ICP. Midazolam may reduce MAP and raise ICP. Propofol is the recommended sedative agent in brain injured patients because it lowers ICP. MAP can be increased by use of alpha-adrenergic agents.

Alternative measures for brain oxygenation include jugular venous oxygen saturation (SjO₂) and brain tissue partial pressure of oxygen (PbrO₂). If measured, interventions to increase cerebral oxygenation when SjO₂ drops below 50% and/or PbrO₂ drops below 15mmHg.

Mannitol is a hyperosmolar plasma expander that also functions as an osmotic diuretic. Mannitol expands plasma volume, reduces blood viscosity, increases cerebral blood flow and oxygen delivery and because of its osmotic effects may reduce brain water and secondary brain injury. Mannitol (0.25g-1g/kg) can be used to lower ICP based upon clinical signs alone ( herniation or progressive neurologic decline) or ICP monitoring. Clinicians must maintain adequate intravascular volume in the face of mannitol therapy.
Hyperventilation has theoretical benefits in lowering pCO₂ and thus cerebral blood volume which lowers ICP. Hypocapnea can, however, produce cerebral ischemia and recent data indicate that hypocapnea may be more harmful than hypercapnea. Moreover, prolonged hyperventilation is probably ineffective because adaptation occurs and cerebral blood flow returns to baseline. Current guidelines for CO₂ control are to achieve a pCO₂=35 and avoid hyperventilation to pCO₂ < 35 mmHg for the first 24 hours post-injury. Hyperventilation may be used as a temporizing measure only in cases of refractory intracranial hypertension.

Additional treatments for severe traumatic brain injury include barbiturates which are recommended for refractory intracranial hypertension in hemodynamically stable patients. Hemodynamic instability and severe ileus are side effects of this therapy. Steroids are contraindicated for the treatment of traumatic brain injury. Anticonvulsants (phenytoin) may be used to prevent early post-traumatic seizures and therapy duration is ≈ 7 days. Prophylactic antibiotics are not recommended for indwelling ICP monitors. DVT prophylaxis is recommended in patients with TBI, with compression devices initially and progressing to anticoagulants as neurosurgery indicates is appropriate.

Pre-Hospital:

- Ensure patent airway while maintaining cervical spine precautions (endotracheal intubation using RSI protocol) if necessary.
- Ventilate patient with 100% oxygen. Keep PaO₂ > 60mmHg (Sat >90%).
- Keep ETCO₂ 30-35mmHg during transport.
- Establish adequate IV access.
- Maintain mean arterial pressure (MAP) >90.
- Mannitol may be given with ingoing signs if neurologic deterioration:
  - Motor score < 3
  - Decreasing motor score
  - Lateralizing motor findings
  - Pupillary changes (dilation or sluggish reactivity)
- Sedation/Neuromuscular blockade can be useful in optimizing transport of head injured patient. Both treatments interfere with neurologic examination and should be avoided if possible.
- Reassess neurologic status frequently.
- Transfer should not be delayed for diagnostic testing.
- Steroids have not been found to be of benefit to the head-injured patient and are not recommended as therapy for severe head injury.

Initial Resuscitation of the Head Injured Patient
• Insure patent airway (endotracheal intubation is indicated in patients with GCS ≤ 8).

• Maintain cervical spine immobilization.

• Maintain MAP > 90 throughout patient course in attempt to maintain cerebral perfusion pressure (CPP) 50-70mmHg. Insure adequate volume repletion before adding vasopressors (CVP >12).

• Maintain adequate circulating volume:
  o NS preferred
  o Monitor for signs of Diabetes Insipidus
  o Place Foley catheter

• Prophylactic anti-convulsants may be indicated.
**Severe Head Injury Management Algorithm**  
(GCS ≤ 8)

- **Neurologic assessment**  
  (GCS ≤ 8)

  - **Established definitive airway**

  - **Obtain ABG**  
    - BVD 100% O2 or Mechanical Ventilation
    - CT Head (see protocol)

  - **IVF NS (preferred)**

  - **MAP > 90**

  - **Decompress stomach**  
    (Place NG/OG)

  - **Insert Foley**

  - **Agitated/PIP > 40**  
    - Yes  
      - Consider Hold sedation
      - Sedation/NMBA
    - No  
      - Monitor Urine Output

  - **Monitor Urine Output**  
    - Lateralizing signs neurologic deterioration

  - **Mannitol**  
    - $\frac{1}{4}$ gm – 1

  - **Monitor UOP**
FACIAL BONE FRACTURE
EMERGENCY DEPARTMENT RADIOLOGIC ALGORITHM

Indications:
1. Obvious facial bone fracture or fracture suspected on physical exam.
2. Facial bone fracture detected on head CT.
3. Facial bone fracture detected on radiograph from referring facility.

*Axial spiral CT with 3mm slices provides sufficient detail for diagnosis and treatment planning for facial fractures (forehead to mandible).

†These films are not often needed urgently and should be obtained at the request or discretion of the maxillofacial trauma consultant.
- Facial plain films are sometimes helpful for treatment planning.
- While (formal) coronal CT is usually only needed when coronal reconstructions do not provide adequate detail for surgical treatment planning, an urgent coronal CT may sometimes be needed to resolve an equivocal CT with regards to optic nerve integrity or compression.

§Mandibular Panorex is a useful study in patients who can sit upright and cooperate with the exam. Thus Panorex is not often logistically obtainable in multi-trauma patients and axial CT with coronal reconstructions, which provides satisfactory detail for treatment planning, is the usual diagnostic of choice.

11/08
SPINE CLEARANCE
Basic Principles

General
1. Entire spine is immobilized during primary survey.
2. Radiographic clearance of the spine is not required before emergent surgical procedures. Presence of a spinal column injury is simply assumed until excluded.
3. Secondary and tertiary exams include examination of the spine for tenderness as well as testing all motor roots, sensation and reflexes.
4. Tertiary exams are performed only on alert and unimpaired patient without distracting injuries.
5. If any spine fractures are found, entire spine must be radiographed.
6. For patients with radiographic injury spine consultation requested for focused pre-operative evaluation regarding relative instability and severity of injury prior to intubation.
7. Patients remain on spine precautions until spine is cleared.

Cervical
1. C-spines are not cleared until after the tertiary exam is completed.
2. Cervical CT scan is the preferred radiographic modality when physical exam is not adequate.
3. With impaired or unconscious patient, rigid collars are taken off within 2 hours and replaced with semi-rigid pressure reducing collar.
4. Enter patients in cervical algorithm for C-Spine clearance.

Thoraco-Lumbar
1. CT scan of thoracic and lumbar spines if there are clinical findings on secondary or tertiary exams or an unreliable exam. Multi-detector CT-scan with reformatted axial collimation is superior to plain films.
2. Radiographic Thoraco-Lumbar clearance is not needed prior to OR for non spine surgery. Thoracic & Lumbar clearance may however be required for some non supine positioning in the OR, depending upon acuity and case type.
3. Tertiary exam is necessary to clear thoracic and lumbar spines.

8/08
Initial Management of Spinal Cord Injury

1. Priorities: Airway, Breathing & Circulation
2. Maintain complete spine immobilization using:
   a. Semi-rigid cervical collar
   b. Modified logroll – maintaining spine in neutral position at all times
   c. Remove patient from long board within 2 hours.
3. *If patient is hypotensive – determine cause and treat hypovolemia with fluids and definitive surgical intervention as directed.
4. If hypotension due to Neurogenic Shock confirmed, consider inotropic agents to maintain blood pressure (MAP 60 – 70mmHg).  
   *Effort must be made to reduce secondary injury.  
   *Methyprednisolone use – insufficient evidence to support routine use
5. Patient should be removed from long spine board & placed on pressure reducing surface within 2 hours of trauma room arrival.
6. Radiographic studies to determine location of injury include:
   a. Plain films
   b. Spiral CT scan
   c. MRI
7. Determine if injury is complete or incomplete and fracture is stable or unstable.
8. Fully document complete neurological exam during secondary survey & prior to OR if possible.
10. Obtain Spine Surgery (Orthopedic or Neurosurgery) consult.
11. Place urinary catheter to monitor urinary output & prevent bladder distension.
12. Place gastric tube to prevent gastric distension & aspiration.
8/08
CRITICAL PATHWAY FOR REMOVAL OF BACKBOARD AND CERVICAL COLLAR

Patient Arrival in the Emergency Department

Remove backboard to maintain spine precautions until status of spine is known
Move patient to pressure-reduction surface within 2 hours

Exam reliable, no intoxication
pain, tenderness, or neurological deficit

- Spine clear, remove cervical collar

Exam unreliable, clinical exam positive, or neurological deficit

- Radiological exam according to spine protocol

  - Spine clear
    (including cervical CT)
    
      - Yes
        Consider collar removal
        if tertiary exam is unavailable
      
      - No
        Change cervical collar to low pressure rigid collar and maintain spine precautions
Blunt Cerebrovascular Injury Algorithm

### Signs and symptoms of blunt cerebrovascular injury
1. expanding cervical hematoma or hemorrhage
2. neurologic deficit with normal CT of head
3. age < 30 and cervical bruist
4. Horner syndrome (ptosis, miosis, and anhidrosis)
   - Or X-ray findings of:
     1. C1-3 fractures
     2. C2 Spine fracture with subluxation
     3. Fractures involving the foramen transversarium

### Does the patient have ≥ 2 of the following?
1. GCS ≤ 8
2. cervical spine fracture
3. Le Fort II or III fracture
4. basilar skull fracture
5. soft tissue injury of neck or clavicle (seat belt sign)

- **Negative**
  - Observe

- **Positive**
  - Vascular Surgery consult & treat (if no contraindication)
    - Grade 1-2: aspirin
    - Grade 3-4: full anticoagulation with heparin preferred; consider ASA if full anti-coagulation contraindicated (possible stent or operative repair for grade 3)
    - Grade 5: CIR

### CT angiography of the cervical vessels & CT of head

- **Equivocal**
  - Four-vessel cerebral angiography

- **Positive**
  - Vascular Surgery consult & treat (if no contraindication)

**Biffi classification** (Biffi et al., J Trauma 1999)
- Grade 1: luminal irregularity or dissection with < 25% luminal narrowing
- Grade 2: dissection or intramural hematoma with > 25% luminal narrowing
- Grade 3: pseudoaneurysm
- Grade 4: occlusion
- Grade 5: transection with free extravasation
Penetrating Neck Injury Evaluation and Treatment Algorithm
University of Kentucky Hospital Trauma Center

Overview
The neck is divided into zones:
- Zone 1-Clavicles to cricoid cartilage
- Zone 2-Cricoid to angles of the mandible
- Zone 3-Angles of the mandible to skull base

Management of patients with penetrating wounds to the neck has historically been determined by zone of injury. Because zones 1 and 3 are challenging to expose surgically, patients with injuries in zones 1 and/or 3 warrant thorough diagnostics because non-therapeutic surgery in these areas is both difficult and morbid. Zones 1 and 3 should be approached surgically only if an injury is felt to be present. However, zone 2 of the neck is easily exposed surgically. Controversy has existed as to whether patients with zone 2 injuries should undergo exhaustive diagnostics to exclude or characterize injuries in this area, or simply undergo neck exploration with limited or no preoperative evaluation of the esophagus and cervical vasculature (esophagography or esophagoscopy or both plus angiography).

Recently published studies have changed the management of penetrating neck trauma in 2 important ways. First, evidence suggests that for patients with no clinical evidence of vascular injury (shown on the algorithm as “Mandatory Criteria for Neck Exploration”) then physical examination has 100% sensitivity, thus definitively excluding vascular injury without any angiography. This is most true if the injury is to Zone 2. The second major advance in the care of these patients has been the advent of helical CT angiography as an alternative to conventional catheter-based angiography, producing equivalent results.

Furthermore, the anatomic detail provided by the neck CT may permit the clinician to exclude injury to the esophagus if the CT clearly shows a missile trajectory remote from the esophagus. However, the precise role that CT will play in excluding injury to the esophagus in these patients remains to be established. If the CT does not conclusively exclude injury to the esophagus, contrast esophagography and/or esophagoscopy (or both) should be performed.

Summary
1. CT scan of the neck including CT cervical angiography is the initial diagnostic of choice.
2. Some asymptomatic patients may avoid angiography entirely.
3. Esophageal injury must be definitively excluded, which may require esophagography or esophagoscopy or both.

References regarding the utility of CT/CTA for evaluating penetrating neck injury:

References demonstrating the diagnostic accuracy of physical exam for vascular injuries in Zone II requiring intervention:

Blunt Cardiac Injury (BCI)

Blunt cardiac injury (BCI), formerly called myocardial contusion, encompasses a spectrum of disease ranging from histologic injury to the myocardium without clinical manifestation to blunt cardiac rupture.\(^1\) BCI contributes to 20% of prehospital deaths from blunt trauma.\(^2\) An exact incidence of BCI does not exist because there is no “gold standard” for diagnosis, i.e., the available data are conflicting with regard to how the diagnosis should be made (ECG, echocardiography, enzyme analysis, etc). This lack of a diagnostic standard makes the literature difficult to interpret and leads to confusion in clinical practice.

The major priority is identification of patients at risk for adverse events resulting from BCI and providing appropriate workup, monitoring and treatment. Conversely, patients not at risk can potentially be discharged home. Patients with appropriate mechanism of injury and clinical evidence of cardiac dysfunction (electrophysiologic or mechanical) can be considered to have BCI.

BCI results from 5 possible mechanisms: direct pre-cordial impact, crush between sternum and spine, deceleration or torsion causing a tear in the heart at a point of fixation, hydraulic effect resulting in rupture from elevated intra-abdominal and caval pressure, and blast injury.\(^3\) Few clinical signs are diagnostic of BCI. Chest pain is the most common finding, but dyspnea, chest wall ecchymosis and rib fractures may also be present. Associated injuries include hemothorax, sternal fracture and great vessel injury. Clinical signs consistent with BCI include dysrhythmias, cardiac ischemia, low cardiac output and hypotension.\(^4\)

Diagnostic tests include ECG, echocardiography, and enzyme analysis. Controversy exists regarding the application of these tests. Frequency of diagnosis of BCI will be proportional to the aggressiveness with which it is sought. Appropriate workup commands achieving a balance between cost-effectiveness and information acquisition with attention to the clinical value of information gained in changing patient management. Guidelines for using diagnostic tests are as follows:

A. Level 1 evidence supports obtaining an ECG in the emergency department for at-risk patients (described above).\(^5\) Using any ECG abnormality, including sinus tachycardia, bradycardia conduction delays and PAC's/PVC's, the diagnostic sensitivity of ECG is 100%.\(^6\)

B. Echocardiography is not effective as a screening tool and does not identify patients at risk for complications.\(^7\) Transthoracic (TTE) or transesophageal echocardiography (TEE) should be obtained in patients with evidence of hemodynamic instability or in whom coincident coronary ischemia is suspected.

C. CK and CKMB fraction analysis is NOT indicated in suspected BCI because associated skeletal and visceral injury creates serum CK abnormalities that contribute to an unacceptable false-positive and negative rate.\(^8\) However, a body of evidence exists suggesting some value to cardiac troponin I (cTnl) or troponin T (cTnT). That evidence is as follows:

i. Diagnosis of BCI should not rely solely on cTnl or cTnT. ECG should be included.

ii. Normal ECG and normal cTnl is 100% sensitive for BCI.\(^9\)

iii. Abnormal ECG and abnormal cTnl is 100% specific for BCI.\(^9\)

iv. cTnl is of little added benefit in patients with a markedly abnormal ECG (diagnosis is already made).\(^10\)
v. Though the utility of cTnI in patients with normal ECG’s is limited, cTnI obtained 4-6 hours after the injury in patients with sinus tachycardia or non-specific EKC changes or in older patients may give reassurance that the likelihood of BCI-related complications is low. 10

References:


Revised: 08/08
BLUNT CARDIAC INJURY (BCI) ALGORITHM

HIGH RISK PATIENT
- History Chest pain and/or dyspnea
  - PE: Ecchymosis, rib fractures, flail chest
  - Injuries: HTX, PTX, Pulm Contusion or Great Vessel Injury

HEMODYNAMICALLY STABLE
- ECG
  - NORMAL
    - NO TELEMETRY
  - ABNORMAL
    - 24 HOURS OF TELEMETRY
      - ECHO and/or cTnI if concern for Cardiac Ischemic Etiology

HEMODYNAMICALLY UNSTABLE
- ECG, ECHOCARDIOGRAM
  - ABNORMAL
    - SUPPORTIVE: PA CATHETER CARDIAC CONSULT CT CONSULT
  - NORMAL
    - TREATMENT OF OTHER INJURIES & MONITOR
      - CONSIDER cTnI@ 4 – 6 HOURS POST INJURY
        - ABNORMAL
THE DIAGNOSIS OF BLUNT INJURY TO THE THORACIC AORTA
What diagnostic test is best?
Angiography, Transesophageal Echocardiography, or Computerized Axial Tomography

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Chief, Section of Trauma and Critical Care
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Background
Blunt chest trauma with resulting aortic injury is a significant cause of death following high-speed motor vehicle collisions. The vast majority of these patients (80%-90%) expire at the collision scene. For the remaining 10%-20%, the mortality rate is high. Thirty percent expire within 6 hours and 40%-50% within 24 hours of injury. The recent multicenter trial by the American Association for the Surgery of Trauma reported an overall mortality of 31%, with 63% of the deaths attributable to aortic rupture. Expeditious evaluation and timely surgical intervention are essential for patient survival.

Screening
The goal of screening patients is to attain a zero nontherapeutic surgery rate without overlooking any significant aortic or arch vessel injury. Mechanism of injury, clinical exam, and the initial chest radiograph should reliably select patients who require further diagnostic evaluation. Chest radiographs demonstrating mediastinal hematoma have good sensitivity (93%) for aortic and arch vessel injury. When combined with mechanism of injury, sensitivity rises to 98%. More importantly the negative predictive value of a normal upright chest radiograph is almost 100%. A normal chest radiograph virtually excludes aortic and/or arch vessel injury. Unfortunately, the specificity of an abnormal chest radiograph is only 10%-45%. Since most mediastinal hematoma originates from thoracic vascular structures other than the aorta, a definitive diagnostic test is required to establish the diagnosis of aortic injury. Computerized axial tomography (CT) of the chest can be used to screen patients for subsequent aortography. CT is more sensitive than chest radiograph in detecting mediastinal hematoma. Screening thoracic CT is cost-effective and the negative predictive value of a normal study is 100%. Consequently, CT can be used to reduce the negative aortogram rate in patients with an abnormal chest radiograph.

Diagnosis-Aortography
Many authors advocate the liberal use of aortography based on mechanism of injury and chest radiographs. Using this approach, aortography yields positive results in only 10% of patients. Although angiography remains the "gold standard", the procedure is invasive and time consuming, requires the use of intravenous contrast material and ionizing radiation, and can result in false negative or false positive results. Transporting an injured patient to the angiography suite is not without risk and interrupts the patient’s ongoing evaluation, resuscitation, and treatment. On the other hand, when performed properly, aortography has a sensitivity and specificity of 99%. Complications occur in less than 1% of patients.
Aortography remains the only study that provides detailed images of the entire thoracic aorta and the arch vessels.

**Diagnosis-Transesophageal Echocardiography**

Transesophageal echocardiography (TEE) provides high-resolution real-time axial and longitudinal images of the aorta. TEE can accurately demonstrate injury to the thoracic aorta. In our hands, TEE was more sensitive (100%) and specific (98%) than aortography. TEE offers a number of advantages over aortography and CT scanning. The study can be performed at the bedside, eliminating transport risks. Concomitant diagnostic and therapeutic procedures can continue unhindered. TEE provides real-time images so that areas of interest can be examined repeatedly in different planes. Simultaneous evaluation of cardiac pathology and function can also be obtained. If urgent surgical intervention is indicated for other injuries, TEE can be performed in the operating room without delaying TEE or the surgical intervention. The study can be performed more rapidly than aortography making TEE ideal for the evaluation of the unstable trauma patient with a number of diagnostic and treatment priorities. Unfortunately, TEE requires the expertise of a well-trained and interested echocardiographer. Airway compromise, esophageal pathology, and unstable cervical spine fractures are contraindications to TEE. The depth and extent of injury are frequently difficult to determine particularly when atherosclerotic disease diminishes the sensitivity of the examination. In our experience, this has resulted in nontherapeutic thoracotomy. There are blind spots related to the tracheal air column and the arch vessels simply cannot be imaged.

**Diagnosis-Computerized Axial Tomography (CT)**

CT scanning technology is advancing rapidly. Perhaps the most promising technology for a fast, accurate, and less-invasive diagnostic test for detecting injuries to the thoracic aorta and arch vessels is the newer generation helical CT scanner. Rather than providing indirect evidence of aortic injury (detection of mediastinal hematoma), the helical scanners can provide direct evidence of aortic injury obviating the need for confirmatory tests. Sensitivity, specificity, and accuracy depend heavily on the technical skill of CT performance and the interpretative expertise. Confirmatory angiography or TEE must be performed for indeterminate or equivocal CT scan results. Although CT can be performed more rapidly than angiography, transport of the injured patient to CT is not without risk and interrupts the patient’s ongoing evaluation, resuscitation, and treatment.

**Summary**

Patients with suspected blunt injury to the thoracic aorta are a challenge for the trauma surgeon. Multisystem trauma, critical illness, and hemodynamic instability in this patient group result in diagnostic and treatment dilemmas. We employ a practical, evidence-based algorithm for the screening and diagnosis of injury to the thoracic aorta. Both mechanism of injury and an abnormal mediastinum on chest radiograph are required to trigger a diagnostic evaluation. Every attempt is made to obtain an “upright” AP chest radiograph to minimize distortion and magnification. However, this is not possible in all patients. Widening of the mediastinum alone is neither sensitive nor specific for mediastinal hematoma. Instead, we employ the criteria for mediastinal hematoma (abnormal mediastinal silhouette) as defined by Mirvis and Ayella. No further diagnostic evaluation is undertaken in patients with a normal chest radiograph, unless there are compelling physical findings that suggest aortic or arch vessel injury (i.e. Pulse deficit,
unequal blood pressure/pulse measurement, unexplained hemodynamic instability, unexplained neurologic deficit). Thoracic CT scan using the aortic protocol is performed. A negative scan yields observation. A scan positive for aortic injury prompts surgical intervention or appropriate non-operative management. Patients with indeterminate scans undergo angiography or TEE to establish or exclude the diagnosis.

REFERENCES:


BLUNT THORACIC INJURY WITH SUSPECTED INJURY TO THE THORACIC AORTA OR ARCH VESSELS

Patients who sustain blunt thoracic trauma are at risk for injury to the heart and great vessels. Patients should be selected for additional diagnostic studies based on mechanism of injury and evidence of mediastinal hematoma on chest radiograph. Every attempt is made to obtain an “upright” AP chest radiograph to minimize distortion and magnification. However, this is not possible in all patients. Widening of the mediastinum alone is neither sensitive nor specific for mediastinal hematoma (5,6,7). Instead, we employ the criteria for mediastinal hematoma (abnormal mediastinal silhouette) as defined by Mirvis and Ayella (6,7). No further diagnostic evaluation is undertaken in patients with a normal chest radiograph, unless there are compelling physical findings that suggest aortic or arch vessel injury (i.e. Pulse deficit, unequal blood pressure/pulse measurement, unexplained hemodynamic instability, unexplained neurologic deficit).

MECHANISM OF INJURY (History of significant deceleration)
1. High-speed MVC (>30-40mph)
2. Substantial vehicle deformity or associated fatalities
3. Unrestrained and/or ejection from vehicle
4. Pedestrian struck by vehicle
5. Falls > 10 feet
6. Hemodynamic instability

INJURY
1. Sternal and/or scapular fracture
2. Multiple rib fractures and/or flail chest

CHEST RADIOGRAPH (One or more of the following)
1. Upper mediastinal widening
2. Indistinct aortic contour
3. Obscuration of the aortopulmonary window
4. Widened left paraspinal stripe
5. Deviation of the NG tube or trachea to the right
6. Depression of the left mainstem bronchus
7. Left apical cap (apical capping)

* Isolated fractures of the first and second ribs without evidence of mediastinal hematoma do not correlate with aortic or arch vessel injury and are not an indication for further imaging.

References:
Evaluation for Suspected Thoracic Aortic Injury

- Abnormal Supine Chest Radiograph
  - Clear spines and obtain upright CXR
    - Abnormal CXR, or cannot obtain
      - CT Scan Chest
        - Positive
          - Immediate Arterial Line/Consider Esmolol drip
        - Negative
          - Indeterminate
          - Observe
      - Normal
        - Observe
    - CT Surgery Consult
  - Observe
    - Angiogram/or TEE
Penetrating Mediastinal Wounds

Airway, Breathing, Circulation

Agonal
Intermediate Thoracotomy

Stable

Unstable

CXR
Chest Tubes as Indicated

Bilateral Chest Tubes
CXR

FAST
(Pericardial view)

Equivocal

Negative
Pericardial Window

Negative
CT scan of chest-aorta protocol (consider bronchoscopy and esophagoscopy based on proximity)

Positive
OR
Sternotomy
Bronchoscopy
Esophagoscopy

Positive
Massive Hemothorax

OR - Thoracotomy
Thoraco-abdominal stab or gunshot wound

CXR

FAST

+ Pericardial fluid and either + or – for Free fluid

OR

- Pericardial fluid + Free fluid

Unstable, peritonitis, evisceration, blood per ngr/rectum

Laparotomy

Stable, No clinical indication for surgery

CT chest/abdo/pelvis with PO and IV contrast

- Pericardial fluid - Free fluid

Unstable, peritonitis, evisceration, blood per ngr/rectum

Surgery

Stable, No clinical indication for surgery

CT chest/abdo/pelvis with PO and IV contrast
DIAGNOSTICS: ROLE OF DPL, CT, FAST (ultrasound)

The goal of the abdominal evaluation of multi-system trauma patients is the safe, accurate, and timely determination of the presence or absence of intra-abdominal injury, particularly those requiring surgical intervention. Physical examination can be unreliable in polytrauma patients, particularly when the abdominal examination or the level of consciousness has been altered by alcohol, drugs, central system trauma, or distracting pain. Diagnostic peritoneal lavage (DPL), CT scan, and abdominal sonography (FAST) are the most frequently employed diagnostic studies used for the abdominal examination of multi-system trauma patients. Each study has advantages and disadvantages. The goal of this session is to integrate these complementary studies into a rational diagnostic algorithm for the evaluation of the abdomen.

Introduced by Root et al. in 1965, DPL (Diagnostic Peritoneal Lavage) was the time-honored standard for evaluation of the abdomen for many years. DPL is rapid (< 30 minutes) and safe (< 2% complication rate) with well-established standards for surgical intervention on the basis of cell counts or the aspiration of free blood after lavage. Overall sensitivity is 98%, with a specificity of 98% and a diagnostic accuracy approaching 100%. The procedure is inexpensive and can be performed at the bedside while other diagnostic and therapeutic interventions proceed. The procedure is invasive. Previous abdominal surgery makes the procedure more difficult and may enhance complications and diminish specificity. DPL cannot evaluate extraperitoneal structures (thorax, retroperitoneum, and pelvis) and must be supplemented with other diagnostic procedures. DPL is not organ specific. Therefore, a positive study may lead to a non-therapeutic laparotomy for a trivial injury. In recent years, DPL has been replaced by FAST in the unstable patient and has a limited role in the stable patient.

Abdominopelvic CT scanning for blunt abdominal trauma was introduced by Federle et al. in the early 1980s and has gained wide popularity in the United States. CT scanning has a sensitivity of 96%, a specificity of 98%, and an accuracy of 97%. CT is organ specific, allowing the identification and grading of injured organs and the quantification of intraperitoneal fluid or blood. This allows for non-operative management of stable patients, thereby reducing the rate of non-therapeutic laparotomy. Extraperitoneal injuries (thorax, retroperitoneum, and pelvis) can be identified and graded. CT scanning is relatively expensive. Sensitivity and specificity depend on quality of the scan and skill of the interpreter. Contrast aspiration and allergy may occur. Bowel and pancreatic injuries may be missed. Even with the new, more rapid scanners, CT is time consuming, and transport to the scanner interrupts other diagnostic and therapeutic interventions. Consequently, CT is limited to hemodynamically stable patients. CT scan is the mainstay in the abdominal evaluation of the stable blunt trauma victim. CT now has a role to play in the evaluation of penetrating torso injury.

The use of ultrasound or FAST (Focused Assessment with Sonography in Trauma) in abdominal trauma first evolved in Germany. FAST has been employed successfully at trauma centers in the United States for over a decade. US is noninvasive, rapid (2 to 4 minutes), and relatively inexpensive. The examination can be performed at the bedside, does not interfere with other diagnostic and therapeutic interventions, and can be repeated as needed. The primary goal of FAST is to detect free fluid in Morison's Pouch, the pelvis, peri-splenic region and the pericardium. The sensitivity of FAST ranges from 80% to 100%; the specificity, from 89% to 100%; and the accuracy, from 86% to 99%. Extraperitoneal structures can be imaged (thorax, pericardium, retroperitoneum). The technique can be easily learned and performed by the
treating surgeon. Sensitivity, specificity, and accuracy of US clearly improve with experience. Although extremely sensitive for peritoneal fluid, US is much less sensitive for specific organ injury (liver, spleen, etc.). As is true of CT, US can miss bowel injuries. However, repeat examinations mitigate the latter weakness, and organ-specific diagnostic sensitivity improves with the experience of the examiner. Sensitivity, specificity, and accuracy also depend on image quality. Obesity, bowel gas, and subcutaneous emphysema interfere with imaging.

References
Gunshot to abdomen, flank or low back
Stab to anterior abdomen flank or low back

CXR
Consider local wound exploration

Unstable Peritonitis
Evisceration
Blood per NG or rectum

Stable
No clinical indication
for surgery

OR

CT abdomen and pelvis
With PO and IV contrast
(+- rectal contrast)
(+- CT cystogram for hematuria)

Surgery, Observation
or Discharge
Genitourinary Trauma
5/08

Trauma to the GU tract is present in approximately 10% of all injuries. The following discussion pertains to the evaluation and management of the stable patient.

Work-up of GU trauma begins with assessment of the urethra. Injuries of the female urethra are rare. Urethral injuries are usually due to blunt trauma associated with pelvic fracture or straddle-type injuries. The primary posterior site of urethral injury is the prostatomembranous junction. The primary anterior urethral injuries are most commonly caused by straddle-type injuries or perineal trauma. The location of injury is typically the bulbar urethra. Physical finding of blood at the meatus, perineal hematoma or extensive laceration, a high riding prostate, or a large hematoma found on rectal exam mandates a retrograde urethrogram prior to insertion of a Foley catheter. Management requires suprapubic urinary diversion or endoscopic assisted placement of Foley catheter.

Once urethral injury is ruled out, a Foley catheter should be inserted. It is essential to document the color of the urine, as gross hematuria mandates further workup of the GU tract. Evidence suggests the microscopic hematuria is not diagnostic for GU trauma and as such a urinalysis should not be part of the workup.

If there is gross hematuria, evaluation of the remainder of the GU tract – kidneys, ureters (in penetrating trauma), and bladder needs to be performed. This can be accomplished by various imaging techniques. However, with the advancement of the CT technology, it has evolved to become the standard of care. Therefore, for gross hematuria, a CT scan of the abdomen and pelvis to evaluate the kidneys, as well as CT cystogram should be obtained.

The kidneys are the most commonly injured organs in the GU tract. Management depends on hemodynamic stability and the grade of injury by CT scan. Most renal injuries do not require an operation in a stable patient. However, incidental intra-operative finding of perinephric hematoma should be explored if the mechanism is penetrating trauma.

A blunt ureteral injury is a case report! Most ureteral injuries are penetrating. They require surgical intervention. Basic principles of ureteral reconstruction include debridement of devitalized tissue, followed by tension-free anastomosis with absorbable suture in a spatulated fashion over a double J stent.

Bladder ruptures can result from penetrating or blunt trauma. Extraperitoneal bladder rupture is commonly associated with pelvic fracture; and intraperitoneal bladder rupture is a result of blunt lower abdominal force on a full bladder. Classic physical findings of bladder rupture include suprapubic pain, hematuria, and inability to void. A CT cystogram should be obtained. Extraperitoneal bladder rupture is generally managed with Foley catheter drainage, and intraperitoneal bladder rupture requires immediate surgical intervention.
Genitourinary Trauma Algorithm

Blood at the meatus? High riding prostate?

No

Insert Foley catheter

Gross hematuria

No

Observe

Yes

Retrograde urethrogram (RUG)

Positive

Urology consult for suprapubic tube or endoscopic placement of Foley catheter

Yes

CT scan of the abdomen and pelvis with IV contrast and CT cystogram

Treat identified injuries accordingly. Surgical intervention is necessary for high grade renal trauma and intraperitoneal bladder rupture

CTA or Renal arteriography for unilateral renal non-function or vascular injury

Revised: 5/08
EMERGENCY DEPARTMENT RADIOLOGICAL ALGORITHM
TO EVALUATE POSSIBLE PELVIC BONE FRACTURE IN BLUNT TRAUMA VICTIMS

Stable Patient

CT Abdo/Pelvis planned

No AP Pelvis film needed. Use boney windows of CT to evaluate possible pelvic fracture

CT Abdo/Pelvis NOT planned

AP Pelvis film

Unstable Patient

AP Pelvis in Trauma Room
UK Hospital Pelvic Fracture Treatment Algorithm

**UNSTABLE PATIENT**
- FRACUTURE IDENTIFIED ON AP PELVIS
- BINDER*
  - FAST
  - INDETERMINEATE
- LAPAROTOMY
  - CONTROL IP HEMORRHAGE; CONSIDER EP PACKING +/- EX-FIX OR C-CLAMP*** BASED UPON HEMODYNAMICS
  - NO PELVIC FRACTURE BLEEDING
    - REMOVE BINDER
    - CONTINUE BINDER
    - PELVIC ANGIO
  - CONTINUE BINDER, O.R. BASED UPON CT
    - CONTINUE BINDER
    - PELVIC ANGIO
  - CONTINUE BINDER
    - PELVIC BLEEDING
    - CONTINUE BINDER
    - PELVIC ANGIO
    - OBSERVE: CT BONY PELVIS, ORTHOPEDIC CONSULT

**STABLE PATIENT**
- CT BONY PELVIS, ORTHOPEDIC CONSULT
  - CT or DPL**
    - GROSS
    - DPL
    - GROSS
  - PELVIC FRACTURE HIGHEST PRIORITY LESION ON CT?
    - NO
    - PELVIC ANGIO
    - CONTINUE BINDER
    - O.R. BASED UPON CT
    - CONTINUE BINDER
    - PELVIC BLEEDING
    - CONTINUE BINDER
    - PELVIC ANGIO
    - OBSERVE: CT BONY PELVIS, ORTHOPEDIC CONSULT
  - WAITING TIME FOR ANGIO?
    - YES
    - CALL ANGIO
    - SEVERELY HDUS?
      - NO
      - PELVIC ANGIO
      - CONTINUE BINDER
      - PELVIC BLEEDING
      - CONTINUE BINDER
      - PELVIC ANGIO
      - OBSERVE: CT BONY PELVIS, ORTHOPEDIC CONSULT
    - YES
    - CONSIDER EP PACKING +/- EX-FIX OR C-CLAMP*** BASED UPON HEMODYNAMICS
    - NO
    - PELVIC ANGIO
    - CONTINUE BINDER
    - PELVIC BLEEDING
    - CONTINUE BINDER
    - PELVIC ANGIO
    - OBSERVE: CT BONY PELVIS, ORTHOPEDIC CONSULT
  - CONSIDER OTHER SOURCES OF MAJOR BLOOD LOSS
    - NONE
    - PRESENT
    - HEMORRHAGE CONTROL

*Binder should fit snugly, not excessive. MAST could also be used for stabilization.
**Decision based upon hemodynamics, other injuries and AP pelvis
***Ex-fix/C-clamp before pelvic angio only at Ortho Trauma Attending discretion and may include EP packing
Traumatic Peripheral Vascular Injury

Any injured extremity should be thoroughly evaluated for a possible vascular injury. The presence of obvious arterial injury from a blunt and/or penetrating mechanism rarely requires imaging and should not delay emergent operative exploration. The presence of "hard signs" strongly supports vascular injury and typically necessitates emergent repair. These “hard signs” are:

1. Bruit/Thrill
2. Active/Pulsatile hemorrhage
3. Pulsatile/Expanding hematoma
4. Signs of limb ischemia and or compartment syndrome including the 5 "P's" - pallor, paresthesias, pulse deficit, paralysis, and pain on passive extension of the compartment (pain on passive extension is the earliest and most sensitive physical finding)
5. Diminished or absent pulses with + Doppler signals (this is not a sensitive prognostic finding, as up to 30% of patients with major vascular injuries requiring repair have normal pulses or Doppler signals distal to the injury due to collateral flow) [1]

The Arterial Perfusion Index, API, is a validated tool for screening for peripheral vascular injury[2]. This is performed by placing a blood pressure cuff above the ankle or on the bicep of the limb of concern. The systolic pressure is determined with a Doppler probe at the dorsalis pedis or brachial artery. Repeat this procedure on the ipsilateral uninjured limb. The API is calculated by dividing the systolic pressure in the injured limb by the systolic pressure in the uninjured limb. An API < 0.9 has a sensitivity of 95% and specificity of 97% for a major arterial extremity injury. In a study on blunt orthopedic extremity injuries the negative predictive value is 100% for an API > 0.9 to exclude an arterial injury.[3-5]

The purpose of these algorithms is to diagnose the occult injury early before irreversible tissue ischemia is present. In patients where the “hard” signs are NOT present it is imperative to maintain a high suspicion of peripheral vascular injury in the injured extremity [2, 6, 7]. If “hard signs” are not present but peripheral vascular injury is suspected then expedient consultation with Vascular Surgery is indicated and the use of imaging, per Vascular Surgery, should be liberal to avoid missed injuries.

References:
Penetrating Extremity Vascular Injury

Hard Signs of Vascular Injury
• Expanding/Pulsatile Hematoma
• Pulseless, pallor, paresthesia, pain, paralysis, poikilothermia
• Bruit/Thrill
• Absent Doppler Signals
• Arterial Pressure Index, API, (< 0.9)

Active Hemorrhage

Direct Pressure

Emergent Vascular Consult

OR vs. CTA vs. Angio

Yes

No Active Hemorrhage

Emergent Vascular Consult

CTA vs. Angio vs. OR

No

Observe
Open Long Bone Extremity Fracture Protocol

Open long bone extremity fractures are associated with significant trauma. The expedient management of these injuries ensures the best possible fracture treatment outcome. The determination of the grade of open fracture is the responsibility of the orthopedic trauma service. The extent of the type of open fractures often requires intra-operative evaluation.

<table>
<thead>
<tr>
<th>Antimicrobial Treatment for Open Fractures Depending on Type</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Open Fracture Type</strong></td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td><strong>Type I</strong></td>
</tr>
<tr>
<td><strong>Type II</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Type III</strong></td>
</tr>
<tr>
<td><strong>Type A, B, &amp; C</strong></td>
</tr>
</tbody>
</table>

*If patient exposed to barn or farm wound contamination then add high dose PCN x 24 hours (Type I and II) or 48 hours in Type III. If patient is has pen-allergy consider flagyl.*

Open fracture management and evaluation, including antibiotics should be initiated as soon as possible from the timing of wounding, not based on arrival to ER.

If a patient gets an operation on this open fracture after completion of the above duration of antibiotics is given they should get only a perioperative dose.

Wound care for open long bone extremity fracture requires coverage of the wound with a Hibiclens or Betadine soaked gauze.

Mandatory documentation of neurovascular exam is required in all extremity injuries pre and post extremity fracture care. Frequent neurovascular examinations are required before and after fracture management to detect extremity compartment syndrome. The **LAST** clinical finding lost in developing compartment syndrome is the pulse. The body has evolved to perfuse cells until the very end so it makes sense that the pulse is the last clinical finding to be lost in developing compartment syndrome.

* All open fractures must be evaluated by the Ortho Trauma Service for proper management (stabilization, wound care, further fracture grading, and definitive fracture management)
Subject: Management of Injury in Pregnancy

Purpose: To establish guidelines for rapid assessment and treatment of critically injured pregnant patients.

PROCEDURE: To effectively manage trauma patients that are pregnant, the Trauma Team must mobilize the resources essential to diagnosis and treat both mother and fetus. For purposes of this policy, a potentially viable fetus is one at 24 weeks gestation, although some exceptions may exist.

I. Mechanisms of Injury

- Motor Vehicle Accident
- Assault
- Domestic Violence
- Other trauma, such as gunshot wound

II. Initial Evaluation and Management

1. If ≥ 24 weeks gestation, sustaining a traumatic injury, activate Trauma Alert
2. Page OB chief Resident
3. Place roll under the torso to give a gentle right-side-up position (10-15 degrees)
4. Early intubation when indicated
5. Chest x-ray and FAST completed during the primary survey
6. Consider avoiding the plain pelvic radiograph if:
   a. Hemodynamically normal patient
   b. No gross instability or tenderness on physical exam
   c. Planned CT scanning would cover imaging of the pelvis
7. Simultaneous fetal assessment should be completed by the OB team
8. In the case of maternal shock with a positive FAST, where emergent laparotomy is indicated, the fetal assessment can be completed in the OR
9. If distress is identified in a potentially viable fetus, every effort should be made to expedite transfer to the OR for emergent cesarean section via a midline incision
10. When significant mechanism or concern for associated intraabdominal injury are present, exploratory celiotomy at the time of C-section is indicated

III. Diagnostic Studies

1. Lab studies:
   a. Urine pregnancy or serum beta-HCG, especially with a questionable history
   b. Clotting factors and plasma fibrinogen
   c. Kleihauer-Betke test, especially when blunt uterine trauma is suspected
2. Imaging
   a. Avoid duplicating films
   b. Shield the fetus whenever possible
   c. See Appendix 1 for estimated fetal exposure

Appendix 1: Estimated Fetal Exposure for Various Radiographic Studies

<table>
<thead>
<tr>
<th>Plain Films: dose per exam (rad)</th>
<th>Estimated Fetal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lateral Cervical Spine</td>
<td>0.002</td>
</tr>
<tr>
<td>Chest</td>
<td>0.00007</td>
</tr>
<tr>
<td>Pelvis</td>
<td>0.040</td>
</tr>
<tr>
<td><strong>CT Scans</strong></td>
<td></td>
</tr>
<tr>
<td>Head</td>
<td>&lt;0.050</td>
</tr>
<tr>
<td>Chest</td>
<td>&lt;0.100</td>
</tr>
<tr>
<td>Abdomen/Pelvis</td>
<td>2.6</td>
</tr>
</tbody>
</table>

Summary

Focus all initial evaluation and resuscitation efforts on the mother.

1. Complete a primary survey before moving the mother from the trauma bay for any reason.
2. Secondary survey should include simultaneous fetal evaluation.
3. Plan radiographic studies and avoid duplication. Shield the fetus whenever possible.
4. Emergent cesarean sections should be performed through a midline incision.

Medical Director, Emergency Medicine   Trauma Program Director
Initial E&M of the Pregnant Trauma Patient

Traumatic injury in female with reported pregnancy at or beyond 24 weeks:

- **Primary Survey**
  - Roll backboard R-side up 10-15 degrees
  - PCXR
  - FAST

  - **Stable**
    - Complete Secondary Survey
    - Fetal evaluation in ED

  - **Unstable - No clear source**
    - Complete Secondary Survey
    - Fetal evaluation in ED
    - Plan additional imaging, lab studies

  - **Unstable w/ Positive FAST**
    - Proceed emergently to MAIN OR

  - **FETUS IN DISTRESS**
    - Emergent C-section via midline incision (MAIN OR)
    - Trauma present for laparotomy after delivery

    - **NORMAL FETUS**
      - Additional work-up as indicated
      - Fetal monitoring for at least 6 hours (or as directed by OB)

- **Maternal death/traumatic arrest**
  - Initiate perimortem C-section ideally within 4 minutes of maternal arrest (If gestational age likely >24 weeks)
EMERGENCY DEPARTMENT EVALUATION OF BURN PATIENTS

Stabilization

A. Maintain airway - the supraglottic airway is extremely susceptible to obstruction from edema as a result of exposure to superheated air. Assess for clinical signs of inhalation injury:
- Facial burns/singeing of the eyebrows and nasal hairs
- Carbonaceous sputum and acute inflammatory changes in the oropharynx, raspy voice
- History of impaired mentation and/or confinement in a burning environment
- Assess for toxic inhalation, or carbon monoxide poisoning

B. Circulation

1. Replace volume based on Rule of Nines calculation. Follow the Parkland Formula (2 - 4cc x % TBSA burned x weight/kg = total to be administered in first 24 hours. Half should be given in first 8 hours from time of burn and second half over next 16 hours) for administration of fluid. The amount of fluid given should be adjusted according to individual patient's response:
   a. Adult UO: 0.5 – 1.0 ml/kg/hour
   b. Child <30 KG: UO 1.0 ml of urine/KG/hour. It is necessary to administer Maintenance IV fluid containing glucose in addition to burn formula

3. Initiate two large bore IVs; overlying burns shouldn’t prevent IV placement (upper extremities preferred)
A. Assess for associated injuries
B. History - time and mechanism of the injury; enclosed fire, or if toxic chemicals involved
C. Assess burn
   1. **First degree**: (Sunburns): characterized by erythema, pain, and the absence of blisters – NOT COUNTED IN TBSA
   2. **Second degree**: (Superficial Partial Thickness or Deep partial thickness): characterized by a red or mottled appearance with swelling and blister formation. The surface may have a weeping, wet appearance and is painfully hypersensitive
   3. **Third degree**: (full thickness): skin appears dark and leathery; may also appear translucent, mottled, or waxy white; the surface is painless and generally dry, but may also be moist
D. Circumferential extremity burns:
   1. Remove rings and bracelets and Assess distal circulation
   2. Check pulses with a Doppler (absent pulse may indicate inadequate fluid resuscitation)
   d. Observe for cyanosis, impaired capillary refill, or progressive neurological signs (i.e., paresthesia and deep tissue pain)
E. Limb Escharotomy
   Relieve compromised distal circulation in a circumferentially burned limb by escharotomy, which can be done without anesthesia, due to the insensitive full-thickness burn
   1. The incision must extend across the entire length of the eschar in the lateral and/or medial line of the limb including the fingers and joints
   2. The incision should be deep enough to allow the cut edges of the eschar to separate
F. Thoracic Escharotomy:
   Circumferential burns of the thorax occasionally impair respiratory excursion. Bilateral, mid-axillary escharotomy incisions should be considered

**Special Burn Requirements**

A. Chemical burns
   1. Flush burns for at least 20 to 30 minutes; alkali burns require longer irrigation
   2. Brush dry powder off before irrigation
   3. Alkali burns to the eye require continuous irrigation during the first eight hours

B. Electrical burns - frequently more serious than they appear on the surface
   1. Initial care as above
   2. Full spinal immobilization
   3. EKG monitoring
   4. Urinary catheter
      a. Observe for myoglobinuria (due to rhabdomyolysis)
      b. Increase IV rate fluid to ensure UO of at least 100 ml/hour
      c. Consult Medical Control for Mannitol 25 GM IVP and IV infusion with 12.5 GMs of mannitol/1000 cc NS to maintain the diuresis

C. Explosive Injuries –
Any patient involved in an explosion should be considered as having a mechanism for traumatic injuries. Even if the patient states they were NOT thrown a distance. The force of a flash flame explosion is enough energy to cause concussive type of injuries.
University of Kentucky Burn Service Care Algorithm

Burn-Injured Patient Arrives in ED

ED Evaluation Phase
Plastic Surgery Burn Resident
ED Attending

Criteria for Critical Care
Respiratory Failure
Inhalational Injury
Shock
Burn ≥ 20% TBSA
Associated Injuries
Extremes of Age
Electrical Burn

Yes
Burn ICU Phase

No
Plastics/Burn Service Disposition

Blue Surgery/Surgical Critical Care Consultation

Admit to Plastics
Blue Manages all Critical Care/Calls
Plastics Manages Wounds/Calls

Plastics Speaks to Family Daily

Blue Speaks to Family Daily

Burns to Hands/Feet/Head/Neck/Perineum

Burns to Arms/Legs/Trunk (excluding perineum)

Plastics + Blue Determine OR Readiness
Plan Excision and Grafting (autograft or homograft) as soon as physiologically appropriate (1st excision within 48 hours of burn)

Post Case as "Class B Emergency" in Morning of First Appropriate Day, Expect OR Start before 12pm
Excision to Physiologic Tolerance (<3hrs total OR time)

Excision and Grafting Complete?

Yes

Wound Care Only?

*Blue/Intensivist Resident Involvement

Complete ICU Care and Rehab
**Adult Fluid Resuscitation**

**Patients Admit Weight**

**Vital Signs Stable: HR < 140, BP > 90/60, SaO2 > 90%**

- **Urine Output < 15 mL:** Increase IV rate by 20% or 200 mL/hr, whichever is greater.
- **Urine Output 15 - 30 mL:** Increase IV rate by 10% or 100 mL/hr, whichever is greater.
- **Urine Output 30 - 50 mL:** Leave IV at current rate.
- **Urine Output 50 - 200 mL:** Decrease IV rate by 10% or 100 mL/hr, whichever is greater.
- **Urine Output > 200 mL:** Consider decreasing IV rate every ½ hour by 10% or 100 mL/hr, whichever is greater. Be sure to assess patient’s blood sugar, BP, HR, lactic acid, ASG, Mnglokin before decreasing IV rate. Consult with Blue Surgeon first.

**Repeat Step One Every Hour Until:**

- Consider improving Base Deficit as indicator to decrease IV fluid.
- Urine Output < 15 mL/hr for 2 hours despite increased fluid.
- CALL Blue Surgery resident check Foley, assess breath sounds, vital signs, bladder pressure, consider albumin protocol.

**Vital Unstable: HR > 140, EF < 50/60, SaO2 < 90%**

**Call Plastic Surgery resident/chief resident or Attending on call for initial resuscitation.**

**ALBUMIN PROTOCOL**

- If patient requires > calculated resuscitation or has complications related to edema, consider albumin protocol.
- Patient may need colloid resuscitation CALL Blue Surgery resident to discuss. Check Foley catheter, breath sounds, vital signs, bladder pressure.
- Infuse current IV rate consisting of 1/3 rate as 5% albumin, 2/3 rate as LR (Example: if current rate = 900 mL, give 300 mL albumin + 600 mL LR).
- Repeat Step One, decreasing fluids as permitted, while maintaining 2:1 ratio, until total fluid = calculated maintenance rate.
- Switch to LR for total fluids. Repeat Step One until patient maintains urine output for hours at calculated maintenance rate.

Lawrence et al. 2010, J Burn Care & Research
UK Trauma Massive Transfusion Protocol

**Clinical Criteria (Admission)**
- SBP ≤ 70mmHg
- Crystalloid > 4L
- Estimated blood loss > 1000cc
- SBP<90mmHg despite 3.5L crystalloid (50mL/kg)
- Temp <34°C
- ISS > 25

**Clinical Criteria (Trauma OR)**
- Non-surgical hemorrhage
- EBL >150 mL/minute

**Laboratory Criteria (Any Time)**
- Base Deficit > 8
- INR > 1.4
- PT > 18 seconds
- PTT > 60 seconds
- Admission Hct < 30
- pH < 7.1

---

Contact Blood Bank: (Attending, Fellow or Chief Resident)
“Activate Trauma MTP”

Submit Specimen for Crossmatch Immediatly

Hemogram, Coags, Fgn

**Controlled Resuscitation**
(Limited Crystalloid, Avoid HTN):
Trauma Alert Cooler (4 PRBC)

Yes.
Contact Blood Bank.
“Stop MTP”

Bleeding Controlled?

No

Consider Thromboelastography

Hemogram, Coags, Fgn

Controlled Resuscitation:
Cooler Next (#2): 4 PRBC/4 FFP
Consider rFVIIa (90mcg/kg IVP)

Bleeding Controlled?

No

Controlled Resuscitation:
Cooler Next (#3): 4 PRBC/4 FFP/6Ptt

---

101
The Anticoagulated Trauma Patient

Warfarin use has been shown to increase the severity of head injury and a higher mortality rate. Mortality of trauma patients with head injury while on warfarin ranges from 33% to 50%. Furthermore, it has been reported that the head injured patients on warfarin have an increased risk of mortality from 2-fold to 4-fold, when compared with non-anti-coagulated patients with similar degrees of head injury.

As part of the trauma workup, one should always obtain an adequate history, which includes a list of current home medication. Early identification of warfarin use has been shown to reduce mortality on patients with intracranial hemorrhage from 48% to 9%. In the same study, mean time to warfarin reversal (normal coagulation profile) was 1.7 hours in the early identification group compared to 4.3 hours.

Another important aspect of the anti-coagulated patient is the decreased reliability of their neurological exam. It has been shown that GCS of 15 and no loss of consciousness does not reliably rule out intracranial pathology after trauma. Indeed, one study reported two anti-coagulated patients with no loss of consciousness that eventually died from consequence of intracranial hemorrhage. Therefore, all patients with known warfarin use should have a CT scan of the head as part of their trauma workup regardless of their mental status.


Phillip Chang, M.D.
Revised: 08/08
SECTION 4: ICU SPECIFIC PROTOCOLS

Revised: 08/08
University of Kentucky Medical Center
Acute Care Surgery (Blue) Service Intensive Care Unit
Mechanical Weaning/Extubation Guidelines

Critically ill trauma/surgical patients frequently require mechanical ventilation to maintain adequate tissue oxygenation until they are able to take on the work of breathing without assistance. Discontinuing ventilator support should be done at the earliest possible time after the disease process has been adequately reversed. In the vast majority of cases, prolonged or gradual weaning is unnecessary. Rather, patients should be assessed for eligibility for separation from the ventilator and if appropriate, separated. The UK Ventilator Separation Protocol is included in this manual for reference and should be ordered for all mechanically ventilated patients. “Weaning” is used to describe gradual removal of ventilator support and is reserved for patients who cannot be discontinued from ventilator support without gradual maneuvers. The weaning process must be tailored to meet each patient’s needs. There are no dogmatic rules or hard and fast guidelines regarding the timing or duration of the process. These are basic guidelines that should be followed.

*Nursing Guidelines:

Pre Extubation:

1. Adequate pain control [remember to decrease and/or withdrawal pain/sedation medications to level of adequate pain control without over sedation].
2. Ensure complete reversal of NMBA if applicable [4/4 in TOF]
3. Assess for hemodynamic stability
4. Patient should be awake, alert and ideally follows commands
5. Correct acid/base and electrolyte abnormalities
6. Assess nutritional status [Is patient’s caloric need being met with dietary regimen]
7. Assess characteristics of secretions
8. Breathing through an endotracheal tube requires more respiratory muscle work than atmospheric breathing following extubation, therefore limit CPAP trial to 30 minutes.

Extubation:

1. Separation criteria met prior to extubation
2. Cool humidified oxygen set up at the bedside
3. Suction out endotracheal tube and mouth prior to extubation
4. Deflate endotracheal tube cuff just prior to extubation
5. Racemic epinephrine available

Post Extubation:

1. Assess breath sounds q 4 hours and PRN
2. Assess for any signs of respiratory distress
3. Monitor vital signs and SaO2 per unit guidelines
4. Elevate head of bed or reverse Trendelenburg 30 degrees
5. Encourage incentive spirometry, deep breathing and coughing per unit guidelines
Post Extubation Therapy:

Breathing Exercises: The most effective method of preventing post-extubation pulmonary complications is to encourage maximal voluntary deep breathing and coughing. Incentive spirometry is perused to augment voluntary efforts.

Aerosol Therapy: Stridor - Upper airway stridor is best treated with nebulized racemic epinephrine

Bronchoconstriction - Bronchodilators delivered via nebulized aerosol effectively reverse airway constriction. Specific drugs have varying B1 and B2 effects that will influence the choice of a particular medication. Patients that do not exhibit clinical evidence of bronchoconstriction will not benefit from this therapy.

Secretions: Thick, tenacious, inspissated secretions can be effectively treated with heated aerosol. Some patients may require the addition of a mucolytic agent [Mucomyst] delivered per hand held nebulizer. A mucolytic agent is an irritant that can cause bronchospasm and should be discontinued after 48 hours due to bronchorrhea.

Percussion and Postural Drainage: The indication for therapy is very narrow and specific.
   A. Increased secretions or infiltrate on Chest radiograph
   B. Atelectasis not responding to breathing exercises
   C. Collapse of lung, lobe or segment.

In order to achieve maximum benefit, the patient must be able to cooperate with the respiratory therapist. A large number of contraindications to this form of therapy, some of which are listed, limit its use in the critically ill patient.

Contraindications: A. Unstable cardiac rate or rhythm
   B. Congestive heart failure
   C. Unstable neurologic status (aneurysm, increased ICP)
   D. Abdominal distention and or obesity
   E. Fractured ribs or flail chest
   F. Bleeding diathesis

*Refer to Mechanical Ventilation by B. Boulanger, M.D., P. Kearney, M.D., G. Hale, R.R.T., J. Coughenour, M.D., for more detailed information on mechanical ventilation.

References

Boulanger BR, Kearney PA, Hale G, Coughenour JC. Mechanical Ventilation: Division of Surgery, Division of Trauma/Critical Care and the Department of Respiratory Therapy, 4th Ed., 2008.
University of Kentucky Ventilator Separation Protocol

Daily Assessment by RT and RN of Appropriateness for Spontaneous Breathing Trial
Consider twice daily SBT if appropriate (eg, recent trach, recent clinical improvement). Choose time at MD discretion.

Criteria for Spontaneous Breathing Trial (SBT)
1. Riker Score 3 or 4 (Trach pts exempt)
2. PEEP ≤ 6 cm H2O
3. pH > 7.35
4. Minimal Vasopressor, No chest pain, (eg, dobutamine 5 mcg/kg/min; or MD discretion)
5. SaO2 ≥ 92% at FiO2 ≤ 0.5
6. SvO2 > 60 (if measured)
7. No ongoing ICP monitoring
8. Temp < 102 F

SBT Criteria Met

1. Document ineligibility for SBT
2. No change in ventilator settings

Spontaneous Breathing Trial (SBT), 60 minutes
1. Pressure Support 10 cm H2O or less at MD discretion
2. PEEP 5-6 cm H2O
3. FiO2 ≤ 0.5
4. TC or T piece at MD discretion

Monitor continuously x 5 minutes then q 15 minutes for criteria for SBT termination.

Criteria for Termination of SBT
1. O2 sat < 90% x 3 minutes (patients with chronic hypoxemia values may be below the threshold cited at MD discretion)
2. Failure to maintain Vt > 5ml/kg (ideal body weight)
3. HR > 130 (or increase of 20%)
4. SBP < 90 or > 180
5. SvO2 < 60
6. Sweating, anxiety, or change in Riker score
7. New dyshrhythmia
8. Chest pain
9. Any signs of distress

SBT Completion Criteria Met-SBT Terminated
1. Document SBT Results
2. Full support settings (recommended) or MD discretion

SBT Completed
1. Consider ABG (Not Required)
2. Document results of SBT

Was SBT successful?
1. RR < 15
2. HR Increase < 20% from baseline
3. SBP Increase < 20mmHg from baseline
4. ABG without respiratory acidosis
5. PaO2 > 60mmHg
6. Cough on command (consider air leak assessment if anticipated alveolar edema)
7. Riker score = 4
8. RSI ≤ 100

Document results.

If secretions manageable:
1. Contact MD with results and for extubation order.
2. If extubation order not obtained, place back on ventilator settings.
EARLY TRACHEOSTOMY PROTOCOL
FOR THE BLUE SURGERY SERVICE

As advances in trauma care and surgical care occur, more surgical patients will require prolonged mechanical ventilation. Early tracheostomy has been demonstrated to reduce the incidence of pneumonia, duration of ventilatory dependence, ICU length of stay and decrease tracheal complications compared to patients who undergo tracheostomy after prolonged endotracheal intubation (> 14 days).

### Predictors of Prolonged Mechanical Ventilation (>14 days)

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Details</th>
<th>OR, 95% CI, p-value</th>
<th>Ref(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume in 24 hrs (L)</td>
<td>Each 10 L fluid</td>
<td>1.49, 1.11-1.82</td>
<td>[4]</td>
</tr>
<tr>
<td>Facial Fractures</td>
<td>Mandible or Maxilla</td>
<td>5.46, 1.73-17.28</td>
<td>[4]</td>
</tr>
<tr>
<td>Age</td>
<td>Each 10 years</td>
<td>1.31, 1.07-1.60</td>
<td>[4]</td>
</tr>
<tr>
<td>Admission PEEP ≥ 10 mm Hg</td>
<td></td>
<td>3.59, 1.18-1.92</td>
<td>[4]</td>
</tr>
<tr>
<td>Chest AIS</td>
<td>For each 1 unit increase in score</td>
<td>1.22, 1.01-1.47</td>
<td>[4]</td>
</tr>
<tr>
<td>ISS &gt; 25</td>
<td></td>
<td></td>
<td>[6,8]</td>
</tr>
<tr>
<td>GCS ≤ 7-8 on admission; &lt;6 day 3</td>
<td></td>
<td></td>
<td>[9]</td>
</tr>
<tr>
<td>Oxygenation at 24-48 H</td>
<td>A-a O2 ≥ 100</td>
<td></td>
<td>[2,6,7]</td>
</tr>
<tr>
<td>Paralysis at any level, especially above C5</td>
<td>- - - &lt;0.001</td>
<td></td>
<td>[5]</td>
</tr>
</tbody>
</table>

### Reference:

**Nosocomial Pneumonia**

The incidence of nosocomial pneumonia is high in mechanically ventilated patients. National data indicates that critically ill patient intubated for greater than 24 hours are at 6 to 21 times the risk of developing pneumonia (VAP). This risk increases by 1% every ventilator day. (Tablan et al, 1994) Morbidity and mortality associated with the development of VAP is high, adding 5-16 hospital days and increased health care cost. (Kolef, 1993, Rello et al, 2002)

The Ventilator Bundle was developed to prevent adverse events that prolong the amount of time a patient requires mechanical ventilation. The Ventilator Bundle consists of stress ulcer prophylaxis, DVT prophylaxis, Elevation of the head of the bed (>30 degrees), antiseptic oral care, as well as Sedation Weaning. This has been incorporated into the Trauma ICU Admission Order Set.

VAP is suspected by:
1. Fever
2. Leukocytosis
3. Change in character and volume of sputum
4. New infiltrate on CXR
5. Increasing ventilator and/or oxygen requirements.

The diagnosis is confirmed by Protected Alveolar Lavage (PAL).

**Protected Alveolar Lavage (PAL) Guidelines**

The procedure is performed by trained respiratory technician, nurse and/or physician.

**Technique:**
1. Confirm physician order.
2. Gather necessary items/equipment.
3. Prepare the patient for the procedure by:
   a. Adequate pre-oxygenation with 100 % FiO2.
   b. Ensure patient is adequately sedated.
4. Using aseptic technique (mask, gloves, cap), advance the catheter out of the protective sheath at the opened end and gently insert protected catheter through the endotracheal tube or tracheostomy cannula into the pulmonary tract until resistance is felt.
5. Pull the set back 3-4 cm, remove the plastic spacer, and advance inner catheter to fully expel the distal polyethylene glycol plug.
6. Instill 20 cc of non-bacteriostatic saline.
7. Aspirate lavage sample from the airway while maintaining catheter position
8. Remove catheter from the endotracheal tube with the syringe still attached.
9. Place sample in to specimen container without contamination.
10. Send specimen to lab without delay.
11. Return to previous ventilator settings.
References


Reviewed: 03/05
# Ventilator Associated Pneumonia Pathway

*(for Adult Patients on Mechanical Ventilation >3 days)*

<table>
<thead>
<tr>
<th>Clinical Diagnosis</th>
<th>CPIS points</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tracheal secretions</td>
<td>rare</td>
<td>abundant</td>
<td>abundant + purulent</td>
<td></td>
</tr>
<tr>
<td>Infiltrate on chest X-ray</td>
<td>none</td>
<td>diffuse</td>
<td>localized</td>
<td></td>
</tr>
<tr>
<td>Temperature (°C)</td>
<td>36.5-38.4</td>
<td>38.5-38.9</td>
<td>&lt; 36 or &gt; 39</td>
<td></td>
</tr>
<tr>
<td>(°F)</td>
<td>97-100.9</td>
<td>101-102</td>
<td>&lt; 97 or &gt; 102</td>
<td></td>
</tr>
<tr>
<td>WBC count (1000/mm³)</td>
<td>4-11</td>
<td>&lt; 4 or &gt; 11</td>
<td>&lt; 4 or &gt; 11 + &gt; 500 bands</td>
<td></td>
</tr>
<tr>
<td>PaO₂/FiO₂</td>
<td>With clinical ARDS</td>
<td>Without clinical ARDS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>or with P/F &gt; 240</td>
<td>and with P/F &lt; 240</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: If Clinical Pulmonary Infection Score (CPIS) is < 6, consider alternative diagnoses CPIS has not been validated in immunosuppressed patients*

## Microbiology

- Obtain Protected Alveolar Lavage (PAL) or Bronchial Alveolar Lavage (BAL) prior to starting antibiotics (suctioned sputum is suboptimal but acceptable in select patients)
  - Order Gram stain and culture, Chest X-ray (if not previously obtained)
    - Begin empiric antibiotics after cultures sent

## Empiric Antibiotics

- **Piperacillin/Tazobactam** (4.5 gm IV q6h)*
  - PLUS **Tobramycin*** (7mg/kg dosing weight IV q24h) *

  *For patients at risk for Gram positive infections or if Gram positive cocci present on Gram stain, begin **Vancomycin** 15mg/kg IV q12h*

  *For Penicillin Allergy:
  **Cefepime** (2gm IV q8h)* or **Aztreonam*** (2gm IV q8h)*

  It is **NOT** recommended that levofloxacin be used for routine empiric treatment
  And should be limited to **patients who cannot receive aminoglycosides.**
  **Levofloxacin** (750mg IV/po daily)*

* Dosing recommendations for empiric antibiotics for patients w/o renal insufficiency. Please consult pharmacy to dose if patient’s Clcr < 60 ml/min.
+ For tobramycin, order 4 & 12 hour random levels after 1st dose.
аз Aztreonam provides only Gram (-) aerobic coverage, additional agents may be necessary to extend coverage for GPC and anaerobes
| Pathogen-directed therapy | For positive culture results: Streamline therapy as appropriate
|                          | If cultures negative* on Antibiotic Day #4:
|                          | • Re-evaluate diagnosis & antimicrobial coverage
|                          | • Consider discontinuation antibiotics for CPIS score <6
|                          | *A diagnostic threshold of 10^4 will be used for quantitative cultures of PAL samples
| Duration of therapy | Evaluate Criteria for short-course therapy on Day #8:
|                          | Discontinue antibiotics if the following criteria are met:
|                          | • Resolving clinical symptoms (i.e. CPIS score < 6)
|                          | • Infections NOT involving
|                          | Pseudomonas, Acinetobacter, or Stenotrophomonas spp
|                          | If therapy is being continued past Day #8:
|                          | Consider streamlining to single agent

References:

**Ventilator Associated Pneumonia Guidelines**

**Duration of Pneumonia Therapy: 8 vs 15 days**

**Modified Clinical Pulmonary Infection Score (CPIS)**
Introduction:

Injuries, surgical wounds, and the attendant critical illness are associated with moderate to severe pain, as well as anxiety and agitation. Intense sympathetic and parasympathetic responses can and do occur with pain and anxiety. When pain and anxiety are not promptly and adequately relieved, excessive adrenergic activity and hormonal changes indicative of stress occur. These physiologic stress reactions produce a marked increase in metabolism, cardiac workload, and oxygen consumption that may compromise tissue oxygenation in the critically ill patient. The goal is to provide effective, sustained pain relief and sedation with minimal side effects.

Analgesia: Morphine is the analgesic drug of choice and may be used alone or in conjunction with a sedative. Morphine may be given intermittently or as a continuous infusion. Continuous intravenous infusion of morphine is preferable because it avoids peaks and troughs in blood levels leading to over and under sedation. When pain control cannot be achieved with morphine, fentanyl is an effective, inexpensive alternative.

Agitation: Haloperidol is preferred for agitation. Frequently, escalating doses are required to reach therapeutic levels and clinical effect. Agitation can occur from inadequate analgesia. Therefore, make sure analgesia is adequate before treating agitation. Although rare, haloperidol can produce extrapyramidal symptoms, neuroleptic malignant syndrome, and cardiac events, such as prolongation of QT interval and torsade de pointes.

Anxiety: Benzodiazepines are the principle class of drugs for treatment of anxiety. Short acting agents may be used for patients undergoing ICU procedures (central venous access, intubation, bronchoscopy, chest tube placement, tracheotomy, etc.). Benzodiazepines should also be used to insure deep sedation for patients requiring neuromuscular blocking agents. Benzodiazepines should not be used as first line drugs for treating agitation. However, agitation can result from inadequate analgesia or severe anxiety. Benzodiazepines may be used for patients who do not respond to haloperidol or for those patients in whom haloperidol is contraindicated.

This protocol is designed to provide effective and consistent pain management as well as effective treatment for agitation and sedation.
ICU Sedation/Analgesia Guidelines
For Mechanically Ventilated Adults

Patient Assessment
Proceed if SAS ≥ 5 [Score on back]

Pain
Physiologic signs of pain include:
tachycardia, hypertension
swelling, dilated pupils
muscle tension
facial grimacing, guarding

Morphine 2-10mg IV Load then
2-10mg q1h pm or
Continuous Infusion @ 2mg/hr

For titrating continuous infusion:
Rebolus 2-6mg IV q30min
prior to each dosing increase of 1-2mg/hr
Normal dosing range = 3-10mg/hr

For hemodynamic instability or
morphine allergy:
Fentanyl 25-100mcg IV Loading Dose
then Continuous Infusion @ 100mcg/hr
May increase drip 50-100mcg/hr q1hr
Normal dosing range = 50-500 mcg/hr

Consider adding bowel regimen for all
patients receiving opioids.

Anxiety
Apprehension that occurs in patients who feel they
are in a threatening situation

Mild anxiety (SAS=5):
Lorazepam 2-8mg IV q30min
until SAS = 3-4
Maintain with 2-8mg IV q2h

Moderate to Severe (SAS=6-7):
Begin Midazolam infusion:
IV Loading Dose 2-5mg
Begin infusion at 2-5mg/hr

Titrante continuous infusion:
Rebolus 2-10mg IV q15minutes
until SAS = 3-4
May increase drip 1-2mg/hr q6h
Normal dosing range = 2-10 mg/hr

If unable to achieve SAS = 3-4
with Midazolam=10mg/hr;
Consider combination therapy.

See Pain Pathway*
See Delirium or Refractory Sedation Pathway*

Delirium or Refractory Sedation
Disorientation to time and place,
usually with illusions and hallucinations;
shows random, purposeless movements

Begin Haloperidol* at
Moderate: 2-5mg IV, Severe: 5-10mg IV
Repeat dose q60-30min until
SAS = 3-4
then reduce dose q6h.
Usual Dose Range: 20mg-60mg/day

Continue scheduled haloperidol
for 24-48 hours if needed to maintain
SAS score, then reduce dose
as tolerated.

Follow Daily Awakening Procedures
For all receiving sedatives > 48 hours

Long-Term Sedation Guidelines:
Convert patients to lorazepam† after:
-Propofol > 3 days or triglycerides > 300
-Midazolam > 4 days or
need for escalating doses (tachypnea/tachycardia)

†See dosing conversion on back
Nursing Care:

1. Assess patients for subjective and objective signs of pain every 4 hours and PRN.

2. Utilize pain, sedation and anxiety scale as shown above.
   a. Decrease pain/sedation medication rate and/or frequency as patient requirements decrease.
   b. AVOID OVER SEDATION


4. Use comfort measure in addition to medication regimen.

5. Always assess vital signs prior to medication administration.
   a. Use extreme caution with borderline MAP and respiratory rate.

6. It is essential to taper high dose analgesic and sedation medications when
   a. weaning patient for extubation.

7. Obtain new pain/ sedation orders after patient is weaned, extubated and no longer
   a. receiving mechanical ventilation.

8. Monitor for extrapyramidal symptoms if patient is receiving haloperidol

9. Administer intermittent haloperidol slowly over 5 minutes if SBP is < 100.

Weaning guidelines for continuous infusion narcotic analgesics:

1. Weaning guidelines for Fentanyl:
   > 2 weeks duration: 100 mcg/hr decreased twice daily
   > 3 weeks duration: 50 mcg/hr decreased twice daily

2. Weaning guidelines for Morphine:
   > 2 weeks duration: 2 mg/hr decreased every 6 hours
   > 3 weeks duration: 2 mg/hr decreased every 12 hours

The weaning guidelines are to serve as parameters for weaning narcotics when patients have been receiving narcotics for more than 2 weeks. These are not iron clad rules. Weaning from narcotic analgesics may be individualized for the patient. Listed below are signs and symptoms of withdrawal from narcotics that the critical care clinician should monitor for when weaning the patient from narcotic analgesics.

Signs and symptoms of withdrawal:

agitation
tachycardia
tachypnea
tremors
fever
increased lacrimation
diarrhea
nausea and vomiting

**Daily Awakening Procedure:**
For all patients meeting inclusion criteria, continuous infusion sedation medications will be interrupted every day at 0800. Infusions are restarted at half the previous rates.

Infusions will be held until:
- Patient is awake and can follow commands (SAS = 4) with medical indication to resume infusion
- Patient becomes agitated (SAS = 5-7) and requires resumption of sedation.

**Inclusion Criteria for Daily Awakening:**
- Patients initiated on continuous sedation > 48 hours
- Patients not concurrently receiving neuromuscular blocking agents
- Patients with stable hemodynamic/ventilatory status including:
  - No evidence of ARDS (i.e. P/F ratio > 250)
  - PEEP < 10 mmHg and pCO₂ < 50 mm Hg
  - MAP > 60 mmHg without use of vasopressor agents
  - Patient not requiring use of rotobed

**Exclusion Criteria for Daily Awakening:**
- Patients initiated on continuous sedation < 48 hours
- Patients concurrently receiving neuromuscular blocking agents
- Patients with unstable hemodynamic/ventilatory status including:
  - No evidence of ARDS (i.e. P/F ratio < 250)
  - PEEP > 10 mmHg and pCO₂ < 50 mm Hg
  - MAP < 60 mmHg without use of vasopressor agents
  - Patient requiring use of rotobed
## Riker Sedation-Agitation Scale (SAS)

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
<th>Observable Behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Dangerous Agitation</td>
<td>Pulling at ETT, trying to remove catheters, climbing over bedrail, striking staff, thrashing side to side</td>
</tr>
<tr>
<td>6</td>
<td>Very Agitated</td>
<td>Does not calm despite frequent verbal reminding of limits, requires physical restraints, biting ETT</td>
</tr>
<tr>
<td>5</td>
<td>Agitated</td>
<td>Anxious or mildly agitated, attempting to sit up, calms down to verbal instructions</td>
</tr>
<tr>
<td>4</td>
<td>Calm and Cooperative</td>
<td>Calm, awakens easily, follows commands</td>
</tr>
<tr>
<td>3</td>
<td>Sedated</td>
<td>Difficult to arouse, awakens to verbal stimuli or gentle shaking but drifts off again, follows simple commands</td>
</tr>
<tr>
<td>2</td>
<td>Very Sedated</td>
<td>Arouses to physical stimuli but does not communicate or follow commands, may move occasionally</td>
</tr>
<tr>
<td>1</td>
<td>Unarousable</td>
<td>Minimal or no response to noxious stimuli, does not communicate or follow commands</td>
</tr>
</tbody>
</table>

### References


The use of neuromuscular blocking agents in the treatment of critically ill patients has increased steadily over the past two decades. Increased use is largely due to advancements in medical technology and a better understanding of the treatment of critical illness. Up to 8% of intensive care patients who require mechanical ventilation may require neuromuscular blocking agents. The decision to paralyze a patient should not be taken lightly. The benefits, however, outweigh risks when consideration is given to the efficacy of short-term use of NMBA’s. Neuromuscular blocking agents are indicated for the treatment of patients with severe acute respiratory failure (ARDS), marginal tissue oxygenation (↑VO₂ or ↓DO₂), and severe agitation which compromises patient safety.

To assess the depth of neuromuscular blockade, a peripheral nerve stimulator using Train-of-Four stimulation will be utilized. Routine twitch monitoring is essential to ensure a consistent and safe level of blockade while preventing prolonged neuromuscular blockade. Clinical indicators should be utilized to assess effectiveness of blockade (e.g. PIP < 40, improved DO₂, ICP<15). Titrate to lowest dose of NMBA to achieve defined parameters. Since pain and anxiety cannot be assessed easily, patients must receive scheduled sedation and analgesia. The neuromuscular blockade will be discontinued every day to determine if the patient is receiving adequate analgesic and sedation, and to evaluate if continued paralysis is needed. The following protocol was developed to assist the physicians and nurses in critical care to achieve optimal management of patients requiring NMBA’s.
NON DEPOLARIZING NEUROMUSCULAR BLOCKING AGENTS
Intubated/Ventilator patients Only

I. Primary indications for the use of continuous infusion non-depolarizing neuromuscular blocking agents (NMBA).

A. To enhance oxygenation during intermittent positive pressure ventilation. Useful in patients with poor lung compliance (i.e., ARDS) or those who compromise ventilation by using forceful expiratory musculature.

B. Hypermetabolic patients with marginal oxygen delivery and increased oxygen consumption. High fever (>40°C), shivering and extreme agitation.

C. Where control of continuous skeletal muscle fasciculation is unresponsive to conventional therapy (i.e., tetanus).

D. Intracranial hypertension unresponsive to conventional therapy or when conventional therapy is contraindicated.

II. Precautions and contraindications for the use of continuous infusion of NMBA:

A. Caution when used in patients with neuromuscular diseases (i.e., myasthenia gravis, Eaton-Lambert syndrome), severe acidosis and hypothermia.

B. Caution when used concurrently with aminoglycosides, tetracyclines, clindamycin, metronidazole, cyclosporin, vancomycin, steroids, calcium channel blocking agents, magnesium salts, procainamide and quinidine due to their potentiating effects.
   [See Section VIII]

C. Caution when used in patients with renal, hepatic or pulmonary impairment, and in geriatric or debilitated patients.

D. Avoid use in patients who have either experienced or have a family history of malignant hyperthermia.

III. Vecuronium should be used as the drug of choice if neuromuscular blockade is indicated. Cisatracurium is available as alternative agent, but must be ordered by an attending physician because of status on formulary. Administer agents by controlled infusion.

A. Vecuronium: mix 50 mg in 50 ml NS
   Concentration: 1 mg/ml
   Load: 0.08 - 0.1 mg/kg [use dry weight]
   Infusion: 0.04 - 0.15 mg/kg/hr to maintain one detectable twitch
by train of four monitor [1/4]
Start infusion @ 0.04 mg/kg/hr

B. Cisatracurium: Mix 200 mg in 250 D5W or NS
Concentration: 800 mcg/ml
Load: 0.2 mg/Kg [use dry weight]
Infusion: 1 - 10 mcg/kg/min to maintain one detectable twitch
by train of four monitor [1/4]
Start infusion @ 1 mcg/kg/min

[please note that infusion is in mcg/kg/min.]

IV. Nondepolarizing neuromuscular blockade can be reversed if clinically required if spontaneous reversal of paralytic agent does not occur after agent is discontinued.

A. Neostigmine 2.5 - 5.0 mg plus glycopyrrolate 0.5 mg
B. Edrophonium 35 - 70 mg plus atropine 0.5 mg

If above regimens fail to reverse blockade, the following considerations must be addressed.

1. 15 - 30 minutes is required to antagonize block.
2. Blockade may be too intense to be antagonized.
3. Respiratory acidosis prevents antagonism.
4. Possible drug interactions.
5. Organ system failure may decrease excretion of NMBA

V. Sedatives and or analgesics must be used concurrently with NMBA’s.
Refer to Pain/Sedation Protocol

VI. Adverse effects associated with NMBA.

A. Reactions associated with histamine release:

1. Bronchospasm
2. Flushing
3. Erythema
4. Hypotension
5. Tachycardia
6. Pruritis
7. Urticaria
8. Wheal formation

B. Cardiovascular effects including changes in:

1. Heart rate
2. Cardiac output
3. Cardiac filling pressure
4. Mean systolic blood pressure  
5. Mean arterial pressure  
6. Systemic vascular resistance  

C. Malignant hyperthermia  

VII. Physiologic conditions that affect the amount of NMBA needed.  

<table>
<thead>
<tr>
<th>Requires Less NMBA</th>
<th>Requires More NMBA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acidosis</td>
<td>Alkalosis</td>
</tr>
<tr>
<td>Hypothermia</td>
<td>Hyperthermia</td>
</tr>
<tr>
<td>Hypocalcemia</td>
<td>Hypercalcemia</td>
</tr>
<tr>
<td>Hypokalemia</td>
<td>Hyperkalemia</td>
</tr>
<tr>
<td>Neuromuscular Disease</td>
<td>Burns</td>
</tr>
</tbody>
</table>

VIII. Pharmacological agents that affect the amount of NMBA needed.  

<table>
<thead>
<tr>
<th>Requires Less NMBA</th>
<th>Requires More NMBA</th>
</tr>
</thead>
<tbody>
<tr>
<td>[potentate blockade]</td>
<td>[antagonizes blockade]</td>
</tr>
<tr>
<td>Aminoglycosides</td>
<td>Azathioprine</td>
</tr>
<tr>
<td>Beta-blocking agents</td>
<td>Carbamazepine</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>Methylxanthines</td>
</tr>
<tr>
<td>Midazolam</td>
<td>Phenytoin</td>
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<tr>
<td>Polymyxin</td>
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<tr>
<td>Procainamide</td>
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<tr>
<td>Quinidine</td>
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<tr>
<td>Tetracyclines</td>
<td></td>
</tr>
<tr>
<td>Vancomycin</td>
<td></td>
</tr>
</tbody>
</table>

IX. The efficacy of NMBA’s for altering oxygen consumption can be measured by monitoring the following parameters:  

1. Cardiac output/index  
2. Venous oxygen saturation  
3. Arterial oxygen saturation  
4. Oxygen consumption  

X. Depth of neuromuscular blockade should be monitored with a peripheral nerve stimulator using the Train of Four (TOF) mode. An appropriate blockade is defined 1 - 2 twitches in the TOF. The following guidelines should be followed when initiating and titrating for appropriate blockade:  

1. Establish baseline by determining the lowest current that evokes a 4/4 response. Monitor TOF at 10 MA above baseline.
2. Ulnar nerve is preferred site for assessing TOF.

*Facial nerve and Superficial Peroneal nerve are alternative sites if both upper extremities are not accessible.*

3. If no response is elicited follow the trouble shooting algorithm. If medication is excessive, the infusion should be held until one twitch is detected. Restart the drip at the lowest dose per kg and titrate to 1/4 or 2/4 twitches.

4. Initially a TOF should be determined every hour until three consecutive TOF elicit the same response. A TOF can be determined every 4 hours thereafter. If the patient is demonstrating renal or hepatic insufficiency, the TOF should be utilized every 2 hours.

5. 100 Hz should not be used unless attempting to determine level of excessive neuromuscular blockade or sustained tetanus.

6. Refer to the Trouble Shooting Algorithm with 0/4 twitches.

7. Brow diaphoresis is indicative of inadequate blockade.

**Nursing Care:**

1. Lacrilube and artificial tears q 2 hours and PRN
2. Ensure complete eyelid closure to prevent scleral abrasions (use paper tape to tape eyelid closed).
3. Oral Care q 2 hours
4. PT Consult for splints per physician’s orders
5. Consult PT when NMBA discontinued
6. Monitor skin integrity q 4 hours
7. Consider Kinetic Therapy
8. Deep vein thrombosis prophylaxis
9. Reposition q 2 hours
10. Passive range of motion q 4 hours
11. Change electrode placement q day and PRN to avoid skin irritation
12. Place new battery in TOF monitor prior to use.
13. Please evaluate the patient for adequate pain and sedation before increasing the NMBA. The goal of therapy is to provide optimum ventilation and if this can be achieved by increasing the amount of analgesia and/or sedative this should be your first priority.

Refer to Trouble Shooting Algorithm
Non Depolarizing Neuromuscular Blocking Agents
Intubated/Ventilator Patients Only

Severe acute respiratory failure, marginal tissue oxygenation, Hyperthermia/shivering, severe agitation, and increased ICP

Appropriate and Adequate Pain/Sedation
(Imperative that pain/sedation be addressed 1st)

Patient Responds

Increase in SaO₂ and/or SvO₂, Decreased ICP

YES

NO

Maintain Adequate Pain and Sedation

Initiate Neuromuscular Blockade

Obtain Baseline TOF

Patients w/o organ dysfunction

Renal Failure

Hepatic Failure

Vecuronium

Vecuronium

Cisatracurium

Titrate to 1/4 or 2/4 twitches
[75% to 90% blockade]

(If the patient shows any S & S of pain/agitation (dilated pupils, etc), consider increasing pain/sedation medication before increasing or restarting the NMBA. Assessment for pain/sedation cannot be over emphasized and should be ongoing)

Administer Benzodiazepines per protocol
Administer Narcotic Analgesic per protocol

Stop NMBA q am @ 0800 to assess adequacy of sedation/analgesic and to determine if continued paralysis is needed.

Restart drip at previous rate if patient exhibits signs and symptoms of inadequate oxygenation. Notify H.O. if the patient is severely compromised & requires a bolus.
Nerve Stimulator Lead Placement

Facial nerve placement
observing for response of the frontalis and orbicularis oculi muscles

black

red

Peripheral Nerve Stimulator Lead Placement

Ulnar nerve placement
observing for thumb adduction

Posterior tibial nerve placement
observing for flexor hallucis brevis muscle with plantar flexion of big toe

red

black
Trouble Shooting Guidelines for Neuromuscular Blockade

If unable to obtain twitch[0/4]:
check electrodes.
Good contact?

- NO
  - Change electrodes

  Good Lead Placement

  - NO
    - Change Lead Placement

  - YES
    - Site Edematous

      - NO
        - Check Battery

          Battery Good

          - NO
            - Change Battery

          - YES
            - Patient Dose Excessive

              Stop NMBA and Check TOF in 1 hour

      - YES
        - Use Alternate Site [refer to diagram]
References


Intra-Abdominal Hypertension and Abdominal Compartment Syndrome Assessment and Monitoring Guidelines

The abdominal cavity can be considered a single cavity and change in the volume of contents will elevate abdominal pressures. Abdominal Compartment Syndrome (ACS) is a condition in which the increased pressure in the anatomic space results in organ dysfunction. Undetected increases in intra-abdominal pressure (IAP) can be life threatening. Identification of patients at risk is essential to prevent hemodynamic and respiratory compromise from undetected ACS. ACS is preceded by intra-abdominal hypertension (IAH) and organ dysfunction may precede development of ACS.

Definition of ACS: Intra-abdominal pressure (IAP) $\geq 20$ mmHg (with or without an APP $< 60$ mmHg) in a minimum of three standardized measurements taken four to six hours apart plus at least one new end-organ failure.

Definition of IAH: IAP $\geq 12$ mmHg.

I. Etiology of Increased IAP

Acute
A. Intra-abdominal Hemorrhage
   - Post resuscitation visceral hemorrhage
   - Hypothermic or consumptive coagulopathic bleeding
   - Rupture of abdominal aortic or visceral artery aneurysm
   - Post traumatic intra-abdominal hemorrhage
B. Retroperitoneal Hemorrhage
   - Blunt trauma (i.e., pelvic fracture, kidney laceration)
   - Hemorrhagic Pancreatitis
   - Ruptured abdominal aortic aneurysm
C. Accumulation of Fluid/Visceral Swelling
   - Septic shock
   - Peritonitis (i.e., perforated viscus, postoperative abscess)
   - Paralytic ileus
   - Bowel obstruction
   - Mesenteric venous thrombosis
   - Mesenteric ischemia/reperfusion
   - Pancreatitis
D. Other
   - Tension pneumoperitoneum
   - Intra-abdominal packing

Chronic
A. Ascites
B. Pregnancy
C. Large abdominal tumor/ovarian mass
II. Physiologic Consequences

Cardiopulmonary Effects
Increased IAP increases intra-thoracic pressure (ITP) which impedes venous return and causes a number of physiologic derangements.

A. Pulmonary
- Decreased compliance (see higher peak airway pressures)
- Increased inspiratory pressure
- Hypercarbia (decreased ventilation)
- Hypovolemia (compresses SVC, decreasing preload = decreased CO)
- Respiratory Acidosis (decreased FRC and TV = decreased ventilation)
- Increased pulmonary vascular resistance (increases pulmonary shunt and increases work on heart to generate same CO)

B. Cardiac
- Decreased ventricular compliance (requires increased preload for same CO)
- Increased CVP, PWP, PAP (Falsely elevated when euvolemic!)
- Diminished venous return (compresses SVC/IVC)
- Tachycardia (decreased preload, need increased HR to keep same CO)
- Decreased cardiac output (seen when compensatory mechanisms fail)
- Increased SVR
  * Venous stasis may increase risk of DVT/PE

Renal Effects
Increased IAP compresses the inferior vena cava and renal veins. Direct extrinsic pressure on the kidney creates a circumferential constriction. The combination of direct trauma, hypoperfusion and venous backpressure can create an intra-renal compartment syndrome. As a consequence, urine output diminishes.

Neurological Effects
By increasing ITP, increased IAP impedes venous outflow from the cerebral circulation.

↑ ICP
↓ CPP
Gastrointestinal/Hepatic/Wound Healing

Increased abdominal pressure reduces blood flow to the abdominal viscera.
↓ celiac and portal blood flow
↓ mucosal blood flow
↓ fascial blood flow- (increases risk of wound infection and dehiscence)
↑ bacterial translocation

Multiple Compartment Syndrome

↑ IAP -> ↑ ITP -> ↑ CVP -> ↑ ICP -> ↓ CPP

When ICP remains elevated despite maximal medical maneuvers, give consideration to MCS which may require decompressive laparotomy and/or decompressive craniotomy.

Grades of Intra-abdominal Hypertension (mmHg)

- Normal = 0 – 11
- Grade I = 12 – 15 (IAH)
- Grade II = 16 - 20
- Grade III = 21 – 25
- Grade IV = >25

Please notify physician if IAP is > 12, or per physician’s orders. Profound physiologic derangements can occur with IAH reinforcing the need to recognize and treat IAH early before ACS develops.

Abdominal Perfusion Pressure (APP) = MAP – IAP

Goal APP > 60 mmHg

III. Procedure for Measuring Abdominal Pressures

A. Supplies Needed

1. 500 ml Normal Saline
2. Transducer/pressure tubing
3. 60 ml syringe
4. 18 gauge needle
5. Providone-iodine swab
6. Alcohol Swab
7. Kelly
8. 4 x 4 gauze
B. Guidelines

1. Place patient in supine position
2. Clamp tubing of the indwelling urinary catheter distal to sampling port with Kelly clamp, using 4 x 4 gauze to protect tubing.
3. Clean sampling port with providone-iodine/alcohol
4. Attach IAP monitoring device to foley
5. Insert 18-gauge needle into sampling port of bladder drainage system.
6. Attach 60-ml syringe to 3-way stopcock and withdraw 60 ml of normal saline from the flush system.
7. Instill 60 ml of normal saline into the bladder
8. Using the proximal stopcock, level and zero the transducer at the symphysis pubis. Please mark position if you are going to be doing more intra-abdominal pressure measurements.
9. Measure abdominal pressure at end expiration (please note that the intra-abdominal pressure waveform is a relatively flat line with excursion that corresponds to respiratory cycle.
10. Record reading on flow sheet
11. Subtract NS instilled into the bladder from urine output
12. Label and date flush bag/transducer used for intra-abdominal pressure readings if repeated measurements are ordered. Please ensure that the flush bag/transducer is labeled for intra-abdominal pressure readings only.

References
Guidelines for Operative Procedures in the Intensive Care Unit

I. Operative Procedures

A. Non-Emergent Procedures
   1. Percutaneous Tracheostomy
   2. Percutaneous Endoscopic Gastrostomy
   3. Planned relaparotomy for the management of intra-abdominal sepsis
   4. Planned relaparotomy for pack removal

B. Emergent Procedures
   Note: Indicated operative procedure to sustain life when patient condition or time precludes transport to the operating room.
   1. Compartment Fasciotomy
   2. Bedside Decompressive Laparotomy

II. Staffing Needs

A. Non-Emergent Procedures
   1. Surgical Attending
   2. Surgical Resident
   3. RN
   4. Other necessary staff based on procedure and need for anesthesia:
      Percutaneous Tracheostomy – Respiratory Therapist
      Anesthesia to be administered – Anesthesiologist
      ICU tech to assist in obtaining supplies

B. Emergent Procedures
   1. Surgical Attending
   2. Surgical Resident
   3. OR Safari team
   4. Anesthesia resident
   5. ICU RN

III. Monitoring Requirements

A. Non-Emergent and Emergent Procedures
   1. Electrocardiogram
   2. Pulse Oximetry
   3. Arterial Blood Pressure
   
   If indicated:
   4. Train of Four twitch assessment
   5. End-tidal CO2

Note: Adherence to strict nursing policies and procedures for monitoring will be maintained at all times. Refer to Appendix A and Appendix B.
IV. Administration of Medications

A. Non-Emergent and Emergent Cases

1. Surgical Attending
2. Surgical resident
3. Anesthesiologist
4. RN

Note: If anesthesia is to be administered, the RN will not administer. RN will follow guidelines set forth for conscious sedation – See Appendix A and Appendix B

V. Supplies Needed

A. Non-Emergent Procedures

1. See Appendix C for Percutaneous Tracheostomy
2. See Appendix D for Percutaneous Endoscopy Gastrostomy

B. Emergent Procedures

1. Overhead OR light
2. See Appendix G for Compartment Fasciotomy
3. See Appendix I for Bedside Decompressive Laparotomy
4. See Appendix H for Minor OR Tray Supplies

Note: Supplies provided by OR Sterile per Safari Team

VI. Guidelines during procedure

A. Non-Emergent Procedures

1. Minimal traffic in and out of room other than indicated staff
2. Unit visiting may be closed as per Surgical Attending discretion

B. Emergent Procedures

1. Unit closed to visitors during operative procedure

References


HIGH DOSE VITAMIN C (Ascorbic Acid) Protocol

PLA – Burn ICU admission order set.

**IV Meds**

☐ If ≥ 30% TBSA burn (? depth) - High dose Vitamin C 66mg/kg/hr x 24 in LR

Calculation box

\[
66\text{mg/kg/hr} \times \text{INSERT KG} \rightarrow XX \text{mg/hr}/25\text{mg/ml} = \text{Rate}
\]

Administer over 24 hours then discontinue infusion

**PHARMACY INSTRUCTIONS**

1. \[
66\text{mg/kg/hr} \times \text{KG} \rightarrow XX \text{mg/hr}/25\text{mg/ml} = \text{Rate _____ ml/hr}
\]

\[
\text{Rate _____ ml/hr} \times 24\text{hr L}/1000\text{ml} = \text{Total Dose = ___ L/dose}
\]

2. Remove 50ml of LR from 1Liter bag

3. Add 50ml (25Gram vial) Vitamin C to 1 Liter of Lactate Ringers

4. Prepare entire total dose (24hr. infusion)

5. Cover each bag with an amber sleeve

6. Deliver entire total dose to the Burn ICU

Ex. 80kg pt. x 66mg/kg/hr = 5280mg/hr /25mg/ml = 211.2ml/hr

Total dose 5.069L/24hr period
ICU Anemia Management Protocol (Adults)

Patients commonly suffer from anemia on admission to the intensive care unit (ICU). Additionally, anemia frequently develops or worsens during the course of a patient’s ICU stay. Anemia can cause prolonged ICU stays, increase the costs of healthcare, and lead to other negative patient outcomes. Anemia is usually treated in these patients but not always in a cost-effective and resource-sensitive manner. In recognition of the ongoing shortage in the nation’s blood supply, the cost of agents used to treat anemia, the potential harmful effects of transfused blood products and the need to improve patient outcomes, the Pharmacy and Therapeutics Committee recently approved the Adult ICU Anemia Management Protocol.

Prevention

- Minimize phlebotomy (avoid daily lab draws, obtain all blood needed at once, use specimen tubes that can be used for multiple labs, add tests to blood already in the lab when appropriate)
- Adequate nutritional support

Transfusion of PRBCs

The protocol defines guidelines for blood transfusions. To receive PRBCs, patients must meet one of three criteria presented in the Table. After the transfusion of one unit, the average 70 kg adult will experience an increase in the Hgb by 1 g/dL. The goal after receiving a transfusion is a Hgb ≥ 7 g/dL (Hct ≥ 21). If clinically indicated to monitor response and further bleeding, blood counts should be collected 30 minutes after the end of the infusion. Routine post-transfusion hematocrits are not mandatory. The most blood-economical manner of monitoring hematocrit is with blood gas panels, which require only 1cc of blood (venous or arterial), are cost neutral compared to specific hemograms or hematocrits and for which results are obtained more quickly by virtue of processing on the blood gas analyzer.

Since 2001, almost all red blood cell units prepared and stored in the United States are leukocyte-reduced.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Transfusion Trigger g/L*, %HCT</th>
<th>Transfusion Goal g/L, %HCT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical Illness (no active hemorrhage)</td>
<td>70, 21</td>
<td>70-90, 21-27</td>
</tr>
<tr>
<td>Critical Illness &amp; septic shock (&gt;6h)</td>
<td>70, 21</td>
<td>70-90, 21-27</td>
</tr>
<tr>
<td>Critical Illness &amp; septic shock (&lt;6h)</td>
<td>80-100, 24-30</td>
<td>100, 30</td>
</tr>
<tr>
<td>Critical Illness with chronic cardiac disease</td>
<td>70, 21</td>
<td>70-90, 21-27</td>
</tr>
<tr>
<td>Critical Illness with acute cardiac disease</td>
<td>80-100, 24-27</td>
<td>100, 30</td>
</tr>
</tbody>
</table>

Table. Indications for PRBC Transfusion
If the decision to transfuse PRBCs is made then 1 U should be given first to monitor for a response as measured by hemodynamic status and measurement of Hg/HCT for appropriate transfusion response. If an appropriate clinical response is not seen then increments of 1 U of transfusion with monitoring for clinical/laboratory response.


Epoetin Alpha (EPO)

EPO administration has demonstrated only a slight decrease in PRBC transfusion in critical illness. This decrease was only appreciated in liberal transfusion models which are not applicable today. In studies with strict transfusion models the decrease in the number of PRBCs transfused was not statistically significant. EPO has been demonstrated to reduce mortality in trauma patients however this inference is from largely retrospective data. EPO was found to increase thromboembolic complications in trauma patients, however, these findings occurred in patients that were not on medical thromboembolic prophylaxis. EPO did show a mortality benefit with no increase in thromboembolic events in those patients on medical thromboembolic prophylaxis. Further studies are needed to determine the clinical benefit in trauma patients.

Adjunctive Medications

It is important for anemic patients to be placed on the appropriate adjunctive agents. Patients being treated for anemia should also receive:

- **Folic acid** 1 mg orally/per tube daily;
- **Cyanocobalamin (vitamin B₁₂)** 500 mcg orally/ per tube daily for five days, then weekly;
- **Ferrous sulfate 325mg** orally/per tube daily unless contraindicated.

Beta blockade to keep the heart rate less than 90 should be considered in patients with known or suspected heart disease. The preferred agent is **metoprolol** starting at 12.5 mg orally/per tube twice daily, and titrated as tolerated to a maximum dose of 100 mg twice daily. The patient must be adequately resuscitated and have appropriate pain control before altering their physiology with beta blockade. Indicators of adequate resuscitation are clearance of acidosis (normal lactate, base deficit and serum HCO₃⁻), normotension, adequate urinary output, and ScVO₂, ScVO₂₂ or StO₂.

Revised 11/08
SECTION 5: ICU and FLOOR PROTOCOLS

FIFTH FLOOR QUALITY IMPROVEMENT PROJECT

The goal of the Trauma/Emergency Surgery service is to provide cost-effective, high-quality patient care. In order to achieve this goal a customer service model will be implemented. The physician/nurse team will make excellent patient care the focus of their effort. This will be accomplished by the development of “best practice” models using evidence based clinical data. This will allow the physician/nurse team to direct ancillary services in the most cost-effective manner for excellent patient care.

General Guidelines for Patient Care
The very best way to care for patients is to understand physiology and pathophysiology. This allows the clinician to understand the treatment being rendered. In general, if it sounds stupid it is stupid! Remember that every beneficial intervention also has the potential to cause harm. When a treatment or intervention is no longer required discontinue the intervention/treatment. Nasogastric tubes are useful for gastric decompression and to prevent emesis associated with bowel obstruction. On the other hand the tubes are uncomfortable and predispose the patient to sinusitis, GERD, and aspiration. Proton pump inhibitors and H2 antagonists reduce the incidence of stress ulceration. However, they are associated bacterial overgrowth in the stomach that may lead to nosocomial pneumonia. IV catheters and fluids can be life saving but they are also associated with thrombophlebitis and infection. Foley catheters may be needed for urinary retention or monitoring of intake and output. However, they are associated with urethral strictures and infections. Phlebotomy for blood tests is a necessary part of patient care. However, excess phlebotomy can and does result in anemia that can be harmful to patients. Medications are extremely important for patient care but drug interactions and adverse reactions can be harmful to patients. These are a few examples of the myriad of rather simple interventions and therapies that can and do harm patients. Modern medical care is exceedingly expensive. Ask yourself why a particular intervention, test, or medication is being used. Is this needed? How does this benefit the patient? What is the harm? How much is this going to cost? What information will I gain? Through rigorous self-examination the answer for many of these questions is easier than you think.

Mobilization
There is clear, irrefutable evidence that extended bed rest is harmful to patients. Supine position and lack of mobilization leads to reductions in pulmonary functional residual capacity, atelectasis, diminished cough, and accumulation of dependent lung water. This makes the patient more prone to pulmonary complications which are the most frequent cause of admission or readmission to the ICU in the Medical Center. Bed rest also leads to rapid loss of muscle mass leading to de-conditioning which may increase hospital length of stay, lengthen rehabilitation, or create the need for rehabilitation that would have not been otherwise needed. Patients at bed rest are more prone to pressure ulcers, bowel dysfunction, and venous thromboembolic disease.

A primary focus of patient care should be early mobilization of the patient. Weight-bearing status should be determined within 24 hours of admission to the hospital. Ambulation of the patient should be an immediate goal. If there are limitations on weight-bearing these should be identified and appropriate resources (physical therapy, equipment, etc) should be applied immediately. At the very least, patients should be out of bed and placed in a chair. This does not mean bringing the bed into a sitting position but actually getting the patients out of the bed into a chair. If traction or hemorrhage risk mandates bed rest, the patients should be nursed with the head of the bed elevated at least 30 degrees. When spine precautions are in place the patient should be placed in reverse trendelenburg.
Respiratory Function
Respiratory therapy is essential for acutely ill and injured patients. Many of our patients have co-morbid lung disease and/or a history of heavy tobacco use. Lung function is further compromised by bed rest, obesity, chest wall trauma, pain, surgical incisions, chest tubes, or via the use of cervical collars, back braces, and/or traction. It is unrealistic to expect respiratory therapy service to assume this task for most patients. Pulmonary toilet should be a major goal for excellent nursing care.

Prevention is the key element here.
Apply vigorous pulmonary toilet early! Use the respiratory therapist wisely. It is far easier to prevent respiratory failure than to treat the consequences. Patients also require education as to their role in pulmonary toilet. Patients often equate pain with further damage. They need to understand that pulmonary toilet may cause pain but not harm. The simplest and best pulmonary toilet is to mobilize the patient. This requires patient effort resulting in work of breathing that maintains respiratory muscle function. Mobilization also shifts lung water, increases lung functional residual capacity, and reduces atelectasis. Mobilization should be supplemented with education on maximum voluntary ventilation, as well as coughing and deep breathing. Inspirometers and blow bottles can and should be used to supplement coughing a deep breathing. Some patients may require bronchodilators and/or chest physiotherapy. Occasionally expectorants are also required. Some patients may require nasotracheal suctioning. Pain control is essential. Patients should be comfortable but not so somnolent that they can't actively participate in pulmonary toilet.

A word about supplemental oxygen
Supplemental Oxygen is expensive and unnecessary for most patients. Oxygen does not improve respiratory failure! In fact, supplemental oxygen usually masks worsening respiratory function that would respond to pulmonary toilet. Virtually all human beings have arterial desaturation when recumbent or sleeping. Spot pulse oximetry in these circumstances is of no clinical value and frequently results in unnecessary application of supplemental oxygen. Respiratory rate and effort combined with auscultatory findings, radiograph, and subjective patient complaints are much better determinants of respiratory failure than arterial desaturation. In the latter circumstance, supplemental oxygen should be used along with pulmonary toilet.

Central nervous system injury
Patients with head and/or spinal cord injury do not have normal pulmonary toilet. These patients rely heavily on positioning, mobilization, and active pulmonary toilet to avert respiratory failure. Nasotracheal suctioning along with chest physiotherapy, bronchodilators, and breathing exercises should be used liberally in this patient group.

Tracheostomy
Tracheostomy is frequently required for the management of airway, pulmonary toilet, and/or respiratory failure in patients with complex critical illness and/or injury. The vast majority of these are performed percutaneously although some are still placed using the older, but still reliable, open surgical technique. Regardless of placement technique, complications, daily tracheostomy tube/site care, and downsizing/decannulation are the same.

Complications
Dislodgement: The most common early and lethal complication of tracheostomy is tube dislodgement. In order to prevent this complication the tracheostomy tube is secured to the skin with sutures and fixed in place with a secure neck strap. Sutures often give a false sense of security and will not in and of themselves eliminate dislodgement. The most important defense against early dislodgement is a secure neck strap and strict avoidance of undue tension and/or torque on the fresh tracheostomy. It takes about four days after insertion to develop a mature tract. After four days, dislodgement rarely
results airway compromise and the tube can simply be reinserted through the neck. Prior to four days, airway loss is likely and the patient may require endotracheal intubation to reestablish the airway. This is a true emergency that requires the immediate attention of the surgical house staff. The patient can be temporized with 100% oxygen delivered via bag valve mask and gentle occlusion of the tracheostomy site.

**Plugging:** The most common intermediate complication of tracheostomy is mucous plugging. This will be the most frequent problem encountered with ward patients. Secretions build up in the tracheostomy tube lumen leading to sudden occlusion and airway compromise. Virtually all of the tracheostomy tubes in use at UKMC have a removable inner cannula. The routine practice of maintaining cuff deflation and routine inspection/cleaning of the inner cannula will prevent this complication.

**Stenosis:** Tracheal stenosis is a late complication of tracheostomy. Virtually all tracheostomies (85%) are associated with some degree of tracheal stenosis. Only 1-2% of patients develop critical stenosis that compromises the airway and produces clinical symptoms. The duration of endotracheal intubation (> 11 days) prior to tracheostomy, technique used (open > percutaneous), higher placement (between rings 1-2 vs. 2 or lower), and smaller airway (children, females) all increase the rate of clinically significant tracheal stenosis. Almost all clinically significant stenosis occur within twelve weeks of tracheostomy. The hallmark of clinically significant tracheal stenosis is respiratory distress and/or stridor and wheezing when the tracheostomy tube is plugged or removed. If plug removal or tracheostomy tube reinsertion alleviates symptoms the tube should remain in place until a diagnostic evaluation can be performed.

**Tracheal-arterial fistula:** Small amounts of bleeding may occur simply from the irritation of suctioning, site care and/or the tube itself. A rare but lethal complication of tracheostomy is tracheal-arterial fistula that occurs from erosion of the tip of the tracheostomy tube into the great vessels of the upper thorax. The hallmark of this complication is a "herald bleed" defined as a moderate to large amount of bleeding that stops spontaneously. If bleeding persists or produces airway compromise, the endotracheal tube cuff can be inflated to tamponade bleeding and maintain the airway. Herald bleeding requires immediate investigation!

**Infection:** Tracheostomy site infection is exceedingly rare. The presence of purulent, foul–smelling secretions accompanied by an expanding zone of erythema establishes the diagnosis. Site care and appropriate antimicrobial therapy are effective in controlling this complication.

**Tracheocutaneous fistula:** This is a rare complication of tracheostomy that is defined as a persistent air leak present for more than one week after decannulation. While a small percentage of these will close after 7 days most will require a surgical intervention to achieve closure.

**Bronchorrea:** Copious secretions usually indicate a residual or recurrent pulmonary problem. Occasionally, these secretions are due to the endotracheal tube itself. The tube can and does irritate the upper airway producing excessive secretions. Decannulation is the treatment of choice. If the patient still requires a tracheostomy (coma), a drying agent such as robirol can be used.

**Tracheostomy tube/site care**
The tracheostomy tube and site should be inspected at least once daily. The site itself should be inspected for purulence and erythema. Gentle cleansing with a small amount of soap and water followed by a dry dressing provides ample site care. The inner cannula should be removed, inspected, and cleaned as necessary to remove build up of dried secretions. The tracheostomy tape should be snug enough to prevent excess movement of the tube but not so tight as to produce skin breakdown/ulceration. The balloon should be deflated on cuffed tubes. Sutures, if present, can be
removed after six days. Tracheostomy bypasses the normal humidification provided by the oronasopharynx so patients are prone to evaporative water loss and desiccation of the airway mucosa. Humidified air or oxygen (if required) should be used at all times to prevent the latter complications.

**Downsizing and decannulation**
The general practice of downsizing a tracheostomy tube prior to decannulation is controversial. Be that as it may, downsizing the tracheostomy tube prior to decannulation is the routine practice at UKMC. The stated advantages are a reduction in size of the tract to reduce tracheocutaneous fistulas and to detect tracheal stenosis prior to decannulation. After four days a well-established tract exists between the surface and the trachea. Downsizing can proceed safely at this point. Decannulation should not proceed until the patient is clinically stable. Respiratory failure should be stable or improving and suctioning requirements should be nominal (>2-4 hours). The patient should have a vigorous cough and be able to handle their secretions. There should be no residual airway issues. As a first step, the plastic tracheostomy tubes (Usually Shiley occasional Portex or Bivona) are removed and replaced with a 6mm metal tube (Jackson). These can then be plugged. If the patient tolerates plugging (see complications: tracheal stenosis), has a good cough and minimal secretions, decannulation can proceed. The tracheostomy site should be covered with an occlusive dressing. The patient should be monitored closely over the next 24 hours for any evidence of respiratory distress. Closure of the tract usually requires 24-48 hours. Comatose patients can be downsized but should not be decannulated. This group of patients rarely has a good cough and cannot protect their airway. Consequently, they remain at risk for aspiration and/or respiratory compromise.

**Dysphagia and aspiration following tracheostomy**
Dysphagia and/or aspiration following tracheostomy are very common. If managed correctly, this is rarely a clinical problem and oral feeding can be safely resumed without an elaborate ritual. The dysphagia team is seldom, if ever required. Almost 30% percent of normal individuals will have some amount of aspiration on barium swallow. Contrast studies often overestimate the problem and lead to unnecessary, complicated, and expensive solutions to a simple problem. Most patients who require a tracheostomy have not had oral intake for some time. This is complicated by the fact that the tracheostomy itself may interfere with swallowing. This is simply a problem of training/initiating a swallowing bolus! To initiate oral intake, cuffed tracheostomy tubes should be deflated or downsized to a smaller metal tracheostomy. Oral intake should never begin with liquids. It is much harder to develop a swallowing bolus with liquids. The initial oral feeding challenge should be with thickened liquids and/or solids. Most importantly, the patient should be sitting upright. Why don’t you try to swallow liquids in a supine position! If the patient doesn’t succeed try, try again. Give the patient good instructions and several attempts before conceding failure. Decannulation, if indicated, can also be accomplished prior to another try. Only an occasional patient will fail and require an alternative feeding access.

**Intravenous Access**
Three quarters (75%) of all hospital bactermia events are associated with intravenous catheters! There is a general hospital wide practice to “heparin lock” and keep both peripheral and central venous catheters. Keeping multiple IV sites is simply not a good practice. Each and every IV site represents a potential nosocomial infection site for patients. Both insertion technique and indwell time influence subsequent thrombophlebitis. Many catheters are placed under less than ideal conditions and should be removed as soon as possible. In all but the most unusual circumstances, a patient will require a single functioning IV access site. Proper inspection and site care should be used to maintain function and sterility. All other intravenous access sites should be removed.
Wound Care
Wound care is much easier than most physicians and nurses think. The process has become
unnecessarily complicated, confusing, and expensive. The simple answer is soap, water, and gentle
handling of tissues. Astringents (peroxide, betadine, acetic acid, alcohol, Daken’s, etc.) should rarely if
ever be used in a wound. There is a widely held misconception that more frequent wound care
somehow makes wounds heal faster. This is simply not the case. Keeping wounds clean, moist, and
covered allows the body to heal the wounds considerably faster. Astringents, frequent dressing care,
and overzealous packing are more often responsible for delays in healing.

Wound Classification
Clean Wounds - These are surgical incisions that follow an elective surgical procedure that does not
involve the aerodigestive tract. Examples would be neurosurgical procedures, vascular procedures,
hernias, most elective orthopedic procedures.
Clean contaminated wounds – These are surgical incisions that follow an elective surgical procedure
that crosses the aerodigestive tract. Examples would be most ENT procedures, operations on the
gastrointestinal tract, or operation on the lung.
Contaminated wounds – These are incisions that follow an emergent surgical procedure where there is
obvious or potential infection. Examples would be perforations of the GI tract, strangulated hernias,
complicated soft tissue infections, open fractures.
Dirty wounds – This is really a matter of degree. The difference between contaminated and dirty
wounds is really the degree of contamination. Complex wounds with large devitalized areas, gross
fecal contamination, large amounts of purulent material, dirt, foreign bodies etc. are usually classified
as dirty.

Important Definition
Dehiscence refers to separation of the wound edges. Dehiscence can further defined as involving the
skin and subcutaneous tissue (superficial) or extending to the deeper layers (fascial dehiscence).
Evisceration refers to the protrusion of visceral contents through the wound. Not all dehiscence has
evisceration but by definition all eviscerations have dehiscence.

Wound management
Wounds are managed in one of three ways:
1. Primary closure of the skin and subcutaneous tissues (most wounds)
2. Delayed primary closure. Wounds are left open initially. The skin is then closed primarily
between day 3 and 4. Bacterial counts are lowest in the wound at this point and delayed primary
closure has the greatest success.
3. Healing by secondary intention. This technique applies for most open wounds.

Closed wounds
Wounds that have been closed primarily will seal within 36 hours. After that point it is very unlikely that
environmental contamination would compromise the wound. The general rule is to leave the surgical
dressing on for 24 hours. After that point the wounds can be covered with a light dry dressing to absorb
minor drainage, prevent irritation and for patient comfort. These wounds should be carefully inspected
at least once a day for signs of infection (redness, swelling, excessive tenderness, purulent drainage).
The subjective patient complaint of wound pain (fever may or may not be present) that increases or is
out proportion to wound size is often the earliest sign of surgical wound infection.

Open wounds
Contaminated or dirty wounds are often packed and left open. The main clinical reason for this practice
is the high incidence of wound infection if the wounds are closed. The wounds are generally packed
tightly to achieve hemostasis after the initial operative procedure. Unless there is a planned return to
the operating room for exam under anesthesia, further debridement, and irrigation, these dressings should be taken down and the wound examined at 24 hours. The first dressing change can be quite painful and provisions should be made for adequate analgesia prior to proceeding. Most of the pain emanates from the densely innervated wound edge and care should be taken in this area. If the dressing is adherent gentle wetting with saline will facilitate removal and reduce discomfort. “Clean wound” care rather than “sterile technique” should be the standard practice. At the first dressing change the decision can be made to initiate saline wet to dry dressing or application of a vacuum dressing. At this point a decision can also be made about washing/showering the wound with soap and water. Dressing changes need only be once or twice a day and packing of the wound should be gentle. Saline irrigation of the wound base is permissible. As mentioned previously, astringents should be avoided and every effort should be made to avoid wound dessication by irrigating the wound in between dressing changes if necessary. Regarding dressing fixation, the skin should be protected from tape adhesives by using duoderm and Montgomery straps or by application of Bandnet dressing (preferred). Absolutely every effort should be made to simplify wound care prior to discharge. Patients should be given clear instructions on clean wound care, showering should be encouraged. When possible, wounds can/should be dressed with tap water rather than sterile saline which is considerably more expensive and unnecessary for most wounds.

**Open wounds and evaporative water loss.**
Open wounds can and do result in significant fluid & electrolyte disturbances. Dehydration from evaporative water loss and malnutrition from protein loss are significant problems with large wounds. This can be amplified if the wound is associated with an enterocutaneous fistula. The patients should be assessed for signs of volume depletion such as excessive thirst, diminished skin turgor, and or low urine output. Keeping the wounds covered and moist reduces evaporative water loss and may reduce protein loss as well.

**Wound infection**
The earliest and most frequent sign of wound infection is excessive wound pain and tenderness. Low grade fever, wound redness, and drainage often appear later and can be easily seen with a good exam and dressing change. Wounds should be opened in the affected area to allow drainage, irrigation, and gentle packing just like in open wounds. Wound culture and antibiotics are totally unnecessary except in rare circumstances such as when patients exhibit signs of systemic illness and/or there is prosthetic material in the wound. **WARNING!** When dealing with abdominal wall wounds, drainage may indicate deep wound problems such as fascial failure and/or evisceration.

**Gastrointestinal Tract**
There is a widely held misconception that the gastrointestinal tract in quiescent following illness, injury, and/or surgery. The gut plays an active role in overall host defenses, gastrointestinal stress ulceration, and systemic inflammation. The historical term attached to the clinical problem of post operative gut dysfunction was “paralytic ileus”. This has been shortened in modern medical terminology to “ileus.” The traditional clinical practice is to withhold oral intake and maintain nasogastric decompression until there was clinical evidence indicating return of bowel function (passage of flatus, bowel movement, or audible bowel sounds). This practice is outdated and not consistent with what is currently known about bowel function in illness. The stomach and small bowel function very well following illness, injury, and/or operative intervention unless there has been mesenteric ischemia or long standing obstruction. The actual root cause of the clinical entity referred to as “ileus” is delayed return of colonic function. Although ingrained in our medical terminology, “ileus” is a misnomer and the proper term to use is colonic pseudo-obstruction.

There are a number of clinical practices that either exacerbate or contribute to colonic pseudo-obstruction. Chief among these are bedrest, narcotic administration (particularly epidural catheters), as
well as fluid & electrolyte abnormalities. Depending on the clinical circumstances, the clinician also needs to consider other contributing factors such as fecal impaction, resolving peritonitis, intra-abdominal abscess, pneumonia, wound infection, retroperitoneal hematoma, and pseudomembranous colitis. Mesenteric ischemia and early mechanical bowel obstruction, although rare, must also be considered in the differential diagnosis.

For most patients, early mobilization, judicious use of narcotics, as well as attention to fluid & electrolytes can mitigate or prevent pseudo-obstruction. Routine use of an effective bowel regimen and/or early enteral nutrition is also effective depending on the patient and clinical circumstances.

The main risk to the patient with pseudo-obstruction is colonic ischemia and/or perforation which are dependent upon the degree of colonic distention. Perforation/ischemia is much more likely when colonic/cecal diameter is > 11cm. Under these circumstances, more aggressive management is warranted. For most patients, the treatment of pseudo-obstruction is relatively straightforward. Bowel rest, hydration, and correction of electrolytes are essential. Narcotics should be reduced as much as possible. Depending on the clinical situation, other treatable contributing factors need to be rectified or excluded. Nasogastric tubes are completely unnecessary for the vast majority of patients because they are not effective in reducing colonic distention. NG tubes should be withheld unless the patient is vomiting and/or has evidence of gastric distention on X-ray. A combination of stool softeners and cathartics accompanied by a prokinetic agent (metaclopramide) are usually effective. Cathartics and prokinetic agents are more effective when given orally but other routes of administration may be necessary depending on the clinical situation. Rectal stimulation with a suppository and/or enema may also produce results. For refractory patients or those with significant colonic distension, a parasympathomimetic agent (neostigmine) can be administered IV with excellent results. Routine use of neostigmine is precluded by side effects such as bradyarrythmias, bronchorrea, and diaphoresis. Ideally, patients should be monitored during drug administration particularly if they have known cardiac disease. Decompressive colonoscopy which is both diagnostic and therapeutic may be required for patients with significant colonic distention.

**Enteral Nutrition**

Not all patients require early enteral nutrition. Well nourished patients who sustain mild to moderate injury or those undergoing elective operations tolerate up to seven days of fasting with little or no adverse consequences. However, patients with documented pre-injury or pre-operative malnutrition as well as those patients with complex critical illness/injury clearly benefit from early enteral nutrition. In fact, the evidence is clear and irrefutable. Infectious complications are significantly reduced in patients who receive early enteral nutrition. Early enteral nutrition also maintains gut integrity, reduces the risk of gastrointestinal stress ulceration, and increases the rate of wound healing.

**Access routes**

The main difficulty with early enteral nutrition is achieving and maintaining a reliable feeding access. Gastric feeding is well tolerated and most patients can be fed in the stomach. Unfortunately tolerance is an issue for some patients, monitoring may be difficult and the aspiration risk is higher than that for post-pyloric tubes. As the patient improves clinically, aspiration risk declines and the need for post-pyloric access diminishes. Three approaches are used to establish feeding access; nasoenteral feeding tube, surgical jejunostomy, and percutaneous endoscopic gastrostomy (PEG). For the vast majority of patients, a nasoenteral feeding tube is a safe, temporary access. These can be placed blindly, via endoscopy, fluoroscopy, or at the time of surgical intervention. Since these tubes frequently become dislodged they are often secured in place with a bridle. Nasoenteral feeding tubes are not a reliable long term access and should be replaced with a jejunostomy or gastrostomy tube. When a patient has significant foregut pathology, a surgical jejunostomy can be placed. This allows enteral feeding to
proceed in the absence of an intact/functioning foregut. The most frequently utilized long term feeding access is the PEG. This is a safe, effective way of delivering enteral nutrition for most patients.

Assessing enteral feeding tolerance
Continuous feeding is the only method used for post-pyloric nasoenteral and jejunostomy feeding tubes. The small bowel will not tolerate bolus feedings. Continuous feeding is preferred for PEG feedings but can be changed over to bolus feedings over time. Feeding intolerance manifests clinically in a variety of ways. The key to delivering effective enteral nutrition is to be aware of the clinical manifestations of feeding intolerance and to realize that signs of intolerance vary depending on the feeding access used. Tube feeding reflux, high gastric residuals, vomiting, aspiration, abdominal distention, and diarrhea are all signs of feeding intolerance.

Tube feeding reflux
In patients with a post-pyloric nasoenteral tube and a nasogastric tube, the first sign of intolerance can be tube feeding reflux in the nasogastric aspirate. The first maneuver should be to confirm tube positions with a radiograph. NG tubes can migrate distally and feeding tubes can be dislodged. Tubes should be repositioned if necessary. Once tube position has been confirmed, then a downward adjustment in rate and/or the addition of a prokinetic agent may be required. If reflux is significant and accompanied by abdominal distention, the best course of action is to hold tube feedings for 12-24 hours and reassess the patient. Sudden abdominal distention and reflux in a patient previously tolerating tube feeds is a very worrisome finding that warrants further investigation.

High gastric residuals
In patients receiving continuous feeding via a PEG elevated gastric residuals are the first sign of intolerance. Residuals should be monitored every 4-6 hours and should not exceed the sum total of the tube feeding over that time period. When the residuals are elevated, feeding should be withheld and rechecked after a period of rest. A prokinetic agent can be added with success in some patients. Again, elevated residuals and abdominal distention in a patient that previously tolerated feeds should alert the clinician to a change in clinical status that warrants investigation. Occasionally, patients will be fed into the stomach using a small bore nasoenteral feeding tube. Residuals cannot be checked via these tubes and no attempt should be made to do so.

Vomiting/Aspiration
Vomiting and/or aspiration may be the first sign of feeding intolerance. In the awake patient, complaints of nausea will precede the event, so don’t ignore this complaint. This manifestation is more likely in patients being fed in the stomach via PEG or nasoenteral feeding tube. Remember that post-pyloric feeding reduces but does not eliminate vomiting/aspiration risk. The most prudent course of action is to hold feedings. Depending on the clinical suspicion for aspiration, an evaluation by a physician is warranted. Vomiting will usually dislodge a nasoenteral feeding tube, so replacement and/or verification of position is warranted.

Abdominal distention
Frequently overlooked, abdominal distention and bloating are the earliest and most reliable signs of intolerance. All patients receiving enteral nutrition should be evaluated daily. Not all patients require and intervention but this should be noted and brought to the attention of the physicians caring for the patient. Acute and/or significant distention may indicate mesenteric ischemia or colonic pseudo-obstruction.
Diarrhea
Diarrhea is probably the most frequent complication of enteral nutrition. Oddly enough tube feeding is usually not the cause. Sorbitol containing medications are frequently to blame so a review of the medication record is warranted. If indicated, *Clostridium difficile* colitis should be excluded. Higher tube feeding rates may produce diarrhea so a change in rate may be warranted. Anti-diarrhea agents can be utilized if the problem persists. Changes in formula can be made. If the volume of stool exceeds 500-1000cc per day then holding the feeds may be necessary.

Tube maintenance
Enteral access tubes are expensive and vital to patient care. Every effort should be made to maintain patency and protect against dislodgement.

Small bore feeding tubes
Standard nursing guidelines for small bore feeding tubes should be rigorously followed to prevent clogging. The most effective way to maintain patency is to flush with tubes frequently with warm water and to avoid medication known to clog these tubes. Whenever tube feedings are interrupted or medications are administered, the tubes should be flushed with warm water.

PEG
These tubes can and do become clogged and or dislodged. One of the most important aspects of daily PEG care is to assess the tube site and determine tube depth. Nurses should pay close attention to the insertion site for redness, swelling, and/or tube feeding reflux. Following placement, PEG tubes are secured in place using a silastic bumper. These bumpers are applied loosely to maintain the PEG at the original depth of insertion which is charted in the endoscopic procedure note. Each PEG tube has a centimeter marker on the side. The general depth for most patients is between 3-6 centimeters. The depth at insertion should be recorded on the nursing assessment. If the depth marker is <3cm or >6cm or there is tube feedings refluxing through the insertion site, feedings should be held and the physician notified immediately. Remember, a sudden change in PEG feeding tolerance accompanied by abdominal distention can indicate PEG tube migration or dislodgement.

Diarrhea
Not all liquid stools constitute diarrhea. Diarrhea is defined as frequent loose stools exceeding 1000cc per day and/or producing fluid/electrolyte abnormalities. The clinical objective is to identify and remove treatable causes of diarrhea. Medications are probably the most frequent cause of diarrhea. Drugs that produce diarrhea such as prokinetic agents, oral macrolides, cathartics, and sorbitol containing elixirs should be eliminated when possible. Adjustments in tube feeding rate and/or formula change may be required. *Clostridium difficile* colitis should be excluded or diagnosed and treated. Diarrhea may accompany a high-grade fecal impaction. Diarrhea may also be the only manifestation of intra-abdominal infection. Surgical resection of the small or large bowel (ileocecal valve in particular) may produce post-operative diarrhea. Diarrhea may follow resolution of pseudo-obstruction or surgical relief of a mechanical small bowel obstruction. In general, treatment is defined by the cause. Medications should be changed/eliminated. Fecal impaction should be cleared. With the exception of *C. difficile* colitis, symptomatic relief can be provided with anti-diarrhea agents such as combinations of lomotil, Imodium, paregoric, and narcotics.

*Clostridium difficile* (Pseudomembranous) Colitis
The Gram negative bacterium *Clostridium difficile* is part of the normal colonic flora in roughly 20-25% of patients. The bacteria exist in small numbers in balance with other colonic flora and do not cause any problems. Pseudomembranous colitis develops as a consequence of an overgrowth of *C. difficile* allowing for increased toxin production and mucosal damage. The major mechanism is antibiotic administration that alters/reduces colonic flora allowing room for increased growth of the drug resistant
C. difficile bacterium. The disease can be produced by as little as one dose of antibiotics and most often follows single dose antimicrobial administration for perioperative prophylaxis. There is some data to suggest that mechanical bowel preparation/cleansing may produce the disease as well. The most frequent offending antimicrobials are cephalosporin (Rocephin), Clindamycin, ampicillin, and fluroquinolones such as levaquin. The primary manifestation of the disease is diarrhea which may occur up to 14 days after the last antibiotic administration. Occasionally the patients will have abdominal pain and distention. Rarely they will present with or have constitutional symptoms such as fever and systemic toxicity that accompany the diarrhea and abdominal pain. The diarrhea associated with the disease is quite distinct. The frequent passage of small amounts of foul smelling liquid stools should raise clinical suspicion. The diagnosis is easily established by sending a stool specimen for toxin assay. Cultures are of no value because the bacteria are normal resident flora in many patients. First line therapy is metronidazole (flagyl) administered 7-10 days via the enteral route. Intravenous flagyl is effective for patients who will not tolerate the oral route. Vancomycin given enterally is reserved for patients who present with severe disease and/or fail on flagyl. Empiric therapy is appropriate after stool cultures have been obtained and can be stopped if the toxin assay is negative. Endoscopy to identify pseudomembranes is occasionally required to establish the diagnosis. Rarely, a patient will develop toxic megacolon and require emergent surgical intervention.

Constipation
There is overlap between constipation and colonic pseudo-obstruction. Abdominal pain, distension, nausea, and vomiting accompanied by absence of a bowel movement for more than several days are the most common symptoms. Unfortunately these symptoms are identical to colonic pseudo-obstruction so the diagnosis is difficult in the hospitalized patient. Narcotics, bedrest, dietary changes, fluid & electrolyte abnormalities, particularly dehydration all predispose the patient to constipation. The key is prevention. Early mobilization of the patient and adequate hydration are essential. Patients who require pain medications should receive stool softeners as a routine. Once constipation develops attention should be turned to correcting the problem. Fecal impaction should be excluded by rectal exam. Remember that diarrhea may be a manifestation of fecal impaction. Stool softeners alone are usually not enough. Unless the patient is vomiting, oral cathartics should be tried initially. Oral dulcolax tablets and/or milk of magnesia (MOM) can be administered along with oral metaclopramide (reglan) 10-20mg. Osmotic agents such as sorbitol or phosphate of soda are also effective particularly if administered with dulcolax. These regimens can be repeated. If the patient is vomiting or does not respond to oral therapy, digital rectal stimulation with a dulcolax suppository with or without enemas can be employed.
**5th Floor Practice Standards**

**Mobilization Standards:**
- Patient will be out of bed to chair three times a day. Patient will also ambulate in hall three times a day if patient is ambulatory.
  1. For non-ambulatory patients: OOB three times a day. Bending the bed is not equivalent to getting them out of bed. Getting them out of bed requires patient effort and therefore respiratory and other muscle work. For bedridden patients, active/passive ROM will be performed every 12 hours along with turning every 2 hours to decrease soft tissue injury.
- Every patient should have incentive Spirometer when admitted unless specifically contraindicated. Incentive Spirometer will be included in admission kit by nursing tech.
- Incentive Spirometer will be used by every patient 10 times every hour while awake.
- Turn/cough/deep breathe will be done for all non-ambulatory patients unless contraindicated every 2 hours. The surgical literature clearly shows that pulmonary complications are reduced by any method of pulmonary care that leads to maximum voluntary ventilation on the part of the patient. Coughing, deep breathing, exertion, and incentive Spirometer use should be encouraged and stressed.

**IV Standards:**
Nurse will have MD order prior to IV initiation.
1. Unless an emergency situation arises.
- IV’s will not be heparin-locked for procedures.
  1. Unless specifically ordered by MD
- Each patient will have only one IV access.
  1. Unless specifically ordered by MD.
  2. Unless additional IV sites are needed for blood transfusions or non-compatible drugs.
- RN will attempt two IV sticks, if unsuccessful; will ask for assistance from one other RN. If IV access is not acquired, RN will notify MD and suggest PICC or deep line placement.
- IV’s and IV tubing will be changed every three days and more often as needed by night shift RN’s.
- RN will assess IV for patency, infiltration, infection every 8 hours and with medication administration.
- Patient may be heparin-locked with adequate PO intake, and IV will be d/c’d unless patient has medication requiring IV, if so the IV will be heparin locked.

**PICC line Standards:**
- PICC line therapy will be considered when IV initiation is difficult or impossible or when long-term IV therapy is anticipated.
- RN will acquire MD order prior to PICC line initiation. PICC line placement will be performed by vascular access RN.
- PICC line dressing will be changed 24 hours after PICC line insertion. Dressing will not have gauze over insertion site so that it can be assessed for infection. After initial change, PICC line dressing will be changed weekly using aseptic technique.
- PICC line should be assessed every 8 hours.
- Always use a 10 cc syringe for flushing a PICC line.
  1. If patient is receiving infusion through PICC line, flushing every 12 hours is not necessary.
• Flush with 10cc of NS and 2cc of heparin in a 10 cc syringe every 12 hours.
• After blood draw, lipid administration, blood transfusion, PICC line will be flushed with 20cc of NS.
• RN is able to discontinue PICC line: pull line, measure length, assess condition (tip of catheter) and document findings.

Diet Standards:
• Diet will be as tolerated. (Progressing diet will be discerned by RN).
  1. Unless specific diet is ordered by MD.
• When a procedure is ordered, MD will specify post-procedure diet or NPO status.

Bath/Shower Standards:
• Baths will be divided between days/evenings/night.
  1. Baths that are appropriate for night shift will be determined by the RN.
• Appropriate patients will have a bath/shower every day.
  1. If patient refuses bath, RN will be notified by NCT.
• Oral care must be offered by NCT 3x’s/day (with am care, after lunch and after supper).
• Oral care on NPO patients must be done at least 3x/day and more as needed (every 8 hours).
  1. If patient refuses, RN will be notified by NCT.
• Hair care will be done when blood or other debris is in hair.
• Hair care will be offered by NCT when appropriate.
• Male patients will be shaved daily unless patient has facial hair that they desire to leave unshaved.
• Denture care will be offered in morning and at night by NCT.

Oxygen saturations Standards:
• Oxygen saturation will not be measured with vital signs except:
  1. Unless specifically ordered by MD.
  2. If O2 saturations ordered by MD to remain at a certain level, patient should be on continuous pulse oximetry.
  3. If patient returns to the floor from surgery on oxygen, aggressive pulmonary toilet should be implemented. Patient should be kept on continuous pulse oximetry until O2 sats remain above 92% on room air.
  4. If patient symptomatic (SOB, chest pain, tachypnea) RN to obtain O2 saturation and notify MD. Remember the most reliable indicator of respiratory distress is patient rate and effort (are they using accessory muscles, are they tachycardic, are they having trouble speaking, are they obtunded).

Intakes and Outputs Standards:
• I & O’s will not be measured unless specifically ordered by MD except for:
  1. I & O’s will be measured every 8 hours on each patient for the first 24 hours to establish base line (per nursing practice guidelines).
  2. I & O’s will be measured when a patient is on IV therapy.
  3. I & O’s will be measured after discontinuing a foley catheter until patient voids.
  4. I & O’s will be measured on patients that are on tube feedings.
Foley Catheter Standards:

- RN must have MD order for foley catheter to be initiated.
- Foley catheter will be assessed for kinks and emptied every 4 hours.
- Foley catheter will be discontinued the night before discharge.
  1. Unless patient is to be discharged with foley catheter in place.
- For total joint patients, foley catheter will be discontinued 2 days post-operative.
- In and Out catheterization may be carried out by RN if patient has not voided 6-8 hours after foley catheter has been discontinued. RN may repeat in and out catheterization a second time. If patient has 400cc’s or more of urine out with catheterization, RN will place catheter and notify MD.
- Foley catheter care will be completed with bath every day and more often as needed.

Nasogastric Tube Standards:

- RN may place NG tube if a patient has vomited 1000cc’s or more in 8 hours.
- NG tube drainage should be measured every 8 hours (per nursing practice guidelines).
- Assess nose/skin for breakdown around NG tube every 12 hours.

Chest tube Standards:

- Chest tubes (site, tubing, drainage chamber) will be assessed every 12 hours.
- Chest tube dressings will be changed every three days and more often as needed.
- Chest tube should never be clamped (unless changing the collection chamber).
- Chest tube cannot be disconnected from suction.
  1. Unless specifically ordered by MD

Medication Administration Standards:

- Medication will be administered by RN with MD order in accurate and timely manner. RN must witness patient taking medication (do not leave medication at bedside).
- Lidocaine (1cc-1.5cc) may be added to runs of potassium (10mEq/100cc).
  1. Unless specifically contraindicated by MD.
- These medications may be ordered by RN as needed under attending MD:
  A. Bacitracin: apply to affected area BID and PRN.
  B. Chloraseptic (for irritated/sore throats): 1-2 sprays every 2 hours PRN.
  C. Tums (for heartburn/indigestion): 2 tabs every 6 hours PRN.
  D. Benadryl (for insomnia and itching): 25-50mg PO every 6 hours PRN.
  E. Tylenol (for headache): 325-650mg PO every 4 hours PRN.
    1. Unless specifically contraindicated (patient allergic or intolerant of medication)
    2. Unless specifically contraindicated by MD.

Admission Standards:

- New patients will be admitted during the shift on which they arrive.
  1. Unless patient arrives to floor 30 minutes prior to end of shift (7am/3pm/7pm/11pm).
  2. If patient arrives to floor one hour prior to end of shift (6am/2pm/6pm/10pm), patient will be settled into room, vital signs assessed and admission paperwork initiated; admission paperwork will be completed by next shift.
- Patients should be reassigned when there are multiple discharges on one wing so that admissions are evenly divided between RN’s.
Discharge Standards:
- Discharge will be completed in a timely manner upon completion of all discharge orders and upon pending discharge being entered into the computer by MD or Patient care facilitator. Foley catheter/IV/PCA will be discontinued the night before discharge.
  1. If discharge orders and pending discharge are not completed 30 minutes prior to end of shift, RN will be responsible for ensuring that IV is discontinued, patient has transportation and belongings are collected. RN will initiate paperwork when possible. Discharge paperwork and process is to be completed by next shift.

Transfer Standards:
- Transfer paperwork of patients that are being transferred to another facility by 11am will be completed by night shift RN. Report will be called by transferring RN.
- Night shift RN will do as much preparation for transfer as possible (bath, dressing change, IV discontinued). RN should also verify pending transfer order in computer/MD chart and that discharge summary has been requested.

Report Standards:
- Report MUST start at 7am/3pm/7pm/11pm. This is the beginning of the shift!
- RN must pull up E-MAR and address any overdue tasks and both RN's will check orders in SCM to assure that they are up to date. This is the beginning of the shift!
- Patient assignment will be done by the off going shift. (Night nurses will divide patient for the day shift nurses and day shift nurses will divide patient assignment for night nurses.) Patient assignment will be made with consideration of who had patient during the previous shift, acuity level, # of patients being discharged).

Assessment Standards:
  1. Nursing assessments will be done at the beginning of every shift
     Except for patients needing more frequent assessment (per RN’s discretion)
  2. Patients will be assessed upon arrival to floor from procedure, surgery or transfer from ICU.

Vital Signs Standards:
- Vital signs will be measured per routine. Routine vital signs are as follows: upon arrival to floor vital signs will be measured every 4 hours times 24 hours
- Every shift. (6a-2p-10p)
  1. Unless specifically ordered by MD to be measured more often.
  2. Unless patient has IV/epidural PCA.
  3. If patient is transferred from another med/surg floor (7th or 8th) vital signs will be measured as they were on transferring floor.
  4. Vital signs will be measured more often as needed per RN’s discretion.

Blood Glucose Monitoring Standards:
- Blood glucose will be measured on known diabetic patients as per protocol Unless MD orders not to do blood glucose monitoring
Logroll Guidelines

General rules:
1. Patients are transported to UK Hospital immobilized so must consider pre-hospital board times (don’t forget referring hospital pre-transfer time as well), thus you may receive patient that has had extended length of time on a board.

2. Evaluate your patient for risk factors associated with skin breakdown such as poor nutritional status, circulatory impairment from cardiac or vascular disease, diabetes, lack of adipose tissue, etc.

3. Hardboards should be utilized in the ICU/Floor for patient transfer and obtaining films only and must be discontinued as soon as possible to prevent breakdown. **Do not keep patient on a board for any longer than necessary (2 hours is maximum time on board).**

4. Document off/on board times.

5. **Don’t use slider board to transfer the patient.** Sliders are flexible devices that do not offer appropriate spine immobilization.

6. Must reassess sensory/motor function with every turn, transfer and prn.

I. **Pre-Log Roll Assessment:**
   A. Review Medical Diagnosis (Know your patient)
      1. Clearance of spines per MD by radiologic evaluation
      2. Level of SCI/stability of spine fractures
      3. Other injuries
   
   B. Review Medical Order for Activity
      1. Spinal Precautions until spines clear
         a. HOB flat or Reverse Trendelenburg (if not contraindicated)
      2. Log Roll
      3. Log Roll with cervical spine precautions
   
   C. Determine number of staff required to perform logroll
      1. Leader positioned at HOB
      2. Assistants (1-2) for placement on hardboard, wound/skin assessment, linen change
      3. Assistants (3-4) positioned for turning
         a. Additional staff may be required depending on patient size and/or injuries
         b. 1st assistant @ torso
         c. 2nd assistant @ hips
         d. 3rd assistant @ legs
   
   D. HOB flat
      1. maintained at all times
      2. Reverse Trendelenburg may be used to elevate patient head after logroll procedure completed
E. Inspect Cervical Collar
   1. Correct size?
   2. Appropriately applied/positioned?

F. Inspect cervical traction (if indicated)
   1. Are weights secure and hanging freely?

II. Prepare for Log Roll:
   A. Prepare patient for log roll turn
      1. Explain procedure
      2. Instruct patient to lay still, not to assist with turn
      3. Ensure patient is in proper alignment prior to turn
      4. Raise bed to approximate waist level of all participants

III. Log Roll Procedure:
   A. Leader takes position at patient’s head
      1. Position hands on each side of patient’s head
      2. Place thumbs at the mandible bilaterally
      3. Place fingers behind head at occipital ridge
      4. Maintain firm, gently stabilization of neck throughout procedure

   B. Leader to assess current motor and sensory function of patient

   C. Leader directs assistants to turn patient (in unison on count of “3”) toward them onto patient’s side
      1. Leader monitors alignment (nose & umbilicus) continuously

   D. Leader directs assistants on opposite side to proceed with turn
      1. Placement of rigid backboard
         a. position rigid backboard for contact with patient’s back
         b. assess skin integrity while patient is on his/her side
         c. change linen

   E. Leader directs return to supine position on count of “3”
      1. Patient should be gently rolled as a unit maintaining spinal alignment

   F. Continue with patient care
      1. Rigid backboard:
         *Patient should be centered on board
         If not centered, then:
         a. Leader maintains cervical alignment as described
         b. Equal number of assistants on either side of patient
         c. On “1-2-3” count, patient should be repositioned to center of rigid backboard

      2. Linen change:
         a. Leader maintains cervical alignment as described and assess spinal alignment
         b. Assistants move to opposite side of bed
         c. Repeat log roll procedure in opposite direction
IV. Transfer/Transport Guidelines:
A. Log Roll procedure is used at all times until spines are cleared by MD order
B. A rigid backboard is used at all times for transfers from one surface to another until spines are cleared by MD order
   1. Stretcher to stretcher
   2. Stretcher to procedure/diagnostic table
   3. Stretcher to bed
   4. Bed to procedure/diagnostic table
   5. Bed to bed
C. Slider boards must not be used to LIFT or TRANSFER patient. Slider is not a rigid surface, thus not a suitable lifting or transfer device.
   Exception: slider may be used under hardboard (not next to patient) to reduce friction associated with movement from surface to surface.
D. Portable Diagnostic X-rays
   1. Place patient on rigid backboard per log roll procedure
   2. Leader and assistants lift patient on rigid hardboard in unison count “1-2-3”
   3. Pancake x-ray board is placed between bed and patient on rigid backboard
   4. Count “1-2-3” in unison to lower patient/hardboard onto pancake board
   5. Notify radiology that patient is ready for films
   6. Patient remains on hardboard and pancake board until radiology approves quality of films obtained

Patient should not remain on hardboard > 2 hours!!

7. Remove patient from pancake board
   a. Leader and assistants lift patient on rigid hardboard.
   b. Pancake board is removed
   c. Leader and assistants lower patient in unison (still on hardboard) to bed surface
   d. Remove patient from rigid backboard using log roll procedure

References


Disordered temperature regulation is a common manifestation of critical illness. Hyperthermia occurs secondary to heat generated by hypermetabolism which accompanies critical illness. This is associated with altered central nervous system thermoregulation resulting in an upward adjustment of the hypothalamic thermostat.

Fever has both beneficial and harmful effects. Fever is a beneficial survival mechanism that enables the body to combat infection. Endogenous pyrogens stimulate production of T & B lymphocytes which increases the body’s antibody production twenty-fold. The harmful effect of fever is a result of increased metabolic activity which in turn increases oxygen consumption. The goal of therapy should be aimed at allowing the body’s defense mechanism to help combat the infectious organism without compromising tissue oxygenation. If the fever is not compromising tissue oxygenation it is not necessary to treat fever.

Diagnosis and source of infection are often difficult to identify in the critically ill patient. Also, there are many clinical conditions which produce hyperthermia that should be considered when attempting to identify the source of fever.

The following algorithm was designed to assist the resident and the intensive care unit nurse in clinical decision making for appropriate intervention and treatment of the critically ill febrile patient ©Protocol for Fever
Fever Evaluation
Temperature > 38.9°C [102°F.] or > 38.3°C [101°F] if patient is neutropenic

- Greater than 48 hours post op
  - YES
  - NO
    1. Known source of temperature elevation
    2. Antibiotic therapy initiated
    3. Patient responding to antibiotic therapy

- Call House officer
  - YES
  - NO
    - Monitor and Notify
    - House Officer on Rounds
    - Pan cultures in Past 96 Hours
      - YES
      - NO
        - Blood Cultures *
        - (if not one in the past 24 hours)
        - Consider Other Sources***

- Intravenous Lines in Place > 72 hours?
  - YES
  - NO
    - Wounds?
      - YES
      - NO
        - Obtain a wound specimen and send for C & S

- ****Ibuprofen 400-600mg po/per tube
  - Q 4 - 6 Hours PRN
  - if Temperature > 39.0°C [102.2°F.]

- Temperature > 40°C. [104°F.]
  - Receiving NMBA
    - YES
    - NO
      - External Cooling
      - Call House Officer
Cannot use external cooling if not receiving NMBA or not properly sedated. Cooling may cause shivering, peripheral vasoconstriction driving deep thermal temperature higher and a marked increase in oxygen consumption if not paralyzed or adequately sedated.

| Blood cultures should be obtained from 3-4 different sites ~20-30ml. (No data to support waiting between draws) |
| Pan cultures defined as sputum, blood and urine cultures. |
| Special Considerations: Also, consider sinusitis or central nervous system infections [Refer to common source of infections in ICU patient]. |
| Acetaminophen 650mg po/pr q4-6 hours PRN should be used for patients with renal insufficiency (Cr>1.5), thrombocytopenia (<50,0000), a known bleeding diathesis, gastrointestinal stress ulceration, or a hypersensitivity to NSAIDS. |

**Other etiologies of fever should also be investigated. Consider:**

- Alcohol withdrawal
- Atelectasis
- Deep venous thrombosis
- Drug withdrawal
- Drugs *
- Hematoma
- Neuroleptic hyperthermia
- Pancreatitis
- Subarachnoid hemorrhage
- SIRS (secondary to shock, trauma)
- Tissue necrosis
- Transfusions

*Drugs:

- Allopurinol
- Antibiotics (penicillin, sulfonamide, cephalosporins)
- Antihistamines
- Barbiturates
- Dobutamine
- Hydralazine
- Methyldopa
- Procainamide
- Phenytoin
- Quinidine
Possible Sites of Infection Seen in the ICU Patient

Pneumonia: (The most common nosocomial infection in the ICU). Risk factors include prolonged intubation, chest trauma and ARDS. Pathogens commonly found include: gram negative enteric organisms (Hemophilus, Pseudomonas, and Enterobacter) and/or gram positive organisms (Enterococcus, other strep species and Staphylococcus aureus).

Urinary Tract Infection: Pathogens commonly found include: E. coli, Enterococcus, Klebsiella, Pseudomonas, Enterobacter, Proteus and Candida species.

Wound Infection: The wound may be erythematous with or without purulent drainage, or subcutaneous crepitus. A surgical wound infection may not be clinically apparent until 5 to 7 days post-operatively.

Vascular Catheter Related Infection: The risk of line infection increases with the length of time the vascular cannula has been in place.

Sinusitis: The risk factors include: nasogastric tube, nasotracheal tube, nasal packing, facial fractures, recumbent positions, and high dose steroids.

Intraabdominal Infection: The risk factors include: peritoneal contamination by GI contents, ascites, or presence of intraabdominal hematoma. If a patient develops bacteremia with Klebsiella, Enterobacter, E. coli, B fragilis, or Enterococci species, an intraabdominal source should be considered and investigated.

Acalulosis Cholecystitis: Any critically ill patient is at risk. Contributing factors include: opiates, fasting, TPN and shock.

Empyema: The risk factors include: pneumothorax, hemothorax, penetrating chest trauma, unrecognized diaphragmatic perforation and pneumonia.

Tracheitis: Usually associated with tracheal intubation. Manifestations may include foul smelling purulent tracheal secretions.

Fungal Infection: This is usually seen in immunocompromised patients or in patients who have been critically ill for a prolonged period of time and have been on extended courses of broad spectrum antibiotics.

Vascular Grafts: Manifestations of vascular graft related infections include: wound drainage, wound infection, graft thrombosis, septic emboli and pseudoaneurysm.

Endocarditis: Central venous catheters can be an etiologic factor. Common pathogens include: Staphylococcus and Streptococcus.

Mediastinitis: Can be seen after surgical procedures performed through a median sternotomy and with injuries to the aerodigestive tract.

Central Nervous System Infection: The risk factors include CSF leak (following craniotomy or basilar skull fracture), craniotomy, intraventricular catheter or penetrating spinal cord injury.
Nursing Guidelines

The goal of therapy is to allow temperature elevation considering the possible benefits of immune functioning, but be aware of the harmful effects that require immediate interventions.

1. Tissue oxygenation: Keep \( \text{SvO}_2 > 60 \), \( \text{SaO}_2 > 90 \), in the absence of shivering
2. Hydration: Keep PCWP > 10, CVP > 8, UOP > 30cc/hr
3. Nutrition: Consult R.D. to ensure metabolic needs are being met with current feeding regimen.
4. Pain/Sedation/Monitor for signs and symptoms of pain and assess need for sedation. Adequate sedation will help control shivering and if unsuccessful will need NMBA.
5. External cooling should only be used if temperature is > 40° C. AND the patient is receiving a NMBA or is properly sedated.
6. Antipyretics may be given if patient temperature is < 39.0 ° C. and adequate tissue oxygenation cannot be achieved.
7. Rectal temperatures correlate most closely with core temperatures and should be used if the patient does not have a pulmonary artery catheter, unless contraindicated or temperature sensing Foley catheter.

External Cooling:
Hyperthermia is a natural adaptive mechanism in critical illness. Hypothalamic temperature regulation is adjusted upward to accommodate the hyperthermia associated with hypermetabolism and infection. Under these circumstances, attempts to lower temperature to normal can be harmful because CNS autoregulation has been reset at a higher core temperature. External cooling will produce increases in sympathetic tone that markedly increase oxygen consumption. The body will attempt to restore temperature, during external cooling by stimulating skeletal muscle, producing shivering, will increase tissue oxygen consumption. External cooling will cause peripheral vasoconstriction. This will shunt heat deeper and make it more difficult to cool. Recognizing the role of hyperthermia in critical illness, a more permissive attitude is taken towards temperature elevation. Modest rise in core temperature is monitored without treatment, and moderate temperature elevation (>102.2°) is treated with antipyretics. External cooling is reserved for extreme temperature elevation (>104°) when compromise of tissue oxygenation and/or direct tissue damage may occur. More aggressive temperature control can and should be employed when marginal tissue oxygenation occurs with lower temperatures.
References


Revised: 12/08
Guideline for Rib Fracture Management

Rib fracture repair has been selectively performed for more than 50 years; however, clear operative indications have not been established yet. The long-term outcome of a strictly nonoperative approach to flail chest, flail sternum, and rib series fracture may not be optimal with the development of chronic pain, chest wall deformity, reduced chest wall compliance and rib fracture nonunion.

In order to improve patient’s morbidity and mortality, indications for rib fracture repair should be considered in patients with flail chest, flail sternum and painful movable rib fractures refractory to conventional pain management.

When considering rib fracture repair, anterior plating with bicortical locking screws or locked intramedullary nails should be used. The anterior approach, which can be performed in a minimal invasive technique, does not violate the pleural space. Further locking screws, where the screw is threaded in to the plate improves fixation stability especially in thin and osteoporotic bone.

Conservative rib fracture management should be adequate with the use of PO/IV pain medication as well as intercostal pain pumps.

ORIF of rib fractures does not normally require an OnQ pump for post operative pain management. PO/IV medication or IV PCA should be considered first for pain management.

**Rib series**: > 6 fractured ribs. Consider ORIF repair for pain management only if fractures occur at rib levels 3 – 7 with a failure of conservative pain management.

**Flail chest**: 4 consecutive unilateral ribs fractured in 2 or more places.

**Sternal flail**: sternum is dissociated from the hemi-thoraces of bilateral, multiple, and anterior cartilage or rib fractures.
References:


VC = Vital Capacity tested on incentive spirometer

August 2010
Chest Tube Management Protocol

A pneumothorax occurs when the resting negative pressure in the pleural space is lost, leading to collapse of the ipsilateral lung. Pneumothoraces can occur spontaneously (primary pneumothorax) after for example, a bleb rupture; or result from trauma (secondary pneumothorax). In penetrating trauma, air can enter the pleural space from the atmosphere. In blunt trauma, air escapes the pleura after barotrauma or laceration by a fractured rib. Signs and symptoms of a pneumothorax can include: dyspnea, pleuritic chest pain, anxiety, cough, and tachypnea. Large or symptomatic pneumothoraces are treated with chest tubes (tube thoracostomies).

Chest tubes are removed when the pneumo/hemothorax has resolved and the amount of pleural effusion is decreased. Traditionally, chest tubes are removed from suction when the air leak has resolved. Chest tubes on water-seal with no air leak, less than 200cc drainage in 24 hours and minimal or no residual pneumothorax on CXR are considered for removal. A chest x-ray is usually obtained 3-8 hours after placement on water-seal to identify any expansion of the pneumothorax. Sometimes, a second follow-up radiograph would be taken the next morning and if still negative, the chest tube is removed. If the initial chest x-ray on water seal shows development of or significant expansion of the pneumothorax, the chest tube is placed back on suction and/or reevaluated. An interval chest x-ray would follow.

There is emerging evidence to support a more rapid and systematic approach to chest tube removal. Recent studies have determined which technique, water-seal or suction, allows for shorter chest tube duration, when radiographs should be obtained, and finally, the optimal time interval for identifying a recurrent pneumothorax on chest x-ray after placing a chest tube on water-seal (Schulman 2005).

Some authors have suggested that the placement of chest tubes to water seal is unnecessary, prolongs dwell time and that tubes on suction with no air leak may simply be removed without a period of water seal. Martino et al. determined that there was no difference in total chest tube dwell time between chest tubes placed on water-seal vs. those in which water-seal was not used, although it appears that a short trial of water-seal allows for occult air leaks to become clinically apparent and significantly reduces the need for another chest tube (Martino 1999). This water seal trial followed by a CXR is the practice of the Blue Surgery Service.

Recently, Schulman et al. studied the time interval for identifying a pneumothorax on chest x-ray after placing a chest tube on water-seal (Schulman 2005) and from this work formulated a new chest tube removal algorithm. This study concluded that a chest x-ray obtained 3 hours after placing a chest tube on water-seal effectively excludes development of a clinically significant pneumothorax. Their algorithm (modified below) will allow patients to progress from water-seal to chest tube removal and discharge on the same day, enhancing patient satisfaction with potential associated cost-savings (Schulman 2005).

Pizano et al. studied the time interval between the removal of a chest tube and a chest x-ray (Pizano 2002) and concluded that a chest x-ray obtained within 1-3 hours after chest tube removal effectively identifies a pneumothorax. These data add further support to Schulman’s algorithm which uses a 3 hour time interval between chest tube removal and “post-pull” CXR. In addition, this study was conducted in mechanically ventilated patients suggesting that it is safe to remove a chest tube from patients undergoing positive-pressure ventilation (Pizano 2002).

References


08/08
### Underlying condition

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<tr>
<td>Cardiac disease</td>
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<td>Hormone (estrogen) therapy</td>
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<td>Obesity</td>
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<td>Malignancy</td>
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<td>History of thromboembolic disease</td>
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<td>Acquired or congenital hypercoagulable state</td>
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### Iatrogenic factors

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<td>Surgical procedure &gt; 2 hours</td>
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<td>Immobility &gt; 72 hours</td>
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<td>Immobility &gt; 5 days</td>
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### Injury related factors

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<td>Spine fractures</td>
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<td>Coma (EMV &lt; 8 for &gt; 4 hours)</td>
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<td>Spinal cord injury with para or quadriplegia</td>
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### Age

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### ABSOLUTE HIGH RISK CRITERIA

1. History of venous thromboembolism
2. Hypercoagulable state
3. Immobility > 5 days
4. Partial or complete spinal cord injury
DVT PROPHYLAXIS ALGORITHM

Low Risk 1
Elevate foot of bed. Encourage Ambulation

Moderate Risk 2-4
Elevate foot of bed. Encourage ambulation. Low dose heparin (5000u SQ q8h. Apply contraindication to heparin.

High Risk Patient > 5
Contraindication to Heparin
Active hemorrhage
Solid Organ injury
Intracranial Hemorrhage
Etc.
(Should be cleared by NS or appropriate service prior to admission)

NO
YES

LOWER EXTREMITY CAN ACCOMMODATE SEQUENTIAL COMPRESSION DEVICES (SCD)

YES
NO

Apply SCD’s
Apply SCD’s to upper extremity if possible 40 mg SQ

Lovenox (Enoxaparin)
30MG SQ every 12 hr or once daily.
(Hold AM dose prior to discontinuation of epidural catheter on morning of operation)

Risk of Hemorrhage Resolved
48 hours post active hemorrhage, solid organ injury, intracranial hemorrhage, etc.

Discontinue SCD’s

*Patients who are non ambulatory at discharge should be maintained on Lovenox or switched to low dose Coumadin to maintain INR at 1.5-2.0. (Follow Ortho recommendations on discharge for Lovenox. If no Ortho recommendations then order X 2 weeks or until ortho clinic follow-up.)

** Routine Duplex Surveillance is no longer performed. Venous Duplex should be requested when clinical suspicion for DVT is present.
THERAPY FOR DOCUMENTED DVT/PE

ANTICOAGULATION THERAPY FOR ACUTE DVT/PE

1. **Unfractionated heparin**
   IV heparin bolus of 80units/kg followed by a continuous heparin infusion @18units/kg/hour.
   The goal is prolongation of the PTT to twice control (+ 10%). Obtain PTT 6 hours after initiation of therapy. Dose adjustments can be made per protocol.

   Low molecular weight (fractionated) heparin (**Preferred**).
   Enoxaparin (Lovenox) 1 mg/kg SQ bid or 1.5mg/kg QD. This will provide therapeutic anticoagulation. Low molecular weight heparins do not effect PTT and therefore measurement is not required. (Dosing in obese patients has not been established. Caution should be used in patients with renal failure). Activated factor X levels must be checked and this is not routinely required.

2. Begin warfarin (Coumadin) 10mg/day once therapeutic anticoagulation on heparin (fractionated or unfractionated) has been achieved. Adjust dose to a target INR of to 3.5 and then discontinue heparin (fractionated or unfractionated). Some patients can be maintained on therapeutic anticoagulation with low molecular weight heparin. Most patients will be converted to warfarin. Anticoagulation should be continued for at least three months.

INDICATIONS FOR VENA CAVA FILTER PLACEMENT

**Prophylactic IVC filter**
The data are inconclusive regarding prophylactic filter placement.
Prophylactic filter may be considered in the following patients:
1. High risk patients with a contraindication to low dose heparin and unable to wear compression stockings or foot pumps.
2. Documented DVT with free floating iliofemoral or vena cava thrombus.
3. Documented PE with hemodynamic compromise and a second PE would be lethal.

**Therapeutic IVC filter**
1. PE on adequate anticoagulation.
2. Documented DVT/PE with contraindication to anticoagulation.
3. Documented DVT/PE with a complication of full anticoagulation.
4. Failure to achieve therapeutic anticoagulation.
ALGORITHM FOR DIAGNOSIS AND TREATMENT OF PULMONARY EMBOLISM
CLINICAL SUSPICION FOR PULMONARY EMBOLUS

Documented DVT
Patient anticoagulated

Diagnosis of DVT not established

Obtain ABG, CXR, ECG

1. Obtain ABG, CXR, ECG
2. If no contraindication, begin anticoagulation
3. Obtain upper and lower extremity venous duplex

High probability clinical diagnosis

NO
YES

*Dynamic Chest CT Scan
Place VC filter

Duplex negative

Duplex positive

*Dynamic Chest CT Scan
Continue anticoagulation

Negative
Positive

Negative
Positive

Stop anticoagulation pursue other sources for pulmonary symptoms

Continue anticoagulation

Continue anticoagulation

Pursue other sources for pulmonary symptoms

*An occasional CT scan will be diagnostic. Depending on clinical suspicion, pulmonary angiography may be required.
**Intra-pulmonary clot treatment will be handled on a case by case basis.
Incidence of Gastrointestinal Stress Ulceration
Clinically important stress-related mucosal bleeding affects up to 4% of critically ill patients, with a mortality rate that approaches 50%.

Pathophysiology
The splanchnic hypoperfusion that causes stress-related mucosal damage in critically ill patients is multifactorial and results from sympathetic nervous system activation, increased catecholamine release and vasoconstriction, hypovolemia, decreased cardiac output, and the release of proinflammatory cytokines.

Stress Ulcer Prophylaxis (SUP)
1) Histamine H2-receptor antagonists (H2RA) Preferred Agents
   a. UK formulary –
      i. PO - Famotidine 20mg tablets
      ii. IV - Famotidine 20mg injection
2) Proton Pump Inhibitors (PPI)
   a. UK formulary
      i. PO
         1. Pantoprazole 40mg tablets
         2. Omeprazole/Sodium Bicarbonate 40mg packets
      ii. IV
         1. Pantoprazole 40mg injection

Recommended Prophylaxis at the University of Kentucky

Who Requires Prophylaxis
Prophylaxis for stress ulceration is not necessary in all patients. Only patients with one or more of the following risk factors require prophylactic therapy:

1. Respiratory failure requiring mechanical ventilation > 48 hours.
2. Coagulopathy (platelet count < 5,000, INR > 1.5, aPTT>2X control)
3. Major Trauma (ISS > 16)
4. Major Burns (TBSA > 30%)
5. Major head and spinal cord injury
6. Stroke
7. Known history of peptic ulcer disease
8. Organ transplant recipients
9. Patients receiving NSAID’s or steroids

Other Considerations
Early enteral nutrition may be an important factor for preventing gastrointestinal mucosal ischemia. Enteral feedings produce splanchnic vasodilation and increased mucosal blood flow thereby preventing mucosal ischemia and its untoward consequences.
UK Trauma Service
Stress Ulcer Prevention Guidelines

Hospital Admission

Screen for Risk Factors
Respiratory failure requiring mechanical ventilation > 48 hours.
Coagulopathy (platelet count < 50,000, INR > 1.5, aPTT >2x control)
Major Trauma (ISS > 16)
Major Burns (TBSA > 30%)
Major head and spinal cord injury
Stroke
Known history of peptic ulcer disease
Organ transplant recipients
Patients receiving scheduled NSAID’s or steroids

≥ 1 Risk Factor?

Yes
Famotidine 20mg BID*

No
No SUP necessary

Consider switch to a PPI ONLY WHEN:
Current or recent upper GI bleed
Famotidine allergy
Ongoing treatment for H. pylori
Unexplained mental status changes
Receiving PPI at home

Enteral Access Available?

Yes
Give PO

No
Give IV

*For renal insufficiency/failure, adjust dosing according to pharmacy recommendations.
Diagnosis and Treatment of Stress Related Mucosal Bleeding

Diagnosis
Endoscopy is the diagnostic modality of choice.

Overt Bleeding
Overt bleeding is defined as hematemesis, melena, hematochezia, gross blood > (100cc) in the NG tube, or coffee ground emesis or nasogastric drainage.

Clinically Important Bleeding
Clinically important bleeding is defined as overt bleeding complicated by one or more of the following within 24 hours of the onset of bleeding (in the absence of other causes):
1. spontaneous decrease of > 20 mmHg in the systolic blood pressure
2. an increase in HR > 20 beats/min
3. a decrease in [Hgb] > 2 gm/dl (Hct of > 8%)
4. subsequent transfusion where the Hgb & Hct do not rise appropriately for the number of units transfused

Only clinically important bleeding warrants further investigation and if necessary treatment. Endoscopy is the diagnostic modality of choice.

Treatment
Initial bolus of pantoprazole 80mg, followed by pantoprozole 8mg/hr continuous infusion for 72 hours. Follow with once daily PPI for ___ months.

References

Calculation of Injury Severity

**HEAD REGION:**
- SINGLE CEREBRAL CONTUSION, TINY AIS 2 (SMALL AIS 3, LARGE AIS 4, MASSIVE >50 CC AIS 5).
- EPIDURAL HEMATOMA AIS 3 (TINY AIS 2, SMALL/MOD AIS 4, LARGE AIS 5).
- SUBDURAL HEMATOMA AIS 3 (SMALL/MOD AIS 4; LARGE AIS 5).
- PENETRATING INJ TO BRAIN ≤2CM DEEP AIS 3 (>2CM DEEP AIS 5).
- VAULT SKULL FRACTURE SIMPLE AIS 2 (COMMUNICATED OR DEPRESSED ≤2CM AIS 3; COMPLEX OR WITH >2CM DEPRESSION AIS 4).
- SKULL BASE FRACTURE WITH/WITHOUT CSF LEAK AIS 3 (COMPLEX, COMMUNICATED, RING, HINGE AIS 4).

**FACE REGION:**
- MANDIBLE FRACTURE AIS 1 (OPEN, COMMUNICATED, DISPLACED AIS 2).
- MAXILLA FRACTURE LEFORT 1 AIS 2 (LEFORT II - AIS 3; LEFORT III - AIS 3; IF >20% BLOOD LOSS AIS 4).
- ORBIT FRACTURES AIS 2.
- ZYGOMA FRACTURE AIS 1 (COMPLEX AIS 2).
- “PANFACIAL FRACTURES” AIS 3 (BLOOD LOSS >20% AIS 4).

**NECK REGION:**
- CAROTID ARTERY INTIMAL TEAR AIS 3.
- LARYNX OR PHARYNX CONTUSION AIS 2.

**THORAX REGION:**
- SUCKING CHEST WOUND AIS 4.
- AORTA INTIMAL TEAR AIS 4.
- AORTA LAC/PERF WITH BLOOD LOSS <20% AIS 4.
- CARDIAC CONTUSION MINOR AIS 1.
  - MAJOR CARD. CONTUSION BY SURG/AUTOPSY AIS 4.
- LUNG CONTUSION, MINOR AIS 2 (BILAT MINOR OR UNILAT MAJOR AIS 3; BILAT MAJOR AIS 4).
- PTX AIS 2 (PTX MAJOR W/50% COLLAPSE OF LUNG AIS 4).
- TENSION PTX AIS 5.
- HTX AIS 3 (MAJOR W/50% LUNG COLLAPSE AIS 4).
- RIB FRACTURES “MULTIPLE” AIS 2.
  - ONE RIB AIS 1.
  - TWO RIBS AIS 2.
  - THREE OR MORE RIBS AIS 3.
  - UNILAT FLAIL CHEST 3-5 RIBS AIS 3.
  - UNILAT FLAIL WITH >5 RIBS AIS 4.
  - BILAT FLAIL AIS 5.

**ABDOMEN REGION:**
- LIVER BY GRADE.
- KIDNEY BY GRADE.
- MESENTERY LAC-MINOR AIS 2 (MAJOR OR W/BLOOD LOSS >20% AIS 3; MASSIVE/AVULSION/COMPLEX/TISSUE LOSS AIS 4).
- SPLEEN LAC SIMPLE AIS 2.
  - >3CM DEPTH WITHOUT HILAR INVOLV. GR III AIS 3.
  - HILAR INVOLVEMENT/GRADE IV.
  - GRADE V, MASSIVE, TOTAL DEVASC. AIS 5.

**SPINE REGION:**
- NOTE: C SPINE CODED TO NECK, T SPINE CODED TO THORAX AND L SPINE CODED TO ABDOMEN FOR ISS CALCULATION.
- INCOMPLETE CORD SYNDROME FOR ALL SPINES AIS 4.
- COMPLETE CORD SYNDROME FOR ALL SPINES AIS 5.
- COMPLETE CORD SYND C3 OR ABOVE AIS 6.
- VERTEBRAL FRACTURES AIS 2.
- ALL BODY FRACTURES WITH COMPRESSION >20% AIS 3.

**UPPER EXTREMITY REGION:**
- PROX HUMERUS AIS 2 (OPEN FX=3).
- HUMERUS SHAFT FRACTURE AIS 2 (OPEN WEDGE/BUTTERFLY SEG/COMPLEX/COMM =3).
- DISTAL HUMERUS FX AIS 2 (ARTICULAR AND OPEN=3).
- RADIUS AIS 2 (ARTICULAR AND OPEN=3).

**LOWER EXTREMITY REGION:**
- FEMUR FRACTURES AIS 3.
- TIBIA FRACTURES AIS 2 (OPEN= AIS 3).
- PELVIC RING FRACTURE CLOSED AIS 3.
  - PELVIC FRACTURE OPEN AIS 4.
- ACETAB FRACTURES AIS 2 (OPEN=AIS 3).

**EXTERNAL REGION:**
- BURNS 10-19% AIS 2.
  - BURNS 20-29% AIS 3.
  - BURNS 30-39% AIS 4.
  - BURNS 40-89% AIS 5.
  - BURNS >89% AIS 6.
- ELECTRICAL INJURY NOT SPECIFIC AIS 2-3.
- INHALATION INJURY W/MINOR AREAS OF ERYTHEMA, BRONCHORRHEA, CARBONACEOUS DEPOSITS IN PROX OR DISTAL BRONCHI AIS 3.

Calculation of Injury Severity Score (ISS) is as follows:
1. Calculate highest single AIS in each category.
2. Identify the 3 categories with the highest single AIS’s.
3. Square those 3 highest AIS’s.
4. Total the squared AIS’s to get the ISS.
Early enteral nutrition is very important in the management of critically ill patients. Obtaining and maintaining access to the GI tract is an essential component of patient care. The gastric dysfunction that accompanies critical illness necessitates post pyloric placement of small-bore feeding tubes to insure tolerance of enteral formulas and the administration of medication. Reliable post-pyloric placement of feeding tubes using a blind technique is difficult. Surgical and endoscopic methods are both difficult and expensive. Maintaining patency of these important enteral access devices to insure continuous nutrient flow and to prevent costly tube placement is essential for proper patient care.

These guidelines were developed to assist the clinician with medication administration, maintenance of the feeding tube, and trouble shooting guideline when the feeding tube becomes clogged.

**Maintenance**

Routine flushing with 20 - 30 ml of water before and after medications is essential for maintaining patency, especially with medications containing sorbitol. If enteral nutrition is held for any length of time the feeding tube should be flushed with 30 ml of water. Adequate flushing of the feeding tube is the key to maintain patency and cannot be over emphasized.

**Common Causes of Obstruction**

1. Infrequent or inadequate water flushes pre/post medication delivery.
2. Viscous medications and tablet fragments may adhere to lumen wall causing obstruction within 15 minutes to one hour.
3. Small caliber feeding tube collapse when aspirated. **Do not aspirate small bore feeding tubes!**
4. Aspirated tube feeding formula mixes with gastric acid and coagulates, producing tube obstruction.
5. Feeding flow rates less than 50cc/hr. may cause residue buildup and obstruction.
6. Viscous feeding formulas such as those containing additives like Promod.
7. Tube type effects patency. Silicone tubes have a higher obstruction rate than polyurethane tubes.
8. Tube kinking from dislodgment.
Assessment of Small Caliber Feeding Tubes and Feeding Tube Regimen

1. Auscultation is not adequate to verify feeding tube location initially or during ongoing assessment. An x-ray must be done to confirm position.
2. Monitor for potential regurgitation of tube feeding into the stomach by aspiration from the nasogastric tube every 4 hours.
3. Change tube feeding canister every 24 hours, formula every 12 hours for canned preparations, and every 6 hours if pre mixed by dietary.
4. Document cessation of tube feeding, amount given, versus the amount prescribed.

Administration of Medications

1. Consider whether medications should be taken on an empty/full stomach. If a patient is receiving intermittent feedings schedule medications accordingly.
2. Check nasogastric or PEG residual prior to medication delivery. If residual is equal/greater than 75% of hourly rate, wait a short period and check again before giving medication.
4. Utilize liquid form of medications instead of tablets when possible.
5. Drugs designated SA, E.E.S., SL, XL, EC, LA, MT should never be crushed or dissolved unless formulated for that purpose.
6. Never add medications to enteral formulas in tube feeding container. This practice may cause coagulation and feeding tube obstruction.
7. Administer multiple medications separately to avoid drug interactions; Flush with 5ml of water between medications, when possible.
8. Determine whether medication should be given in the stomach or small bowel. Drugs such as sucralfate, antacids, iron salts, ketoconazole, should be administered via the nasogastric tube to insure efficacy.
9. Phenytoin administrations; stop tube feeding one hour pre/post administration.
10. Some medications require special preparation to insure proper efficacy. If unsure of how to administer the drug, please check with the pharmacist.

Nursing Guidelines

1. Ask pharmacy if medication is available in solution.
2. Always flush feeding tube with 20 - 30 ml of water pre/post medication administration.
3. Elevation of head of bed 30° is necessary when feeding tube is in the stomach. Elevation is not necessary but is recommended when the feeding tube is in the post-pyloric position.
4. Monitor the patient for diarrhea or constipation (refer to appropriate algorithm).
5. Send the patient to the operating room with enough formula for anticipated length of case (May send 12 hours of formula in the container, if case is expected to go beyond 12 hours, please send cans of formula with patient).
6. The nurse should notify the patient’s primary service in the event the anesthesiologist or consulting service requests that the tube feeding be stopped.
Troubleshooting Obstructions for Small Caliber Feeding Tubes

1. If a small caliber feeding tube becomes clogged, attempt unclogging with warm (not hot) water or carbonated soda.
2. Pancreatic enzymes (Viokase) can be used to unclog tubes. Prior to administration of above agent, aspirate tube-feeding formula using a 30 - 50 ml syringe. This will clear tube up to the obstruction site. Clamp tube post administration for 15 minutes, and then flush with water.
3. Due to rare instances of tube perforation, reinsertion of the stylet is not recommended without the physician’s approval or supervision

See Clogged Feeding Tube Algorithm
Clogged Feeding Tube

Slowly aspirate tube feeding formula using 30-50 syringe
Flush tube with 30 ml of warm water. Clamp tube for 15 minutes

Clogged     Unclogged

Administer the following:

Viokase + sodium bicarbonate (obtained from pharmacy)

Clamp feeding tube for 15 minutes

Clogged     Unclogged

Raise HOB 30 degrees   Continue tube feedings
Turn patient on side

Clogged

Is tube kinked? Obtain KUB, reposition tube with MD order. Flush with 30 ml warm water

Clogged     Unclogged

Consider tube replacement   Continue tube feeding
References


Drug Information Center, University of Kentucky Medical Center. Pharmacy News for Nurses. 1992; 13(4):


SUBJECT: Enteral Feeding: Verification and Maintenance of Small-Bore Feed Tubes in Adults
SEE ALSO: NN08-03, Placement and Maintenance of Small-Bore Tubes (Adults)

INFORMATION
To facilitate delivery of enteral nutrition in adults, the Hospital has established guidelines for the verification and maintenance of small-bore feed tubes. Clinical Nutrition’s consultation service should be involved with all patients receiving enteral nutrition, and will be responsible for ordering the feeds.

Confirmation of Tube Placement
Verification of small-bore feeding tube position requires initial radiographic confirmation with KUB or lower chest x-ray prior to initiation of feeding.
Exception: Feeding tubes placed during laparotomy do not require radiographic confirmation. In patients with surgical disruption between the GI tract and larynx, the physician may document that radiologic confirmation of the feeding tube is not necessary.

1. The physician will notify the nurse of the location of the feeding tube and give an order to begin enteral feeding.
2. The nurse should document the location initially on the nurses’ note and on the patient’s care plan or the electronic Assessment and Intervention record, and should document that tube feeding is started per physician’s order. This documentation is required each time a feeding tube is inserted and with each time feeding started.
3. If tube is not in the small bowel as confirmed by x-ray, then nurse may reattempt insertion twice. If tube continues to be in gastric position after both subsequent attempts, the nurse will document and notify physician for endoscopic tube placement.

Administration of Formula (Open System)
Formula administration should be continuous via a feeding pump, unless otherwise ordered by the physician. Bolus feedings should be avoided in the adult ICU patient. Cyclic administration that delivers feeding over a few hours (either daily or intermittently during a 24-hour period) using a feeding pump may be appropriate in some patients and should be ordered by the physician.

Food coloring or dye on an on-going basis is contraindicated and should not be added to the formula or container. Physicians may order food coloring added to tube feeding in specific situations in which aspiration of tube feeding is suspected. Nurses should follow the guidelines for use of food coloring in these instances.

Prevention/Assessment of Aspiration
For All Patients on Tube Feeding
1. Unless contraindicated (i.e., patient with cervical spine injury or subdural drain), **elevate the head of the bed to 30 to 45 degrees** to reduce the risk of aspiration. Patients with spinal injuries may be able to be placed in reverse Trendelenburg position at 30 to 45 degrees to reduce the risk of aspiration.

Note: The nurse should verify head of bed elevation with the physician.
2 -- HP08-39, Verification and Maintenance of Small-Bore Feed Tubes in Adults
For Critically Ill Patients with One Major Risk Factor (refer to following list of risk factors), it is recommended: • to provide all care listed above, • maintain tight glycemic control (blood glucose between 80-110 mg/dl), and • use continuous infusions rather than intermittent boluses.

For Critically Ill Patients with Two or More Major Risk Factors (refer to following list of risk factors), it is recommended: • to provide all care listed above, • that all feeding tubes be in the small bowel, and • to use prokinetic agents (Metoclopramide).

Major Risk Factors • previous episode of aspiration • decreased LOC (sedation or elevation in intracranial pressure) • neuromuscular disease • neuromuscular blocking agents • endotracheal tube or intubation • vomiting • persistent high residuals

Patients Receiving Gastric Tube Feeding
1. If the patient has any of the risk factors for aspiration listed above, tube feeding tolerance should be assessed by checking residuals on gastric tube feedings every four hours.
2. For gastric residuals of > 300 ml, hold tube feeding for 1 hour, then recheck residual. If residual remains > 300 ml after 1 hour, then hold tube feeding, discard residual, and notify service.
3. If second gastric residual is < 300 ml, resume previous tube feeding orders and return residual to patient. If second gastric residual is > 300 ml, hold tube feeding and notify service for specific orders (see Enteral Nutrition Physician/Patient Care Orders, form J703).

Glucose Monitoring in Patients Who are Diabetic or Receiving Insulin
1. Fingerstick glucose should be monitored at least every six hours in diabetic patients or in those receiving insulin.
2. Patients receiving insulin infusions require more frequent glucose monitoring, which should be specified by the physician.

Approved by Karen Stefaniak, Chief Nursing Officer
Approved by Joseph Conigliaro, M.D., Associate CMO, Quality & Patient Safety Authorized by Murray B. Clark, Jr., Associate VP for MC Operations
The injured/critically ill patient undergoes physiologic alterations in gut function. Gastric motility slows; use of narcotics slows intestinal motility, warranting bowel function surveillance to ensure timely identification and intervention of alterations. All trauma service ICU patients will be started on a bowel protocol upon admission consisting of Docusate Sodium 250 mg twice daily and Biscodyl suppository twice daily prn. Assessment of the patient should include bowel patterns pre-injury, other medical conditions that predispose patient to alterations in bowel function, medications,

High risk indicators: use of narcotic analgesia, lack of BM x 24 hours. Diarrhea and constipation in critically ill patients may either be serious or benign conditions. There are many causes for constipation such as improper diet, intestinal obstruction, tumors, excessive use of laxatives and weakness of the intestinal musculature. What constitutes constipation is very subjective and individualized. However, absence of stool > 3 days in patients receiving enteral nutrition should be investigated and appropriate therapy initiated when indicated.

Diarrhea is common in critically ill patients, occurring in 24% of patients admitted to intensive care units. Many factors contribute to diarrhea, such as infection, antibiotics, and drugs containing sorbitol, bowel edema, inflammation, enteral feeding rate, and hyperosmolar enteral feedings. Incomplete digestion may occur in patients who have had feedings withheld for several days, therefore low rates with slow advance are recommended when beginning enteral feedings. However, diarrhea associated with enteral feedings is usually seen in patients who have gut atrophy from prolonged fast or patients on high hourly feeding rates (> 75 ml/hour). Hypoalbuminemia (<2.5g/dl) and attendant bowel edema have been implicated as a cause of diarrhea, but this association has never been firmly established.

Diarrhea associated with antibiotic therapy is usually benign, but can be serious. Antibiotic therapy alters colonic flora which may allow overgrowth of pathogenic and or diarrheagenic bacteria. Clostridium difficile is present in the normal colonic flora of some patients. Overgrowth by toxigenic C. difficile can occur in patients receiving antibiotic therapy. C. difficile infection can present as diarrhea that is mild to moderate or can cause severe colitis with pseudomembrane formation. Pseudomembranous colitis can lead to severe diarrhea, hypovolemic shock, toxic megacolon, perforation and death. Specific findings of pseudomembranous colitis include watery, green, foul-smelling, non-bloody or bloody diarrhea, cramping abdominal pain, fever (> 39.5°C) and leukocytosis. Stool specimen should be sent for C. difficile toxin. C. difficile culture is a less efficient method and does not differentiate between nontoxicogenic colonic flora and toxic strains of C. difficile. Turnover time for the C. difficile toxin assay is usually 24 to 48 hours. Severe diarrhea, abdominal distention, tenderness, unexplained SIRS, megacolon on plain film and a high index of suspicion should prompt an endoscopic evaluation to exclude pseudomembranes.

Treatment varies according to the severity of the illness. Enteral metronidazole is the first line drug of choice. If a patient cannot tolerate oral medication intravenous metronidazole should be given. Intravenous vancomycin is not effective in the treatment of C. difficile enterocolitis. Enteral vancomycin is the drug of choice for severe colitis and treatment failures on metronidazole.
Diarrhea Guidelines

> 3 liquid stools/day or > 500 ml for 2 consecutive days

Have pharmacist check medications
1. Patient on prokinetic agent? (Metoclopramide)
2. Liquid medications containing sorbitol?
3. Any other potentiating medication? (stool softener, laxative)
4. Consider TF rate reduction or change in formula

Antibiotic therapy in the past 6 weeks?

- Yes
- No

*Severe diarrhea, leukocytosis, fever, abdominal tenderness

Foul-smelling Heme + or bloody stool

Endoscopic Exam

- Positive
- Negative

C. difficile toxin

- Positive
- Negative

**Metronidazole enteral/IV

Patient does not respond or relapses (48hr)

- Yes
- No

PO Vancomycin

PO Vancomycin

Changes Indicated in medications/TF formula/rate

- Yes
- No

Diarrhea persist >24hrs

- Yes
- No

No treatment necessary

Treatment

1. Loperamide 4 mg PO now, then 2 mg after each stool up to 16 mg/day or
2. Diphenoxylate/atropine 5 - 10 mg PO q 6 hr. x 48 hrs or
3. Paregoric 5 - 10 ml QID x 48 hours
4. Consider Lactines if patient has been on recent antibiotic therapy

* Severe diarrhea, abdominal distention, tenderness, unexplained SIRS, megacolon on plain film and/or high index of suspicion should prompt an endoscopic evaluation to exclude pseudomembranes. In the event of fulminant colitis, sigmoidoscopy and/or colonoscopy should proceed cautiously because of the risk of perforation.

**Metronidazole PO/Feeding tube is preferred: Enteral vancomycin is reserved for severe C. difficile colitis and/or treatment failures on metronidazole.
© Bowel Regimen

Constipation

Absence of stool > 3 days in presence of enteral/PO feedings

Receiving Enteral Nutrition

*Consider opioids as source

YES  NO

Continue to monitor  

NO

Stool in 48 hours

YES  NO

Continue to monitor  plausible explanation

YES  NO

Continue to monitor

Rectal exam to P/O impaction

No Impaction  Impaction

Notify physician

Recommendation for Removing Impaction
1. Manually remove as much stool as possible, then repeat rectal exam every 4 hours x 24 hours
2. If the impaction is not obvious on rectal exam the mass may be in the sigmoid colon. The mass may be softened by ingestion of 30 ml mineral oil every hour until oil begins seeping out of the rectum (usually 24-48 hours).

Unless there is a high index of suspicion of bowel obstruction or other plausible explanation for delay in BM the following treatment is suggested after obtaining a physician's order

If no stool after 24 hours notify physician on rounds

Discussate sodium 250 mg p/e per tube bid and give
Dulcolax suppository 10 mg, may repeat x 1 in 30 minutes

If no response in 1 hour → Fleet's enema x 1, may repeat in 1/2 hour

If no stool within 24 hours consider:
Limited doses of prokinetic agent (metoclopramide or Cisapride)
MCM 10 ml x 4 hours
Mag Citrate 1/2 to 1 bottle x 1 dose
Lactulose 30 ml ltd
Nursing Guidelines:

Diarrhea:

1. Document frequency and amount of stool
2. Inform physician of greater than 3 liquid stools day or greater than 500 ml for 2 consecutive days
3. Use skin barrier or fecal bag to prevent skin breakdown from diarrhea stools
4. If oral medication is administered in the nasogastric tube clamp for at least 30 minutes
5. Flush feeding tube with 20 ml - 30 ml of water pre and post medication
6. Based on algorithm send stool specimen for C. difficile toxin per physicians order [turn around time is usually 24 to 48 hours]
7. Notify H.O. if patient does not respond to antibiotic therapy within 48 hours or if diarrhea returns < 72 hours after antibiotic stopped

Constipation:

1. Notify physician when patient who is receiving PO/enteral feeding has not had a stool for > 3 days
2. Ensure patients are receiving adequate hydration
3. Assess for medications or dietary intake (low residue, low fiber) that may contribute to constipation
4. Lubricant should be used when manually removing impaction
5. Abdominal pain and/or distention may be a clinical manifestation of a serious problem

References


Blue Surgery Bladder Management Protocol for the Urologically Non-complicated Patient

UTIs account for 31% of nosocomial infections in US medical ICUs, thus it is essential to understand the logistics of Foley monitoring and maintenance. The risk of bacteriuria from an indwelling catheter is 3-10% per day. Daily assessment for the continued necessity of an indwelling catheter and removal when they are no longer indicated are simple but important steps to reduce infection, encourage a return to normal physiologic function, and improve patient care.

Intermittent catheterization deals with draining the bladder at specific time intervals to simulate normal physiologic function. An adult bladder holds approximately 400 ml of urine and voids 4-5 times/day. Intermittent catheterization should likewise be performed a 4-5 times/day with adjustments based on volume drained. The total volume drained should not exceed 400 ml. If volume drained is high, either the frequency of intermittent catheterizations should be increased or fluid intake should be decreased.

Spinal Cord Injuries: According to several studies, intermittent catheterization is a better option than indwelling catheterization for both male and female patients. Some studies show that for patients who are undergoing catheterizations approximately 4 times/day, bacteriuria occurs at an incidence of 1-3% per catheterization. Antibiotics are usually not required during intermittent catheterizations unless the patient is in a high-risk population (immunosuppressed, internal prosthesis, etc.).


BLUE SURGERY BLADDER MANAGEMENT PROTOCOL

1. D/C Foley
   2. Maintain strict I&Os
      Capable of volitional urination?

   Yes
   
   No
   
   Incontinent

   U/S PVR check

   <100cc PVR

   >100cc PVR

   I/O cath

   
   Spontaneous Void?

   US PVR check

   <100cc PVR

   >100cc PVR

   I/O cath

   Record urine/PVR volume in chart

   Continuing spontaneous/incontinent episodes?

   <100cc PVR

   >100cc PVR

   I/O cath

   
   Record urine/PVR volume in chart

   3 consecutive U/S PVRs <100ccs warrants D/C U/S PVRs as bladder emptying is adequate

   5 consecutive I/O caths in q4h

   Look for etiology: infection, stones, excessive diuretics/miotics etc.

   Texas cath vs. adult diaper for control

   Replace Foley to protect skin if becoming macerated

   For continued incontinence issues, consider urology or PM&R consult for workup

References: Rice, MD; Martha Grace Rice, M3; Marv Shechter, M3; June 2007
Indwelling vascular catheters are essential for patient care. All indwelling vascular catheters have associated mechanical and infection risks. Catheters should be placed when needed and the insertion should be performed properly using strict aseptic technique. Catheter maintenance should follow accepted guidelines including sterile technique for infusions, lines, and hubs. Site inspection and care are essential for preventing infection. Catheters should never remain in place for caregiver convenience and should be removed when no longer needed.

**Placement**
1. Appropriately trained and experienced personnel identified to place CVC
2. Time out performed prior to procedure (patient ID, consent, site selection, diagnosis)
3. Choose the most appropriate site for CVC insertion based on patient’s needs
4. Full sterile precautions must be performed on ALL non-emergent CVC insertions. This includes sterile hat, mask w/shield, gown and gloves. A fully sterile sheet is applied after appropriate antisepsis.
5. Appropriate antisepsis is achieved with 2% chlorhexidine gluconate for 30 seconds and then allowed to air dry. If this is not available, it is appropriate to use iodine, iodophore or 70% ethanol, no organic solvents.
6. Choose a central venous catheter with the minimum number of lumens for your patient’s needs.
7. All internal jugular and femoral lines should be placed under ultrasound guidance unless emergent line placement is required.
8. If a CVC is malfunctioning then a new one may be placed by exchange over a guidewire ONLY if there are no signs of bacteremia and/or infection
9. >3 needle sticks for access increases risk of insertion complications and consideration should be given to more experienced personnel insertion and/or new stick site
10. After successful insertion a chlorhexidine impregnated sponge should be placed around the catheter at the insertion site.
11. Position of CVC must be evaluated with a STAT chest x-ray. Correct CVC should have the tip near the SVC and right atrial junction. All CXR should be evaluated for evidence of pneumothorax.
12. If line is in satisfactory position the line needs to be cleared for use in SCM. Alert the nursing staff that the line is ok to use and that the order for clearance is in SCM.
13. A procedure note is to be performed on all CVC insertion attempts, successful or not. SCM has a procedure note dedicated to CVC insertion. This is the default and expected method of procedure note completion. A brief note in the chart should indicate the patient name, date and time with reference to the complete note in SCM.

**Maintenance**
1. The routine replacement of central lines does not prevent CRBSI and is not recommended in the absence of CRBSI
2. The CVC site should be inspected daily and PRN
3. Before manipulation of any CVC proper hand aspesis should be performed by washing with soap and water or alcohol scrub (even when gloves are worn)
4. Clean gloves should always be donned before CVC manipulation
5. If CVC lumen access is attempted via the injection ports or caps then asepsis should be applied to the ports/caps with 2% chlorhexidine gluconate or another appropriate antiseptic.

6. 2% chlorhexidine gluconate, iodine, iodophore or 70% ethanol (no organic solvents) should be used for all CVC dressing care and dressing changes. All antiseptic should be allowed to air dry before manipulation/dressing changes.

7. Use a sterile, transparent dressing over catheter site with clean gloves and a no-touch technique. If the site is not dry, then apply a sterile dry gauze and change dressing when it becomes saturated. Change to a transparent sterile dressing as soon as possible.

8. Sterile dressing should be replaced q7 days unless it becomes loose.

9. There is no indication for antimicrobial prophylaxis (systemic or local) with an indwelling CVC.

10. Avoid anticoagulants for clot or CRBSI infection unless certain patient conditions mandate their use.

11. Use sterile NaCl (heparin if indicated) to flush and lock to maintain patency.

12. The use of needle free connectors is encouraged to prevent needle stick injuries, and aseptic technique should always be followed.

**Catheter Related Infection and/or Complication Evaluation**

1. The occurrence of fever should not prompt CVC removal. It is expected that clinical judgment be applied. If patient demonstrates a strong suspicion of CRBSI then CVC removal is considered.

2. If CRBSI is suspected or confirmed, the CVC or introducer should be removed. The line should be cultured only if CRBSI is suspected.

3. The tip or intracutaneous segment only should be cultured.

4. If the patient demonstrates erythema or purulence at the catheter site, sepsis, + blood culture results the CVC should be removed.

5. If the CVC that was exchanged demonstrates quantitative cultures suggestive of CRBSI (>15 Colony Forming Units, CFUs) then the catheter should be removed and placed at a new site.

6. 2 sets of blood cultures, one from a peripheral stick, in all patients with suspected CRBSI

7. After removal of CVC in patients with CRBSI, a non-tunneled CVC may be placed at a new site after systemic antimicrobial therapy is begun.

8. If after removal of CVC there is persistence of bacteremia and/or fungemia, lack of clinical improvement (after 3 days of CVC removal and appropriate antimicrobial therapy) then the clinician should seek septic foci (i.e. endocarditis, septic thrombi, and metastatic infections).

9. All institutions should have monitoring systems for outcomes, infections and complication rates. They should also have systems in place if complications exceed the standard of care to identify and correct these occurrences.

10. Venous thrombosis, documented at insertion site, the CVC should be removed and placed a new site if CVC is still needed.

**Central venous, pulmonary artery, and peripheral venous lines placed outside the Intensive Care Unit**

All deep lines placed outside of the intensive care areas must be changed to a new sight within 24 hours of admission to the unit. Exceptions to this policy are as follows:

1. Lines placed under aseptic conditions in the operating room, on the floor, or in another ICU where sterility of the procedure can be documented.
2. All emergent lines, placed under non-sterile conditions, placed in the ED for emergency resuscitation must be removed within 24 hours of admission to the ICU without exception.

**Pulmonary Artery Catheter Important Notes**
1. PAC should not be left in for > 10 days due to the significant risk of CRBSI
2. If the PAC is removed, under no circumstance should the introducer sheath be left in place.
3. Guide wire PAC exchanges are only indicated for PAC malfunction only. If there are extenuating circumstances then chief, fellow or attending approval is needed.

**Insertion, maintenance, removal, and replacement of Arterial lines**

**Route of Insertion**
1. The percutaneous route of arterial line placement is preferred to surgical cutdown.
   a. Surgical cutdown for arterial cannulation should only be performed after approval by the critical care attending.

**Site of Insertion**
1. The preferred site of arterial cannulation is the radial artery. Alternate sites of arterial cannulation are for most patients listed in descending order preference.
   a. Femoral artery
   b. Dorsalis Pedis artery

*In patients with peripheral arterial disease, percutaneous femoral arterial cannulation has a much higher complication rate and should be avoided. Dorsalis Pedis cannulation may lead to inaccurate blood pressure measurements. Caution must be exercised in choosing the site of arterial cannulation in this group of patients.

2. The complications associated with brachial artery and axillary artery cannulation are higher than other routes.
   a. Brachial artery: Used uncommonly because of the high complication rates. The major complication is thromboembolic occlusion usually without ischemia.
   b. Axillary artery: Limb threatening ischemia negligible. However, catheter infection rate is much higher than other sites and line care is difficult.

**Insertion Procedure**
1. The site chosen for arterial cannulation should be prepped and draped to create a sterile field.
2. Sterile gloves and mask should be worn during insertion of the line.
3. The line should be sutured in place using aseptic technique.
4. At the completion of the procedure, a chlorhexidine impregnated sponge is applied to the insertion site and covered with a sterile MVP (Tegaderm © or OP-Site ©) dressing.

**Line Changes**
1. The infection rate in percutaneously placed arterial cannulas are very low. Routine catheter removal and change to a new site is unnecessary. Arterial cannulas can remain at the original site of insertion until no longer needed.
   *Exception:* Catheters should be changed to a new site when:
   a. There is evidence of infection at the insertion site manifested as pain, redness, swelling, or purulence. Catheters should always be cultured in this situation.
b. There is evidence of ischemia distal to the site of insertion.
c. The catheter is implicated as a potential source of unexplained systemic sepsis.

2. The decision to change the arterial line to a new site or to culture the catheter tip is left to the discretion of the treating physician. It is recommended that catheter tips be submitted for culture when there is evidence of infection at the site of insertion or when the patient exhibits unexplained sepsis.

Reference

University of Kentucky Hospital
Trauma Intensive Care Unit
Hypnosedative/Alcohol Withdrawal Prophylaxis

Introduction:

Alcohol abuse and/or addiction are frequent problems in the trauma patient population. Acute alcohol withdrawal increases mortality and morbidity for the critically ill and/or injured patient. It is essential that physicians and nurses obtain a thorough history to ascertain if the patient has a history of alcohol abuse or dependency.

Symptoms of alcohol withdrawal begin 6 - 12 hours after cessation of alcohol and can be difficult to differentiate from injury/illness related symptoms. Tremor, nausea, vomiting, tachycardia, hypertension, diaphoresis, irritability and profound anxiety are frequently seen. Seizures are the most life threatening symptom of alcohol withdrawal. Seizures cause additional stress on body reserves which will further compromise the critically ill patient. Delirium tremens is classified as the “late” phase or major withdrawal.

Patients will often have a combined alcohol and hypnosedative abuse which requires a different treatment approach to prevent withdrawal symptoms.

The goal of medical management is to recognize symptomatology of hypnosedative/alcohol withdrawal and prevent progression into delirium tremens for patients at high risk. Early pharmacological intervention is designed to prevent and/or mitigate withdrawal symptoms thereby minimizing risk to the critically ill patient.

Criteria for Implementing Alcohol Protocol:

1. Alcohol level > 200 with GCS of 15
2. Alcohol level > 200 with prior history of Delirium Tremens and/or prior enrollment in a detoxification program
3. History of Delirium Tremens or Detoxification program with clinical manifestations of withdrawal

Criteria for Implementing Alcohol/Hypnosedative Protocol:

1. Above Criteria plus
2. History of daily use of benzodiazepines or barbiturates or
3. Positive drug screen with history of daily use.
4. Enter Chemical Dependency Consult.

Nursing Care Guidelines

Signs and Symptoms of Withdrawal: agitation, anxiety, tremors, nausea, vomiting, hypertension, tachycardia, diaphoresis
[Differentiation from behaviors associated with closed head injuries, and agitation/anxiety related to uncontrolled pain is essential]
1. Monitor vital signs q 1 hour x 24 hours
2. Monitor agitation/sedation level q 1 hour x 72 hours then q 4 hours and PRN

A. **Diazepam Load and PRN Diazepam**
   Use PRN diazepam **only** if patient is having tremors

   Use lower dose of haloperidol and diazepam for non-intubated patients

   Assess and record the following vital signs parameters prior to each dose:
   - Heart Rate
   - MAP
   - Respiratory Rate
   - SpO₂
   - Level of sedation

   Hold next dose and/or notify physician if :
   - Heart rate < 60 [if a change from baseline]
   - Respiratory rate < 16
   - MAP < 60
   - Sedation level > 4
   - SpO₂ < 92%

B. **Carbamazepine:**
Carbamazepine level prior to starting maintenance dose if patient is having signs and symptoms of withdrawal  **Goal is to have level > 12.**
Assess and record the following vital sign parameters prior to each dose:
   - Heart Rate
   - MAP
   - Respiratory Rate
   - SpO₂
   - Level of sedation

   Hold next dose and/or notify physician if:  Heart rate < 60 [if a change from baseline]
   - Respiratory rate < 16
   - MAP < 60
   - Sedation level > 4
   - SpO₂ < 92
C. **Haloperidol:**

1. Administer 10 mg IV over 1 - 2 minutes [administer over 5 minutes if SBP< 100]
2. Not to exceed 240 mg/24 hours.
3. Monitor for extrapyramidal symptoms and notify physician if symptoms observed.
4. Prolonged QT interval & incidence of Torsades des pointes is rare.
5. Monitor for signs and symptoms of rigidity, consult physical therapy if present

<table>
<thead>
<tr>
<th>Sedation Status:</th>
<th>Anxiety Scale:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tremors</td>
<td></td>
</tr>
<tr>
<td>1 - Wide Awake</td>
<td>1 - No Anxiety</td>
</tr>
<tr>
<td>Non Existent</td>
<td>2 - Mild Anxiety</td>
</tr>
<tr>
<td>Moderate</td>
<td>3 - Anxiety</td>
</tr>
<tr>
<td>3 - Dozing Intermittently</td>
<td>2 -</td>
</tr>
<tr>
<td>Profound</td>
<td>4 - Severe Anxiety</td>
</tr>
<tr>
<td>4 - Mostly Sleeping</td>
<td>5 - Extreme anxiety</td>
</tr>
<tr>
<td>5 - Only Awakens When Aroused</td>
<td></td>
</tr>
</tbody>
</table>

**References:**


Fraser GL, Riker RR. Controlling severe agitation in the critically ill with intravenous haloperidol. Hospital Pharmacy. 1994; 29(7): 689-691.

Use of Neuraxial Pain Control Methods
For Trauma and Acute Care Surgery

Julie McWhorter, MD, Department of Anesthesia and
Jeffrey Coughenour, MD, Department of Surgery,
Section of Trauma and Critical Care

- The use of Anti-Xa levels is not predictive of the risk of bleeding.
- Antiplatelet or oral anticoagulant medications used in combination with LMWH may increase the risk of spinal hematoma.
- Patients who present with chronic use of Coumadin should be off therapy for 4-5 days prior to neuraxial procedures. An INR should be checked and should be <1.5. If therapy is reinstituted with an indwelling epidural catheter, INR should be monitored closely. The catheter can be removed at any time assuming the INR is <1.5. The site should be monitored for 24 hours after removal for complications.
- NSAIDs pose no significant added risk of bleeding or spinal hematoma after neuraxial procedures.
- GP IIb/IIIa antagonists (Ticlid, Plavix) should be discontinued for 14 days (Ticlid) and 10 days (Plavix) respectively prior to procedures. Administration of platelets may be of assistance in urgent situations, but no clear risk stratification has been established.
- Patients taking herbal medications pose no increased risk from neuraxial procedures, unless they are taken in conjunction with other conventional anticoagulants.
- No specific consensus statement exists regarding risk and the use of direct thrombin inhibitors and fondaparinux.
- Spines should be evaluated and cleared. Method of evaluation and a negative tertiary exam should be documented by the Trauma, NS, or Ortho spine service.
- Prophylactic Lovenox should be held at least 12 hours prior to epidural placement.
- Epidural catheters may be placed in intubated patients. Some attending anesthesiologists are less comfortable with this as the ability to determine development of a neurologic deficit is difficult. Therefore placement may be on a case-by-case basis.
- Literature clearly supports placement of epidural catheters for pain control and improvement of pulmonary mechanics in the setting of rib fractures.
- Pre-operative placement of epidurals for thoracic operations and many abdominal operations is associated with lower incidence of DVT, quicker return of bowel function, improved pulmonary toilet, improved pain scores and increased ambulation postop. Contrary to popular belief, Foley catheters are unusually required for thoracic epidurals.
### Minimum time from last dose to catheter placement/spinal injection

<table>
<thead>
<tr>
<th>Anticoagulants</th>
<th>Minimum time from last dose to catheter removal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard Anticoagulants</strong></td>
<td></td>
</tr>
<tr>
<td>Warfarin INR &lt; 1.5</td>
<td>Avoid use while catheter in place</td>
</tr>
<tr>
<td>Heparin, full dose IV/SQ INR &lt; 1.5</td>
<td></td>
</tr>
<tr>
<td>Heparin prophylaxis (BID, TID)</td>
<td>No restrictions</td>
</tr>
<tr>
<td><strong>Newer Anticoagulants</strong></td>
<td></td>
</tr>
<tr>
<td>Xigris (Drotrecogin Alfa) 24 hours</td>
<td></td>
</tr>
<tr>
<td>Arixtra (Fondaparinux) 24-48 hours</td>
<td>Avoid use while catheter in place</td>
</tr>
<tr>
<td>Lovenox (1 mg/kg BID) 24 hours</td>
<td></td>
</tr>
<tr>
<td>Lovenox (30 mg SQ BID) 10-12 hours</td>
<td></td>
</tr>
<tr>
<td>Lovenox (40 mg SQ QD) 10-12 hours</td>
<td>10-12 hours</td>
</tr>
<tr>
<td><strong>Direct Thrombin Inhibitors</strong></td>
<td></td>
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<tr>
<td>Argatroban aPTT &lt; 40</td>
<td>Avoid use while catheter in place</td>
</tr>
<tr>
<td>Lepirudin aPTT &lt; 40</td>
<td></td>
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<tr>
<td><strong>Antiplatelet Agents</strong></td>
<td></td>
</tr>
<tr>
<td>ASA/NSAIDs</td>
<td>No restrictions</td>
</tr>
<tr>
<td>Plavix 7 days</td>
<td>Avoid use while catheter in place</td>
</tr>
<tr>
<td>Ticlid 14 days</td>
<td></td>
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<tr>
<td><strong>Thrombolytic Agents</strong></td>
<td></td>
</tr>
<tr>
<td>TPA (full dose for stroke, MI, etc.)</td>
<td>10 days Avoid use while catheter in place</td>
</tr>
<tr>
<td>TPA (2 mg for catheter clearance)</td>
<td>No restrictions</td>
</tr>
</tbody>
</table>

### References:

- University of Washington Medical Center, Nursing Epidural Policy and Procedure  

05/08
Pain Management Protocol for Hospitalized Patients

**General Principles**

1. Use oral medications whenever possible, including day of admission if appropriate.
3. Use ibuprofen for appropriate patients, up to 2400mg/day in adults (may be contra-indicated in some orthopedic patients).
4. Discontinue IV opiates at least 24 hours before to discharge.
5. If opiate-dependent at baseline, patients should take usual home opiate regimen plus a taper in form of plain oxycodone.
6. Roxicet elixir is dosed same as Percocet (5mg/325mg per 5cc).

```
Can patient tolerate PO?    
<table>
<thead>
<tr>
<th>No</th>
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<tr>
<td>Yes</td>
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</table>
    
Intermittent IV Morphine vs IV PCA
Consider Epidural for Postop or Chest Wall Trauma
Consider Toradol IV

Percocet 5mg 1-2 POq4hr PRN
Unless Allergy
Consider Toradol IV

Adequate pain control? 
<table>
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<tr>
<th>No</th>
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<tr>
<td>Yes</td>
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</table>

Transition to Orals At Least 24hrs Prior to Discharge, Consider scheduled opiate.

Add oxycodone 5mg or 10mg po q4hr scheduled in addition to Percocet 5mg 1-2 q 4 PRN

Discharge with pre-printed prescriptions.

If inadequate after 8hours, reassess patient at bedside.

Double scheduled oxycodone if appropriate.

Repeat this decrease daily if applicable.

During hospital course, if patient is requiring less than 2 Percocet q4hr, stop or halve scheduled oxycodone.
```
UK Trauma Service
Rehabilitation Management Protocol
(Needs to be initiated within 3 days)
10/08

Does the patient have?

1. Spinal Cord injury
2. Head injury EMV ≤ 13 on admission
3. Stroke
4. Multiple Trauma involving ≥ 2 extremities
5. Extremity Amputation
6. Total Hip or Knee Injury

Then Consult Rehab Medicine on admission to unit.

YES

NO

Then, evaluate rehab needs and consult appropriate services.

PT
1. Gait Training
2. Assistive device training
3. Bed to chair transfer training
4. Lower extremity:
   a. Splinting
   b. Brace application
   c. Blachard boots
   d. CPM's
   e. Amputations
5. Endurance strengthening for severely deconditioned patients
6. Burns > 5% TBSA or burns crossing a joint

OT
1. Specified ADL training with adaptive equipment
2. Cognitive evaluation for Moderate Head Injury pts
3. Speech Therapy
4. Upper Extremity
   a. Splinting
   b. Brace Application
   c. Nerve damage
   d. Amputations
5. Dysphagia evaluation
6. Fine Motor Coordination deficits
7. Perceptual deficits: motor and visual
8. Sensory Re-education

NSG
1. Simple ambulation with assistance of one
2. Basic ADL training
3. Up to chair transfers
4. Simple AROM instruction
5. PRGM
6. Management splinting schedule
7. Encourage patient to perform instructed exercises
SECTION 6: DISCHARGE INSTRUCTIONS

Blue Surgery Discharge Follow-up Protocol

Did the patient have surgery by Blue service?

No

Was that surgery for their only injury?
1. Spleenectomy
2. Non-therapeutic laparotomy
3. Diagnostic laparoscopy
4. Uncomplicated bowel resection/repair
5. Minor laceration repair without open wounds

Yes

Open wound?

No

Arrange sub-specialty follow-up (if needed)
Give good instructions & contact number for Blue service
No Blue follow-up

Blue Clinic

No

Arrange Clinic date follow up as appropriate

Tuesday
1. 2-2 weeks if subcuticular closure
2. 7-14 days if non-absorbable closure
3. Discharging attending is attending at the week BUT
4. Attending that staffed the operation may want a specific follow-up date
Discharge Instructions

D/C Home:

Please be thinking ahead of time on patient’s D/C home plans. Please inform the bedside RN of D/C plans so home care instructions can be completed. If the pt. needs home health or home equipment, please contact patient care facilitator assigned to Blue Surgery for this before the day of D/C. The Care Facilitator will contact you if they need written prescriptions for any of the Home Health/DME orders. On the weekends, the weekend social worker can set up Home Health; the patients do not need to be kept over the weekend for home health needs only.

Next, complete the following:

1. Complete the UK Discharge Orders form (H341) fully
2. Controlled substance prescriptions must be written on a separate (green) prescription pad. Record type and amount of any controlled substance prescription on the white medical record copy, of form H341, in order to have documentation of all meds given to pt. at D/C.
3. Make sure the need for all f/u appointments have been documented on form H341 (may need to call consulting services to find out if /when they need to see pt. back)
4. Write “D/C to home” order in routine MD orders
5. Complete an automated D/C summary*

   *For patient’s who live out-of-state, you will need to do a STAT D/C summary to send with the patient in case they can find a local MD to provide their follow-up care.

Inter-Facility Transfers:

Such as to: Acute Rehab, Subacute Rehab, ECF, or Hospital to Hospital

The Social Worker for our service can assist you with inter-facility transfers. If you suspect the pt. will need some type of placement, contact the S.W. on pager number found on Blue Surgery Census. Inform the pt./family that they may have some rehabilitation needs and that our S.W. will come by to talk with them. Please never tell a pt./family we will send them to a specific place (such as Cardinal Hill). Many factors need to be looked at before a pt. can go to a facility and not all pts. are candidates for CHH.

Once a facility has accepted the pt. please complete the following:

1. Complete a STAT D/C summary. This will have to go with the pt. It takes several hours to get this done so please plan accordingly.
2. Complete the UK Discharge Orders Form (H341). This form still needs to be completed except for the prescriptions, since the list of meds are in the D/C summary. Please make sure you write for all needed F/U appointments on the form so the clerk can schedule these before the pt. is transferred.
3. There is an Inter-Facility Form (J076) that has to be completed prior to transfer. This form has 2 pages. You are responsible for completing the M.D. section on page 1 and the Risk & Benefit section on page 2

4. Write an order “Transfer to _______” in routine M.D. Orders

Subject: Physician responsibility in completion of Inter-Facility Transfer Form (J076) that must be completed by the physician prior to transfer of patient to another facility that will assume care of the patient.

**Patient Condition** (page 1, gray section)

Includes:
- Diagnosis/initial impressions
- Current condition/observations
- Treatment rendered
- Current medications
- ATTENDING PHYSICIAN SIGNATURE AND DATE

**Transfer Information** (last section of page 1)

The physician completing the Inter-Facility transfer form MUST WRITE THE NAME OF THE RECEIVING PHYSICIAN on the appropriate line.

**Authorization of Transfer** (page 2, gray section)

Includes:
- Risks of transfer
- Benefits of transfer
- Condition of patient at time of transfer
- Attending physician’s signature and date

NOTE: “See H & P” cannot substitute completion of the form by a physician.
Discharge Pain Medication Algorithm
Outpatient Surgery, Including Laparoscopy-8 Day Taper

Lortab 5/500mg or Percocet 5/325mg
1 PO q4hr PRN x 2 days then
1 PO QID PRN x 2 days then
1 PO TID PRN x 2 days then
1 PO BID PRN x 2 days and stop
Disp #30
Tylenol and/or Motrin thereafter unless contraindicated

Long-Bone & Pelvic Fractures and Ribs-20 Day Taper (until ortho follow-up)
Percocet 5/325mg
1-2 PO q4hr PRN x 5 days then
1-2 PO QID PRN x 5 days then
1-2 PO TID PRN x 5 days then
1-2 PO BID PRN x 5 days and stop
Disp #150
Tylenol or Motrin thereafter unless contraindicated

Soft-Tissue Trauma, Laparotomy & Non-Long Bone Fractures-16 Day Taper
Percocet 5/325mg
1-2 PO q4hr PRN x 4 days then
1-2 PO QID PRN x 4 days then
1-2 PO TID PRN x 4 days then
1-2 PO BID PRN x 4 days and stop
Disp #100
Tylenol or Motrin thereafter unless contraindicated

Lortab is available as 5/500mg. Therefore, tapers with Lortab must not exceed 2 tabs q6hr so that total Tylenol dosage does not exceed 4g/day.

Instruct the patient that they may take ibuprofen 600mg QID with Percocet or Lortab but that Tylenol/acetaminophen should not be taken with Percocet/Lortab. Discharge Pain Medication Protocol
Discharge Pain Medication Protocol

Stop IV opioids at least 1 day prior to discharge.

Laparoscopic Surgery

Open Surgery, Ortho or other

Determine pain medication requirement at time of discharge (from MAR, nurse or patient):
1. Prescribe that amount for 2 days
2. Taper by 25% every 2 days
3. Stop after 8 days total
4. Use pre-printed pads when ever possible
5. Motrin or TYLENOL thereafter

Determine pain medication requirement at time of discharge (from MAR, nurse or patient):
1. Prescribe that amount for 4 days
2. Taper by 25% every 4-5 days
3. Stop after 16-20 days total
4. Use pre-printed pads when ever possible
5. Motrin or TYLENOL thereafter

If isolated subspecialty (Ortho, Neuro or Face) with no Blue follow-up, advise patient to call subspecialty surgeon if further pain medication required.
SECTION 7: WITHDRAWAL OF CARE/POTENTIAL ORGAN DONATION

UNIVERSITY OF KENTUCKY HOSPITAL  POLICY NUMBER: HP06-19
CHANDLER MEDICAL CENTER  FIRST ISSUED: 2/85
HOSPITAL POLICY  CURRENT AS OF: 10/07

SUBJECT: Diagnosis of Death
SEE ALSO: Hospital policy HP06-27, Organ and Tissue Procurement for Transplantation

INFORMATION
In order to ensure appropriate patient care and abide by KRS 446.400 as it defines and applies to a patient's death, staff physicians of the University of Kentucky Hospital should follow these established guidelines in determining death.

Ordinary Circumstances
In ordinary circumstances, the signs of death are:
1. Unresponsiveness,
2. Absence of pulse and heartbeat,
3. Absence of spontaneous respiratory movement and all other movement, and
4. Absence of reflexes.

Cerebral Death
Cerebral death is defined as the absence of cortical and brain stem function. Certification of signs of cerebral death shall be attested to and documented by a member of the active medical staff.

Diagnostic Clinical Criteria of Cerebral Death
Currently acceptable clinical criteria for determination of cerebral death in the presence of cardiac activity and relatively normal blood pressure, whether or not artificial means are used to maintain the circulation of oxygenated blood, include:

1. Absence of hypothermia (body temperature 32°C), neuromuscular blockade, shock, significant levels of sedative and central nervous system depressants in the patient's serum (e.g., Phenobarbital, benzodiazepines), and severe metabolic disturbance (e.g., hyperosmolar coma, hepatic encephalopathy).
2. Cerebral unconsciousness and motor unresponsiveness to stimuli which are normally intensely painful. True decerebrate or decorticate posturing or seizures are inconsistent with the diagnosis of cerebral death.
3. Absence of spontaneous movements for an observation period of at least one hour, except for spinal reflex activity.
4. Absence of reflexes which involve cranial nerves. The pupils must be fixed at midpoint or larger in diameter and nonreactive to sharp changes in the intensity of incipient light. No ocular responses or eye movements to head turning or irrigation of ear with ice water.
5. Absence of corneal reflexes.
6. No gag, cough, or retching reflex in response to bronchial stimulation with suction catheter.
7. No respiratory movements when the patient is disconnected from the mechanical ventilator. Adequate testing for apnea is very important. An accepted method is ventilation with pure oxygen for a 10-minute period before withdrawal of the ventilator, followed by passive flow oxygen. A 10-minute period of apnea is sufficient to attain hypercarbia (60 Torr or greater) which adequately stimulates a respiratory effort. Testing or arterial blood gases can be used to confirm this level. Any spontaneous breathing efforts indicates that part of the brainstem is functioning and that the patient is not brain dead.

In the absence of confirmatory tests, the seven conditions described above must persist unchanged for at least six (6) hours. A confirmatory test may shorten the observation period.

**Confirmatory Testing for Determination of Cerebral Death**

An additional confirmatory test is recommended for determination of cerebral death a) when the preceding reflexes cannot be adequately assessed and documented or b) in children under the age of five.

Currently acceptable confirmatory tests performed under a staff physician with appropriate privileges include:

1. Angiography, which reveals absence of cerebral circulation.
2. Cerebral nuclear scan, which demonstrates absence of cerebral circulation.
3. Transcranial doppler study, which demonstrates absence of cerebral circulation.

Angiography, cerebral nuclear scan, or a transcranial doppler study which demonstrates the absence of cerebral circulation is a definitive test of cerebral death. A waiting period is not required.

4. An EEG, which demonstrates isoelectric activity, provided that severe hypothermia, neuromuscular blockade, shock, significant levels of sedative or central nervous system depressants, or severe metabolic disturbance are absent. A waiting period is recommended when EEG is used a confirmatory test (See Special Circumstances below).

**Special Circumstances**

- In cases of anoxic brain death, with demonstrated electrocerebral (EEG) silence but without radiologic, nuclear scan, or doppler demonstration of absence of cerebral circulation, a six-hour period of observation and repeat examination, excluding apnea testing, is required.
- In cases of children under the age of one year, where absence of cerebral circulation has not been demonstrated, a 72-hour period of observation and demonstrated isoelectric activity on EEG at the end of the observation period is required.
- In cases of children age one through five, where absence of cerebral circulation has not be demonstrated, a 24-hour period of observation and demonstrated isoelectric activity on EEG at the end of the observation period is required.
- In cases of gross anatomical brain injury, the period of observation for the persistence of clinical criteria for cerebral death may be reduced to one hour. Gross anatomical brain damage may be appropriately assessed by physical examination or craniotomy or by cranial MRI or CT studies, interpreted by a staff
radiologist, that indicate that the brain is irreparably damaged, extruded, divided, or destroyed.

Pronouncing Death

In all cases, the patient’s physician will arrive within one hour to pronounce a patient dead. Notification of death must be provided to Admitting within one hour of pronouncement of death.

Pronouncing Death in Cases in Which Artificial Ventilation is Employed

In cases in which artificial ventilation is employed, the fact of death and the presumptive cause of death should be determined by scientific evidence which, in the opinion of the physicians making the determination, is current, acceptable, and adequate to demonstrate irreversible cessation of cerebral and brain stem function.

The pronouncement of death in these cases will be made on the basis of the foregoing criteria by no fewer than two active medical staff physicians, one of whom may include the attending physician interpreting the confirmatory test. The time of death will be determined by the physicians who attend the patient death or, if none, by the physicians who certify the death. When possible, the surrogate or legally responsible family member(s) will be informed before cessation of artificial ventilation.

Organ Donation

In the case of potential organ donors:
• All criteria of HP06-27, Organ and Tissue Procurement for Transplantation, must be met.
• Legally responsible family member or designated health care surrogate must provide witnessed informed consent for specific donation.

The two physicians determining death must not be involved in determining the suitability of the donor and must not be members of the surgical team performing the transplant.

Approved by Richard Lofgren, M.D., Chief Medical Officer
Authorized by Joseph O. Claypool, FACHE, Hospital Director
INFORMATION and INSTRUCTIONS
Conditions That Require Notification of Coroner

"Coroner's case" means a case in which the coroner has reasonable cause for believing that the death of a human being within their county was not natural (homicide, suicide, accident, under suspicious circumstances) or poses a threat to the public health. According to KRS 72.020 and KRS 72.025, the attending physician, designee, or any person finding or having possession of the body of any deceased person must notify the coroner whenever the death:

- Appears to be caused by homicide or violence.
- Appears to be the result of suicide.
- Appears to be caused by drugs or poisons in the body.
- Appears to result from a motor vehicle accident in which the operator of the motor vehicle left the scene of the accident or in which the body was found in or near a roadway or railroad.
- Occurs during a motor vehicle accident and an external examination of the body reveals no lethal traumatic injury.
- Occurs while the person is in a state mental institution or hospital and there is not previous medical history to explain the death.
- Occurs while the person is in a penal institution or otherwise in police custody, except pursuant to a death sentence.
- Appears to be caused by fire or explosion.
- Appears to be caused by physical abuse, including when the death of a child appears to indicate child abuse prior to the death.
- Appears to be caused by drowning.
- Occurs as a result of an accident.
- Appears to be caused by sudden infant death syndrome.
- Occurs at the work site when industrial toxics may have contributed to the cause of death or when there is no apparent cause of death.
- is sudden and unexplained.
- Human skeletal remains are found.
- A person under the age of 40 dies and there is no medical history to explain the death.
- The body is to be cremated and there is no medical history to explain the death.
- The decedent is not under the care of a licensed physician and there is no medical history to explain the death.
- When post-mortem decomposition of a human corpse exists to the extent that external examination of the corpse cannot rule out injury or where the circumstances of death cannot rule out the commission of a crime.
- When the manner of death appears to be other than natural.
In recognition of an Attorney General's Opinion (OAG 62-964), University of Kentucky Hospital also requires that:

- Deaths that occur in the operating room or PACU in which the operation was necessitated by violence -- accidental or otherwise -- be reported to the coroner.

2 -- HP05-25, Notification of Coroner and Release of Medical Information/Specimens Instructions for Notifying the Coroner

The law places responsibility for reporting to the coroner the types of death listed above with the attending physician. As a result, University of Kentucky Hospital requires that:

1. The attending physician will
   A. determine whether each death is a coroner's case,
   B. notify the coroner and document the notification in the appropriate section of the Notification of Death form, if death is determined to be a coroner's case,
   C. complete and sign the Notification of Death form and submit it to Admitting within one hour of time of death.

2. The admitting clerk will verify that the coroner has been contacted when the Admitting Department receives the Notification of Death certificate on a coroner's case. (The Capacity Command Center fulfills the role of Admitting when Admitting is closed.)

Note: If "coroner's case" is checked in the Notification of Death section and the Coroner/Medical Examiner Section has not been completed and signed, the admitting clerk will contact the coroner immediately. The coroner should be called in any case in which doubt exists as to whether the death represents a "coroner's case."

Releasing Information and Specimens to the Coroner

In accordance with KRS 72.415, University of Kentucky Hospital does not require written permission to release medical information, specimens, objects, clothing, or other evidence concerning a coroner's case to the coroner. When patient information is copied from the medical record, however, Medical Records or other Hospital personnel who prepare the information or pull the files, specimens, objects, clothing, or other evidence must document coroner receipt on form J100, Record of Possession of Medico-Legal Specimens, and file the form in the administration section of the patient's permanent medical record.

- During regular business hours, the coroner should contact Medical Records to request medical information or other requested items needed for a coroner's investigation.
- After regular business hours, the coroner should contact the Emergency Department or Admitting to obtain medical information needed for a coroner's investigation.
- The coroner should contact Clinical Lab's Special Chemistry department to obtain specimens needed for investigations (24 hours a day).

The staff member who releases medical information, specimens, objects, clothing, or other evidence to the coroner will document the release.

Disclosures of protected health information are included in HP05-37, Accounting and Tracking Disclosures of Protected Health Information per HIPAA.
SUBJECT: Donation after Cardiac Death
SEE ALSO: KRS 311.241, KRS 311.992; Hospital policies HP06-17, Withholding/Withdrawing Potentially Life-Sustaining Treatment; HP06-19, Diagnosis of Death; HP06-21, Donation of Body Parts; HP06-27, Organ and Tissue Procurement for Transplantation; HP06-33, Advance Directives; HP07-03, Patient Payment and Financial Allowance; HP08-10, Management of Pain

INFORMATION The purpose of this policy is to outline the steps needed to enable patients or their surrogates who have elected to withdraw life support to be able to donate organs after death is declared on the basis of cardio-pulmonary criteria. This policy pertains to patients where the attending physician, patient, or their surrogates have already decided to withdraw life-sustaining support. Organ donation after cardiac death (DCD) refers to organ donation from a deceased donor who has been declared dead on the basis of traditional cardio-pulmonary criteria (permanent cessation of circulatory and respiratory function), rather than on neurological "brain death" criteria (permanent cessation of whole brain function).

SUITSABLE CANDIDATE SELECTION

A patient who has a non-recoverable and irreversible neurological injury resulting in ventilator dependency but not fulfilling brain death criteria may be a suitable candidate for DCD.

Other conditions that may lead to consideration of DCD eligibility include end stage musculoskeletal disease, pulmonary disease, and high spinal cord injury.

The decision to withdraw life sustaining measure must be made by the Hospital's patient care team and legal next of kin, and documented in the patient chart.

The assessment for DCD candidate suitability should be conducted in collaboration with KODA and the patient's primary health care team. KODA determination of donor suitability may include consultation from a KODA medical director.

Assessment should be made as to a whether death is likely to occur (after the withdrawal of life-sustaining measures) within a time frame that allows for organ donation.

DEFINITIONS
Brain Death: The irreversible cessation of all brain functions, including brain stem function. Donation from this group of patients is detailed in the Hospital organ donation policy (HP06-27)
**Cardiac Death:** The complete and irreversible cessation of cardiac and respiratory function. The diagnosis of death by traditional cardiopulmonary criteria requires confirmation of correct EKG lead placement and absent pulse via an arterial catheter. The patient must be pulseless, apneic, and unresponsive with five minutes of ventricular fibrillation or five minutes of electrical asystole (no complexes, agonal baseline drift only) or five minutes of electromechanical dissociation.

**Irreversibility:** It is the persistent cessation of function during a 5 minute period of observation meeting the definition of cardiac death. DCD donor death occurs when respiration and circulation have ceased and cardiopulmonary function will not resume spontaneously.

**INSTRUCTIONS**

**Eligibility for Donation after Cardiac Death**

As a patient is being evaluated for withdrawal of life sustaining therapy, the Kentucky Organ Donor Affiliates (KODA) must be notified at 278-3492 or 1-800-525-3456.

After withdrawal of life sustaining therapy has been approved and documented in the chart by nursing, an assessment will be made by KODA to determine suitability for organ donation before addressing donation with the patient’s next of kin. If the patient’s family raises the subject of donation, they should be informed that KODA will be contacted immediately and the family’s interest expressed to the KODA representative, or if already on site, guided to the KODA representative. Only a designated requestor can approach the family regarding consent for organ donation in DCD cases.

If the patient is not already a DNR, the patient should be made so by their attending physician, as per UK Hospital policy HP07-03, Patient Payment and Financial Allowance.

Consultation of another critical care attending physician to assist with ICU support through the DCD process is appropriate. Transfer of the patient to another attending/service specifically for the DCD process is acceptable but not essential.

**KODA Suitability Approval**

A request for the withdrawal of life sustaining therapy is made in accordance with the patient’s previously expressed wishes or upon initiation by next of kin. The guideline set forth in UK Hospital policy HP06-17, Withholding/Withdrawing Potentially Life-Saving Treatment, should be followed. A decision to withdraw treatment must be made entirely independent of any consideration of organ donation. However, KODA should be contacted on all withdrawal of care cases.

If the patient is initially found suitable for organ donation after cardiac death, and likely to die soon after removal of life sustaining therapy, a KODA coordinator, in collaboration with medical staff, will approach the family to discuss the possibility of organ donation.

If the next of kin or authorized party wishes to pursue DCD, the KODA coordinator will, if clinically indicated, request permission from the patient's physician for the physician to evaluate the patient for likelihood of cardiac arrest within an hour after extubation.

If the physician consents to this evaluation, the patient is disconnected from the ventilator by a physician for a period of up to ten minutes to record vital signs and
respiratory parameters. If, during the evaluation, the patient becomes unstable, the patient will be replaced on the ventilator. This suggests a likelihood of expiration shortly after extubation and DCD should be pursued.

If the patient does not meet criteria for probable cardio-pulmonary death within one hour, no further evaluation will take place, and the coordinator will explain to the family the reason why organ donation cannot take place. As these criteria are not absolute, however, it may be reasonable to proceed at the family's request and with the physician's consent.

**Consent**

Permission for organ donation is granted in the State of Kentucky according to the following order:

- **Authorized Donor Designation.** This is listed in Section I, KRS 311.175, which allows a signed donor card or the first person consent. Section II includes those that follow:
  - Legal spouse
  - Mentally competent adult child age 18 or over.
  - Parent(s)
  - Mentally competent adult sibling age 18 or over
  - Legal Guardian of the decedent
  - Person responsible for disposing of the body

Elements of consent must include an overview of the DCD process with ample opportunity for the family to ask questions and to demonstrate understanding. The discussion will include the need for additional testing to determine suitability; the possibility that donation will not take place if cardiopulmonary death does not occur within one hour following removal of life support; and that in such a case the patient will return from the OR to their ICU bed and team or an appropriate floor bed, where comfort care will continue. The patient’s ICU bed will be held until declaration of death has been made or an appropriate floor bed has been designated. The family will also be informed that if they accompany the patient to the OR, they will be asked to leave promptly after the patient dies.

The legal next of kin may elect to consent to procedures or drug administration for the purposes of organ donation (e.g., heparin, regitine, femoral line placement, ECMO, and bronchoscopy). No donor-related medications will be administered or donation-related procedures performed without specific written consent.

Once all questions have been answered, the person authorized to give consent will sign the consent form (KODA Authorization for Removal of Anatomical Gifts consent form) for organ and tissue donation after cardiac death. Documentation of two witnesses of family/next of kin's consent is required. A copy of the signed consent form will be added to the patient’s medical record. At this time, consent will also be obtained for administration of heparin, et al to maintain organ viability.

The family will be provided appropriate emotional and spiritual support. The KODA coordinator, social worker and nurse will play important roles at this critical time. Pastoral Care services will be offered and available for additional services.

Withdrawal of life support shall take place in the operating room only, and organs shall not be retrieved in the ICU for controlled DCD donation. The family will be given the
option of saying goodbye to their loved one in the ICU. If they wish, however, members of the immediate family may accompany the patient to the OR and be present until the patient expires or until an hour has passed without cardio-pulmonary arrest. (A space must be defined in the OR for families accompanying these patients.) Families must be informed that they must leave the OR immediately after death is declared. The KODA family support liaison or pastoral care will accompany the family to the Hospital chapel.

The Kentucky Organ Donor Affiliates will be responsible and billed for all costs related to the evaluation of medical suitability and recovery of organs and tissue for transplantation. No donation-related charges will be passed to the donor family. Should the patient not reach a determination of death in one hour, the patient will be returned to the patient care area for further comfort measures and family support. Upon return to ICU or floor responsibility for care reverts back to the patient's physician of record (if care had been transferred as part of DCD) and financial charges revert back to the Hospital and responsible pre-DCD payors.

Transfer to the OR and Withdrawal of Life-Sustaining Therapy
The critical care attending has sole responsibility for determining whether and when the patient will be extubated, sedated, and/or given any ancillary procedures in the life support withdrawal process. The comfort and dignity of the patient will be maximized during the withdrawal process as it is in every patient death. All members of the DCD care team must ensure that the highest level of palliative care is provided to the patient at all times during this process. No member of the transplant team shall be present for the withdrawal of life sustaining measures. No member of the organ recovery team or OPO staff may participate in the guidance or administration of palliative care, or declaration of death.

The KODA coordinator will arrange the time of the organ recovery based on the family's wishes, and the availability of the OR and donor surgery team. The OR nursing director/coordinator will be notified as soon as the decision to carry out DCD is made. The anesthesia attending on call will be notified by the patient's critical care attending physician or designee prior to transfer of the patient to the OR and, will be fully briefed concerning the details of the case and the plans for DCD.

The patient will be transferred to the OR and may be accompanied by the ICU nurse who has been managing the patient. A floor bed should be pre-arranged and held or the patient's ICU bed should be held during this time period in case the need arises to return the patient to a bed because death does not occur within the hour window. If the patient has a cardiac arrest prior to transfer to the OR, no resuscitation will be carried out in deference to the patient's DNR status. Organ recovery may still be possible if circumstances allow.

The patient will be prepped and draped prior to extubation in order to keep warm organ ischemic time to a minimum, however, the donor surgery team will not be present in the OR during the terminal wean and until the patient has been declared dead. This will have been explained to the family at the time consent was obtained. If the patient's family chooses to be in the OR, they will be accompanied by the KODA coordinator. In pediatric cases, exceptions can be made, with agreement between the surgeon and family, as some families may wish to hold their child during this time. The patient should be accompanied to the OR by a staff member from the primary care team (ICU nurse) or OR support personnel but without involvement of any anesthesia provider.
Appropriate orders must be documented prior to transfer to the OR, as follows:

- Heparin to be administered in the OR as per organ donation protocol
- Authorization for transport on monitor and, if necessary, opiate titration for comfort.
- A DNR order must be in place.

Whether and how much to sedate the patient pre-extubation is a decision that will be made by the patient’s treating physicians following accepted hospital practice. It is a decision that should not be influenced by the possibility of organ donation. The usual measures to ensure patient comfort will be followed. If opioids or sedatives are to be used, they may be administered in the ICU prior to transfer to the OR, or they may be begun in the OR. Further dose titration will be left to the discretion of the physician who will be managing the patient in the OR.

Extubation and removal of life-sustaining therapy will be carried out in the OR or designated room near the OR by the patient’s attending critical care physician or by a physician designated by the attending physician. This may be another critical care attending.

The comfort and dignity of the patient will be maximized during the withdrawal process as it is in every patient death. All members of care team must ensure that the highest level of palliative care is provided to the patient at all times during this process.

No member of the transplant team shall be present for the withdrawal of life sustaining measures.

No member of the organ recovery team or OPO staff may participate in the guidance or administration of palliative care, or declaration of death.

**Pronouncement of Death**

If, within one hour following life support withdrawal, the patient develops apnea, asystole, or pulseless electrical activity that is sustained for a period of five minutes (as defined in the Definitions section of this policy), the patient then will be pronounced dead by the attending critical care physician or designee (licensed fellow/resident).

The physician will record the date and time of death in the medical record and will fill out the death certificate.

The physician declaring death may not participate in the procedure to retrieve or transplant the organ(s) or be associated with the transplant team or with the care of any potential recipient. After pronouncement of death, the patient's family will be escorted from the OR. If not present in the OR, the family will be notified promptly by the declaring physician or designee that death has occurred and that organ recovery will proceed.

The donor surgery team will proceed with organ retrieval immediately after the patient is pronounced dead.

**Hospital Ethics Committee Review**

A subcommittee composed of the Ethics Committee chair, director of the OR, and the chief of Anesthesiology or their designees will review all DCD cases and report findings to the Hospital Ethics Committee quarterly. Representatives from KODA as well as other
external reviewers are invited to observe the case reviews as well. Quality documentation throughout the process is critical for these reviews to be able to ensure compliance with the procedures, identify potential or actual problems as well as to protect the interests of the organ donors, recipients, and health care workers.

Approved by Richard Lofgren, M.D., Chief Medical Officer
Authorized by Murray B. Clark, Jr., Associate VP for MC Operations
SUBJECT: Organ and Tissue Procurement for Transplantation
SEE ALSO: KRS 311.241, KRS 311.992; Hospital policies HP06-17, Care of Terminally Ill Patients; HP06-19, Diagnosis of Death; HP06-21, Donation of Body Parts; HP06-33, Advance Directives; HP07-03, Patient Payment and Financial Allowances

INFORMATION
Federal and state legislation requires hospitals to consider every death as a potential organ or tissue donation. These laws also require that families be given the opportunity to donate. The families should be approached with discretion and sensitivity as appropriate to the circumstances, beliefs, and desires of the family and potential donor.

As a result, it is the duty of each physician at University of Kentucky Hospital to facilitate the procurement of organs and tissue for transplantation whenever possible in cases in which the patient has died or death is imminent. Organ donor maintenance and organ recovery take place in accordance with Hospital policy and Kentucky Organ Donor Affiliates (KODA) procedures. KODA is designated as an organ procurement agency by the Health Care Financing Administration in compliance with section 372 of the Public Health Service Act.

All Hospital personnel shall make an effort to convey to the attending physician any known intent of any hospitalized patient to make a donation of all or part of the body. Note: The attending physician or another physician designated by the attending physician will make the declaration of death in accordance with recognized criteria (see Hospital policy HP06-19, Diagnosis of Death).

INSTRUCTIONS
1. Whenever a patient has died or death is imminent, the attending physician, another physician designated by the attending physician, or the nurse shall notify Kentucky Organ Donor Affiliates (KODA) immediately. Imminent deaths should be referred to KODA after determining the Glasgow coma score is equal to or less than 4 or if for a severely brain injured patient’s further care is determined to be futile; and prior to discontinuing ventilation or life-sustaining treatments when the decision is made to downgrade, withhold, or withdraw care. KODA will evaluate the patient for suitability of donation. Only a KODA representative or a designated requester trained by KODA, in collaboration with the health care staff, may speak with the family about the option to donate or deny organ donation. KODA will participate in approaching the family to discuss the option to donate or deny organ donation, and will document the family’s decision. KODA will also assist with family counseling. If the patient is determined to be suitable for donation the Hospital will work with KODA to maintain the potential donor while the necessary testing and placement of organs, tissues, and eyes takes place.

The local KODA telephone number is 278-3492; the 24-hour number is (800) 525-3456 or (866) 206-9250.
2. The attending physician, physician designee, or the nurse shall document on the Provisional Report of Death form that KODA has been contacted, including the name of the KODA coordinator, if the patient is suitable for donation and the name of the family member 2 -- HP06-27, Organ and Tissue Procurement for Transplantation approached with their decision. The Provisional Report of Death form shall be filed in the patient's medical record.

3. All cardiac standstill deaths (i.e., when artificial respiration and circulation are not maintained and there is an irreversible cessation of spontaneous respiration and circulation) will be referred to KODA by the attending physician, the physician designee, or the nurse. KODA will obtain information about the deceased from the caller and determine if the patient is suitable for tissue donation. If the patient is suitable, as determined by KODA, KODA may direct the caller to contact a Hospital staff member who is trained as a designated requester to offer the family tissue donation (corneas, eyes, skin, bone, veins, and heart valves). If the family desires donation or wants more information the caller will contact KODA to speak with the family. The trained designated requester's name will be documented in the medical record or the provisional report of death.

4. When a staff member informs KODA of a potential organ/tissue/eye donor they should report the patient's name, age, reason for hospitalization, and medical/social history; they should also have the patient's medical record available in order to provide any additional information as appropriate.

5. If the patient is considered an organ/tissue/eye donor, the designated requester or KODA coordinator will obtain written consent for donation, using the Kentucky Organ Donor Affiliates/Lion's Eye Bank Authorization for Removal of Anatomical Gifts form. If the family is not present at the Hospital, KODA may obtain a recorded consent from the next-of-kin. KODA will provide the Hospital a copy of the recorded consent transcript or a written consent for the medical record. Kentucky Revised Statutes recognizes the following order of consent for authorization of donation of organs for transplantation:

**Section I of KRS 311.175**
Authorized donor designation, listed in KRS 311.175, which allows a signed donor card, authorization through the donor registry, or the first person consent.

**Section II of KRS 311.175**
- patient
- spouse
- adult daughter or son
- either parent
- adult brother or sister
- guardian at the time of the patient's death
- any other person authorized or under obligation to dispose of the body

If there is actual notice that the patient or a member of a prior class opposes donation, the donation shall not be accepted.

Two witnesses should confirm the next-of-kin consent by signing the witness attestation on the Kentucky Organ Donor Affiliates/Lion’s Eye Bank Authorization for Removal of Anatomical Gifts form.
The original copy of the authorization form should be filed in the medical record.

6. The KODA coordinator can write all medication and patient care orders in accordance with established guidelines and protocols for the care of the donor patient.
   a. The name and title “KODA coordinator” shall be documented in the body of the order, not in the physician’s signature space.
   b. Pharmacy shall dispense medications upon the written order of the KODA coordinator.
   c. All orders will be implemented by the nursing staff upon the written order of the KODA coordinator.
   d. The medication orders written by the KODA coordinator shall be countersigned by the transplant physician at the time of the organ recovery, or within 24 hours of the time the orders were written.

Approved by Richard Lofgren, M.D., Chief Medical Officer
Authorized by Murray B. Clark, Jr., Associate VP for MC Operations
I. Rationale for involvement of intensivist in management of Brain dead organ donors.

A new paradigm in management of brain dead organ donors has appeared in the last few years based upon the observation that the pathophysiologic changes associated with brain death may not result in irreversible organ damage, but in fact that if the donor is optimally resuscitated, function of potentially transplantable organs may improve resulting in more and better organs being available for successful transplantation. This improved outcome (number of organ donors, and number of organs donated and transplanted per donor) has been found to be associated with initiation of protocols and involvement of Intensivists in the management of these donors. The recognition that by improving the care of one brain dead donor, an intensivist may have the ability to improve the lives of six other patients is a powerful incentive for this effort.

Instead of rushing the donor to the operating room to retrieve the organs as soon as possible, the new paradigm proposes that it is important to take the necessary time in the ICU to optimize multi-organ function to improve transplant outcomes. Resuscitation and re-evaluation can improve reversible organ dysfunction (myocardial and cardiovascular dysfunction, oxygenation impairment related to potentially reversible lung injury, invasive bacterial infections, and hypernatremia) and allow time to evaluate temporal trends in hepatic aspartate aminotransferase (AST), alanine aminotransferase (ALT) and creatinine or any other potentially treatable situation. This treatment period can range from 12 to 24 h and should be accompanied by frequent re-evaluation to demonstrate improvement in organ function toward defined targets. Once organ function is optimized, surgical procurement procedures should be arranged emergently. (Shemie, 2006)

II. Initial communication:
   1. KODA will be notified of potential donor,
   2. KODA will be notified when Brain Death has been declared

III. Initial Evaluation
   1. Meet with KODA case manager
      a. Review potential organs to be transplanted
      b. Review time-lines
   2. Review mechanism of brain death and patients course since initial event
   3. Review current status of patient
      a. Vital signs, fluid balance
      b. Current medications and ventilation
c. Latest laboratory studies
d. Determine if meeting KODA goals (see Item IV below)
e. Look for common complication
   i. Hypothermia or hyperthermia
   ii. Hypertension and tachycardia
   iii. Hypotension and/or low cardiac output
   iv. Pulmonary dysfunction and/or edema
   v. Lactic acidosis
   vi. Hypernatremia
   vii. Other electrolyte abnormalities
   viii. Diabetes Insipidus
   ix. Hypovolemia
   x. Coagulopathy

4. Confirm orders regarding routine management (see item V. below) and laboratory studies (see item VII. below)
5. Initiate any required invasive monitoring (see item VI below)
6. Assure appropriate consultation i.e., with pulmonary medicine and cardiology, and potential receiving transplant surgeons.
7. Initiate interventions to achieve KODA donor goals.

IV. General Targets and Objectives
(* = at variance with or not mentioned by with KODA guidelines; Canadian = Shemie, CMAJ, 2006; SSC= Surviving sepsis campaign, Dellinger CCM 2004))

Heart rhythm Sinus*
Heart rate 60-120
MAP \geq 70*; <91 (Canadian); *KODA \geq 60; SSC \geq 65;
Systolic Pressure >100; < 160* (Canadian)
CVP 10-12
PAOP <12; 6-10 (Canadian)
Mixed venous oxygen sat (PA or CV \geq 70\% (SSC); \geq 60 (Canadian)
Cardiac Index >2.4 (Canadian)
SVR 800-1200 d.sec cm-5 (Canadian)
LVSWI > 15 gm/kg-min (Canadian)
Urine output 1ml/kg/hr; Canadian 0.5-3.0; SSC 0.5)
Sodium 130-150 (Canadian)
K, Ca, Mg, PO4 normal
Glucose 72-144 (Canadian)
Hematocrit
   If hemodynamically stable >21
   If unstable >27 (Canadian); > 30 (SSC)
Arterial saturation >95% (Canadian)
PaO2 >80* (Canadian); KODA >100
Ph 7.35-7.45(Canadian)
PaCO2 35-45(Canadian)
Temperature 97-99 F; 36.5-37.4 C
V. General Management of all potential donors
1. Baseline laboratory studies and evaluation (See item VII below)
2. Insert monitors
   a. Arterial line
   b. Central venous catheter
      If not already in place, insert introducer suitable for placement of a PAC and volume therapy (e.g., MAC or AVA) via right internal jugular vein
   c. Pulmonary artery catheter (Consider- see item VI.11 below)
   d. Urinary catheter (If not already in, place temperature sensing catheter)
   e. Core temperature monitor
   f. TEE (Consider- see item VI.12 below)
3. NG tube to low suction
4. Type and cross match 4 units
5. Ventilator
   a. PRVC
   b. Tidal volume 8-10 ml/kg (IBW) (Canadian)
   c. PEEP 5 (Canadian)
   d. Peak pressure limit 30 cm H2O (Canadian)
      If not possible, consider lowering tidal volume or accepting higher pressure limit
   e. FiO2 as low as possible to maintain SpO2 ≥ 95%
   f. Rate initially about 10
      Adjust to keep PaCO2 and pH within desired limits
   g. Obtain ABG within 30 minutes of initial settings
      Recruitment maneuvers periodically (Canadian) or at least if PaO2 <80 on FiO2 >0.4, or P/F < 300:
         -PC ventilation with PAP 25 and PEEP 15 for 2 hours
         (SALT protocol; Angel 2006), or
         -Sustained positive pressure of 30 cm H2O for 30-60 sec
6. Remove cervical collar
7. Elevate head 30 degrees
8. Suction ETT Q 1-2 hours
9. Turn to full lateral; alternate right and left every 1-2 hours
10. Cefazolin 1 gm Q 4 hours after cultures
11. Irrigate eyes with normal saline hourly
12. Enteral feeding by jejunal tube if possible (10 ml/hour, increase to 0.5 ml/kg/hr as tolerated)
13. IV fluids
   Maintenance: D5-1/2 normal saline 1.5 ml/kg/hr
14. Consider triple hormone therapy in all donors
   a. Vasopressin: Bolus 1 unit followed by infusion 2.4 units/hr
   b. Methylprednisolone: 15 mg/kg and Q 24 hours
   c. T4: Bolus 20 microgram followed by infusion 10 mcg/hr
15. See special management of potential heart and lung donors, and of common problems below.
VI. Monitoring (At least hourly unless stated otherwise)
1. Arterial pressure (S, D, M)
2. Pulse oximetry
3. ECG: Heart rate and rhythm
4. Respiratory rate,
5. Ventilator settings (Mode, tidal volume, FiO₂, PEEP, PAP)
6. Temperature (central: bladder, esophageal, PA, nasopharyngeal)
7. Urine output
8. Fluid balance
9. CVP
10. Central venous oxygen [continuous or intermittent (Q4h)]
11. PAC: Consider in all. Definite if hemodynamically unstable (hypotensive, evidence of impaired cardiac output requiring vasopressors or inotropic drugs or fluid boluses) potential lung and or heart donors
12. TEE: consider in hemodynamically unstable patients, or if abnormal TTE
13. Repeat laboratory studies (See item VII below)

VII. Baseline and periodic Laboratory studies
1. Height, weight, BMI, BSA
2. CMP
3. Electrolytes Q 4 hrs
4. Osmolality Daily
5. BUN and Creatinine Q 6 hrs
   Finger sticks hourly if elevated or on insulin
7. Calcium Daily
8. Magnesium Daily
9. Phosphorous Daily
10. Liver panel Q 6 hrs
   a. AST
   b. ALT
   c. Bilirubin
11. Viral studies
   a. Hepatitis B surface antigen HBsAg) and HCVAb
   b. HIV
12. Type and screen
13. Coagulation studies Daily
   a. PT, INR
   b. PTT
14. CBC (WBC, hematocrit/hemoglobin, platelet count)
15. Urine analysis and microscopic examination
16. Blood culture x 2 Daily
17. Urine culture Daily
18. Sputum gram stain Daily
19. Sputum culture Daily
20. ABG Q 6 hr
21. ECG
22. CXR Q 12 hrs
23. TTE or TEE
24. Troponin; repeat in 6 hours Q 12 hours
25. Lactate Q 2-4 hours
26. Central venous or mixed venous hemoglobin oxygen saturation; Q 2-4 hours
27. See special evaluation and laboratory studies for potential Lung and Heart donors (item IX. A. and B below).

VIII. Management of specific Issues

A. Hypertension (Canada)
   Definition: Systolic arterial pressure >160, MAP >90
   Management: Sodium nitroprusside 0.5-5.0 mcg/kg/min, or
   Esmolol 100-150 mcg/kg bolus followed by an infusion of 100-300 mcg/kg/min

B. Tachycardia
   - No established guidelines
   - Need to differentiate the probable cause of the tachycardia, i.e., whether it is compensatory for a low stroke volume (depressed LV function) or is secondary to the hyperdynamic state due to CNS injury.
   - If due to latter, and not needed to maintain cardiac output, consider administering esmolol bolus followed by an infusion (see item VIII.A. above.)

C. Hypotension and low cardiac output
   If MAP low (<60-70) but cardiac output deemed to be adequate (i.e., good peripheral perfusion, urine output, CI > 2.5, SvO2 > 70)
   - If hematocrit < 30, correct with PRBC
   - If hematocrit > 30, give vasopressor
     - First choice: vasopressin up to 2.4 units /hr
     - Second choice: norepinephrine up to 0.2 mcg/kg/min
     - If no PAC insert one and consider TEE

   If MAP low and Cardiac output low
   If CVP <16 and PAOP < 21
   - If hematocrit < 30
     - Give 1-2 units PRBC
   - If hematocrit >30
     - Give fluid bolus over 20-30 minutes
       - 500 ml hetastarch, or
       - 500 ml 5% albumen, or
       - 15 ml/kg crystalloid (e.g., NS, LR)
     - If cardiac output and MAP still low
       - Start dopamine (5-20mcg/kg/min)
   If no PAC insert one and consider TEE

   If MAP adequate (>60-70) but cardiac output is low
   If CVP <16 and PAOP < 21
   - If hematocrit < 30
     - Give 1-2 units PRBC
- If hematocrit > 30
  - Give fluid bolus over 20-30 minutes
    - 500 ml hetastarch, or
    - 500 ml 5% albumen, or
    - 15 ml/kg crystalloid (e.g., NS, LR)
- If cardiac output is still low
  - Start dobutamine (5-20 mcg/kg/min) or milrinone (load 50 mcg/kg over 20 minutes; infuse 0.5 mcg/kg/min)

D. Diabetes Insipidus (Canad)
   Definition: Urine output > 4 ml/kg/hour plus rising serum sodium > 145, rising serum osmolality > 300, and Urine osmolality > 200
   Treatment: vasopressin 1 unit followed by infusion of < 2.4 units/hour.

E. Hyperglycemia
   If > 500 mg/dl administer 20 units insulin and begin infusion (below)
   If > 400 mg/dl administer 15 units insulin and begin infusion (below)
   If > 300 mg/dl administer 10 units insulin and begin infusion (below)
   If > 200 mg/dl administer 5 units insulin and begin infusion (below)
   If > 100 mg/dl administer 3 units insulin and begin infusion (below)
   Plus infusion
   Start at 0.1 unit/kg/hour and adjust to keep glucose 80-120

F. Hypocalcemia
   If ionized < 4.6 mg/dl or total < 8.5 mg/dl give calcium gluconate 1 gm over 10 mins
   If ionized < 3.6 mg/ml or total < 7.0 mg/dl give calcium gluconate 2 gms over 30 mins

G. Hypernatremia
   If > 155 administer D5/water at 100 ml per hour (expected to decrease serum sodium about 0.4 mEq/hour in 70 kg patient)
   If > 150 administer D5/water at 50 ml per hour (expected to decrease serum sodium about 0.2 mEq/hour in 70 kg patient)

H. Hypomagnesemia
   If < 1.8 gm/dl give 1 gm Magnesium sulfate over 30 minutes
   If < 1.2 gm/dl give 1 gm magnesium sulfate over 60 minutes

I. Hypophosphatemia
   If < 2.7 mg/ml give potassium phosphate 9 mMol/150 ml over 4 hours
   If < 1.0 give potassium phosphate 15 mMol/150 ml over 4 hours

J. Hyperthermia (Core temperature > 37.4 C (99F)
   Use cooling blanket, Tylenol etc.

K. Hypothermia (core temperature < 36.5 C (97F)
   Use warming blanket
L. Prevention of Contrast Induced Nephropathy (CIN) (REMEDIAL protocol, Briguori et al, Circ 2007; 115; 1211-7)
   If plan to perform contrast arteriogram (coronaries, hepatic or renal)
   -Assure normovolemia
   -Administer 1200 mg of N-acetylcysteine (NAC) enterally immediately and repeat in 24 hours
   -Infuse 154mEq/L sodium bicarbonate in D5/W at 3ml/kg/hr for one hour immediately before contrast injection and at a rate of one ml/kg/hour for 6 hours afterwards.

IX. Management of potential donors of specific organs
   A. Heart
      Special evaluation
      1. PAC
      2. CK, CK-MB, troponin Q12hrs
      3. TEE; Consider repeating Q6-12 hours
      4. Cardiology consultation
      5. Consider coronary angiography. Canadian guidelines:
         i. History of cocaine abuse or males >55, females >60 y/o
         ii. Males > 40 or Females > 45 if ≥ 2 risk factors (see below)
         iii. Any age if ≥3 risk factors
      Risk Factors for considering coronary angiography
         -Smoking
         -Hypertension
         -Elevated lipids
         -BMI > 32
         -Positive family history of CAD
         -Ischemia on ECG
         -Anterior-lateral RWMA on ECHO
         -EF < 41%
      6. Consider dobutamine stimulation test (low level DSE) if have RWMA on ECHO
         Graduated dosing of dobutamine every 3 minutes (5, 10, 15, and 20 mcg/kg/min) looking for improvement in wall motion (which was found to be associated with improved ventricular function over time, i.e., reversible cardiac dysfunction.)
         (Kono T, etal. Am J Cardiol 1999; 84 (5): 578-2)
      Management
      T4 protocol ((KODA)
      1. 50 ml of 50% dextrose plus 20 units of insulin
      2. Solumedrol 2 gm
      3. Levothyroxine (T4) 20 mcg bolus followed by 10mcg/hour
      4. Vasopressin 1 unit/hour
      5. Replace potassium as needed.
B. Lung

Special evaluation
1. PAC
2. Measure P/F ratio after being on 100% oxygen and 5 cm PEEP for 10 minutes. Repeat Q 4 hours
3. CXR. Repeat Q 4 hours
4. Bronchoscopy and BAL
5. If Louisville KY Jewish Hospital recipient
   Obtain sputum culture for AFB and toxoplasmosis
6. Pulmonary medicine consult for evaluation as possible lung donor

Management
1. Narcan 10 mg
2. LINK vest treatment 10 min per hour
3. If Louisville KY Jewish Hospital recipient
   a. Administer gentamicin 80 mg as aerosol
   b. Vancomycin 1 gm, ceftazidime, 1 gm, cleocin 900 mg.
4. If P/F < 300 repeat bronchoscopy and performs recruitment maneuvers:
   a. PC ventilation with PAP 25 and PEEP 15 for 2 hours (SALT protocol per Angel 2006)), or
   b. Sustained positive pressure of 30 cm H2O for 30-60 sec
5. Rotate full lateral Q 2 hours
6. Diurese to normovolemia (ARDS-Net Conservative fluid management protocol, NEJM 2006; 354; 2562-75):

   If perfusion is adequate, and MAP > 60 without vasopressors, and
   urine output > 0.5 ml/hour: lower CVP to <4 or PAOP to <8

   If perfusion is adequate, and MAP > 60 without vasopressors, but
   urine output < 0.5 ml/hour: lower CVP to <9 or PAOP to <13

   If perfusion is inadequate but MAP > 60 without vasopressors:
   lower CVP to <13 or PAOP to <18

C. Liver
   Nothing special other than treating hypernatremia (see item VIII.G.above)

D. Kidney
   Nothing special other than CIN prophylaxis (see item VIII. L above)
X. A. References
1. KODA Routine Adult Organ Donor Maintenance Orders, Revised June 2007


X. B. Selected supplemental bibliography


SUBJECT: Withholding/Withdrawing Potentially Life-Sustaining Treatment

SEE ALSO: Hospital policies HP06-09, Consent to Treatment; HP06-27, Organ and Tissue Procurement for Transplantation; HP06-33, Advance Directives; HP08-03, Patient Rights; HP08-10, Relief of Pain; Medical Staff Rules and Regulations

INFORMATION
The University of Kentucky Hospital recognizes that the dignity of human life and the right of all persons to a dignified and peaceful death requires that a medical procedure or treatment should be used only if it furthers one or both of the following goals:
• the relief of suffering, or
• the prolongation of a life satisfactory to the patient.

Definition of Terms
Do-Not-Resuscitate (DNR) is an order to withhold cardiopulmonary resuscitation measures (as designated by the American Heart Association standards) that could restore blood circulation and breathing in a person who has experienced cardiac and/or respiratory arrest.

Medically Inappropriate Interventions (formerly Futile Treatment) is a form of therapeutic intervention is appropriately considered medically inappropriate for a patient when an attending physician, in consultation with a patient’s care team and family or proxy, and consistent with available medical literature, concludes that such intervention holds no reasonable possibility of providing: a cure, improvement, or amelioration of the patient’s condition; restoration of a quality of life satisfactory to the patient; or such intervention would only increase or prolong the patient’s suffering.

Artificial Nutrition and Hydration is a medical treatment whereby nutrition and/or hydration are delivered by a feeding tube or parenteral means.

Patient with Decision-Making Capacity is an adult (18 years of age or older) or an emancipated minor who is able to understand the information that is relevant to making a decision about the treatment or admission, able to appreciate the reasonably foreseeable consequences of a decision or lack of decision, and able to communicate a decision. A person is presumed to be capable with respect to treatment or admission. A person is entitled to rely on the presumption of capacity with respect to another person unless he or she has reasonable grounds to believe that the other person is incapable with respect to the treatment or admission.

Patient without Decision-Making Capacity is a person who has been declared legally incompetent by a court of law; or a minor (under 18 years of age, unless the minor is emancipated); or an adult, or an emancipated minor, who is unable to appreciate the reasonably foreseeable consequences of a decision or lack of decision, and unable to communicate a decision. A person may be incapable with respect to some treatments and capable with respect to others. A person may be incapable with respect to a treatment at one time and capable at another.
Family or Proxy
• the adult child of the patient, or if the patient has more than one child the majority of the adult children who are reasonably available for consultation; or
• the parents of the patient; or
• the nearest living relative of the patient, or if more than one relative of the same relation is reasonably available for consultation; or
• the majority of the nearest living relatives. (KRS 311.631); or
• any other person designated by the patient orally or in writing when the patient had capacity.

Kentucky Emergency Medical Services (EMS) DNR is the form designed and supplied by the state for use by EMS personnel that allows DNR status for a transported patient.

Advance Directives
• Living Will is a written declaration instructing the maker's (patient's) physician to withhold or withdraw life prolonging treatment if the patient has a terminal condition or is permanently unconscious. (KRS 311.625)
• Substitute or Proxy Decision Maker is a person(s), including a health care surrogate, who has the responsibility (subject to certain limitations) to make decisions on behalf of a patient without decisional capacity. (KRS 311.625)

INSTRUCTIONS
Autonomy
The decision to withhold or withdraw any potentially life-sustaining treatment should be based on the principle that a patient with decision-making capacity has the right to reject potentially life-sustaining treatment even when such treatment is medically recommended.

Medically Inappropriate Interventions
There is no ethical or legal obligation to provide a treatment which, in the opinion of the physician, is medically inappropriate.

Withholding versus Withdrawing Life-Sustaining Treatment
There is no ethical, moral, or legal difference between stopping a life-support measure and not starting it. In the event of uncertainty, it may be preferable to provide a life support measure for a limited time trial before concluding that it lacks benefit. Decisions to withhold/withdraw more than one treatment should be made explicitly and separately. The fact that an order has been written to withhold/withdraw a particular medical treatment has no bearing on the provision of other medical treatments.

Artificial Nutrition and Hydration
The decision to institute artificial nutrition and hydration requires the same process of informed consent as any other treatment. Its use is associated with inherent risks as well as benefits. Institution of artificial nutrition and hydration requires expertise in calculating the nutritional needs of the patient in the context of the goals of therapy, in placing and managing the delivery devices and in recognizing and treating complications. The provision of artificial nutrition and hydration may be associated with more risks and discomfort for individual patients than withholding or withdrawing this form of therapy. It is expected that the clinician attending to the patient will address these issues when discussing end of life decisions. Nutrition and hydration cannot be withheld or withdrawn if they are needed for comfort or the relief of pain. (KRS 311.629.13-ck) This should
rarely be the case if the patient is provided access to appropriate palliative care.

**Double Effect**
Relief of pain and suffering is central to exemplary patient care. Commitment to the relief of pain and suffering of the dying patient is essential, even if death may be hastened as a result of effectively relieving the patient’s pain.

**Integrity of Medical Profession**
A physician has no obligation to render or offer any treatment that violates applicable standards of medical practice, nor may a physician abandon the patient without referral to available and competent medical resources.

**Patient’s Right of Choice**
A patient has the right to change physicians if the patient (or proxy) and physician disagree over the necessity or appropriateness of treatment. A patient with decision-making capacity has the right to accept or refuse treatment after being appropriately informed of treatment choices.

**Categories of Inpatient Status**
The Hospital recognizes three major levels of support with regard to resuscitation:

**Category 1**
Full support, including all CPR modalities. The patient receives full resuscitative care. Unless an attending physician writes an order to the contrary, the patient will be provided full support, including CPR.

**Category 2**
DNR. This order only addresses cardiopulmonary resuscitation and does not specifically limit other appropriate treatments. Active DNR orders will not automatically be rescinded when patients leave their hospital units for invasive or non-invasive testing. Note: It is inappropriate to divide resuscitation into components that could be initiated (e.g. defibrillation, pharmacologic agents) without providing others (e.g. airway management, mechanical ventilation.

**Category 3**
Withholding/withdrawing other measures. The patient (or proxy) may, in consultation with the attending provider decline these treatments. When an order to discontinue treatment is written but the physical means for providing the treatment remains in place (e.g., mechanical ventilator or feeding tube) the physician or other willing member of the health care team should remove or disconnect the treatment device with the assistance of auxiliary staff, as appropriate. If upon removal of said device, death is expected imminently, then a physician member of the health care team should be present.

**Making End of Life Decisions**

**Adult Patients (or emancipated minors) with Decision-Making Capacity**
Decisions to withhold or withdraw potentially life-sustaining treatment are to be made by the patient with decisional capacity after consultation with the attending physician.

**Adult Patients (or emancipated minors) without Decision-Making Capacity**

- **Determining Capacity:** It is the responsibility of the attending physician to determine if the patient has decision-making capacity for any proposed medical treatment using the criteria set out in the definitions.
• Determining the appropriate surrogate decision-maker: If an adult patient does not have decision-making capacity, then healthcare decisions on behalf of the patient may be made by any of the following responsible parties in the following order of priority:

1. The judicially appointed guardian to the patient, if medical decisions are within the scope of the guardianship;
2. Person named in a properly executed written advance directive;
3. The spouse of the patient;
4. An adult child of the patient, or if the patient has more than one child, the majority of the adult children who are reasonably available for consultation;
5. The parents of the patient;
6. The nearest living relative of the patient, or if more than one relative of the same relation is reasonably available for consultation, the majority of the nearest living relatives. (KRS 311.631);
7. Any other person designated by the patient orally or in writing when the patient had capacity.

Minors

If a patient is a minor child under the age of eighteen years and not emancipated under the laws of the Commonwealth of Kentucky, treatment may be withheld or withdrawn when:

1. the parent(s) or legal guardian of the minor patient expresses to the physician an understanding of the purpose of treatment and the risks of forgoing the treatment and declines life-sustaining treatment or indicates that such treatment be withdrawn.
2. and advance directive has been issued on behalf of the patient declining treatment and any conditions contained in the directive are met. (Kentucky law)
3. Treatment is medically inappropriate.

An individual authorized to consent for another shall act in good faith, in accordance with any advance directive executed by the individual who lacks decisional capacity, and in the best interest of the patient who does not have decisional capacity. (KRS 311.631)

According to Kentucky law (KRS 311.629.13) if the patient is pregnant, life-sustaining treatment, including nutrition and hydration, cannot be withheld or withdrawn, regardless of the patient’s (or proxy’s) directions, unless the attending physician and another licensed physician who has examined the woman determine within reasonable medical certainty that such procedures:

1. will not maintain the woman in a way to permit the continued development and live birth of the unborn child, and
2. will be physically harmful to the woman, or
3. will prolong severe pain that cannot be alleviated by medication

The physician is responsible for providing the patient or surrogate decision maker with all pertinent information concerning the possible benefits and risks of treatment (see Hospital policy HP06-09, Consent to Treatment). If support services (e.g., palliative care, pastoral care, social services) have not been involved with the patient’s case, the attending physician is encouraged to engage these services when a decision to forgo life-sustaining treatment is made.
Wards of the State
1. When the attending physician believes that potentially life-sustaining treatment should be withdrawn/withheld from a patient who is a ward of the state, the family social worker should be contacted to obtain the necessary state documents to request withdrawing/withholding treatment.

Note: State regulations specify that withdrawing or withholding potentially life-sustaining treatment can only be considered for patients who are terminally ill and permanently unconscious.

2. The attending physician will complete the state-provided form requesting permission to withhold/withdraw treatment. The attending physician will also request a second physician to complete a consultative opinion form, also provided by the state, concurring in the request.

3. The attending physician may or may not seek a consultation from the Clinical Ethics Consult Service prior to making such a request.

4. The completed documents will be submitted to the patient's state guardian, who, in turn, will submit them to the state health decision committee for review. This review is usually completed in 24 to 48 hours.

5. After receiving written notice from the guardian of the state health decision committee's approval, the physician may write orders for the withdrawing/withholding of potentially life-sustaining treatment (see Documentation section below). The written notice and physician orders will be added to the patient’s chart.

Documentation

1. In any case in which a health care decision is made, the decision shall be noted in writing in the patient’s medical record. (KRS 311.631) The note should include the parties involved, key elements of the discussion and the agreed upon conclusions or plans. If the level of support designated for a patient excludes CPR, the attending physician should initiate a conversation with the patient (or proxy). Documentation in the chart of this discussion should include:
   - patient decisional capacity when the order was given, and
   - patient consent to the level of support, and
   - if the patient did not have decisional capacity:
     - whether the patient had a living will that authorized the level of support, and
     - the name and relationship of the proxy who, on the behalf of the patient consented to the level of support.
   - a written order by the attending physician to reflect the decision made.

2. An order must be entered to institute DNR status or withdraw life-sustaining measures.

3. Telephone Orders: Verbal orders for DNR may be given by an attending physician to a senior resident in exceptional situations. In such situations, the resident may write the order, but the attending physician must personally cosign the order and document the related information within 24 hours.
4. Review and Revocation of DNR Orders: The patient with decision-making capacity (or proxy) who initially requested a DNR order has the right to change his/her mind and retract the agreement, requesting a different level of support by informing the physician. DNR orders should be reviewed at least every 30 days.

Conflicts
The attending physician is responsible for taking the lead in resolving conflicts between or among interested parties including the patient, surrogate, family members and health care team members.

If the disagreement or confusion is not resolved, the patient (or proxy), the patient’s family, or any member of the health care team can request a clinical ethics consult through the Clinical Ethics Consult Service.

If the attending physician, because of personal beliefs or conscience, is unable to comply with the decision of a patient (or proxy) concerning the withholding/withdrawing of treatment, the attending physician should attempt to transfer care of the patient (as well as the patient’s medical records) to another physician who is willing to comply. The new physician must be acceptable to the patient (or proxy). In the event that a transfer is not possible, the case should be referred to the Clinical Ethics Consult Service.

If the attending physician, in consultation with a patient’s care team, decides that certain therapeutic interventions are medically inappropriate for the patient, the physician should discuss carefully with the patient (or proxy) the nature of the ailment; the care options available and useful for the patient, including palliative and hospice care; the prognosis; and the reasons why certain interventions are considered inappropriate. If the patient (or proxy) and the attending physician agree, treatment may be discontinued.

If the patient (or proxy) and the attending physician do not agree with reference to the futility of a proposed course, the attending physician will discuss with the patient (or proxy) obtaining an additional medical opinion on the patient’s case from another physician. The physician who will provide the second opinion will be selected by the chief medical officer.

If a physician offering a second opinion on inappropriate treatment concurs with the attending physician, the patient (or proxy) and the patient’s family and/or significant others should be given adequate time to consider this additional opinion.

If, after considering the opinion of the attending physician and a concurring opinion of the consulting physician, the patient (or proxy) desires interventions that have been judged to be inappropriate, and if the attending physician does not want to proceed with such interventions, the attending physician should:

- request a clinical ethics consult through the Clinical Ethics Consult Service;
- inform the patient (or proxy) that the request has been made; and
- inform the patient (or proxy) that the patient is at full liberty to effect the patient’s transfer to another hospital or to another physician.

If the consulting physician disagrees with the attending physician about the treatment of the patient, and if the patient (or proxy) desires, the chief medical officer will facilitate the patient’s (or proxy’s) request for transfer to another physician.
If the patient (or proxy) initiates a clinical ethics consult, a clinical ethics consultant (CEC) will be contacted and will review the case and make recommendations in a timely fashion. The CEC may call in additional ethics consultants, or other expert consultants as needed, or bring the case before the entire Hospital Ethics Committee for review. A CEC letter will document the issues in the case and be inserted into the patient’s chart.

If the CEC agrees with the attending physician that such treatment is inappropriate for this patient, such treatment will not be initiated or will be discontinued and document the decision in the patient’s record.

If the CEC disagrees with the attending physician and if the attending physician wishes to withdraw from the case, the CEC will contact the chief medical officer, to either secure an attending physician to carry out the patient’s wishes or, failing this, will attempt to effect the patient’s transfer to another hospital.

**Clinical Ethics Consultations**

The CEC service pager number is 330-0365; 24 hours a day, seven days a week, to all clinical enterprise faculty and Hospital staff. A request by email can be sent to bioethics@uky.edu. The Program for Bioethics and Patients’ Rights website is www.ukhealthcare.uky.edu/bioethics

**Special Situations**

**EMS Transport of Patients with or Without DNR Designations**

Kentucky law requires that patients with DNR designations have a complete, signed original EMS DNR form, which is given to EMS personnel before transport.

DNR orders without EMS DNR forms cannot be honored by EMS transport personnel.

The EMS DNR form must be notarized, or it may be witnessed by two persons who are not:

- blood relatives of the patient
- beneficiaries under the descent and distribution laws, or
- directly financially responsible for the patient’s health care.

*Note: An EMS DNR can be witnessed by Hospital staff as long as those staff members are not related to the patient or responsible for the patient’s health care.*

**Initiating Kentucky EMS DNR in the Hospital**

Patients with DNR designations, who want to continue this status, leaving UK Hospital in emergency medical transport must have a completed and signed Kentucky EMS DNR form.

1. The patient must have a physician’s order for DNR status.
2. The physician and/or nurse may consult with Social Services, a patient representative, or the hospice nurse to initiate an EMS DNR.
3. If the patient or family wants an EMS DNR and no DNR order exists, the health care professional must contact the attending physician for initiation of DNR specifications to be documented in the medical record. If the attending physician refuses to grant DNR orders the physician should request a clinical ethics consult (see pages 5 and 6 of this policy).
4. The completed, original Kentucky EMS DNR should be given to the transport personnel.
5. The bottom of the Kentucky EMS DNR should be torn off the form and
attached to the patient.

6. The transport staff will give the original Kentucky EMS DNR form to the patient or responsible family member upon arrival at their destination.

7. If the patient has a medical emergency during transport, EMS personnel will retain the original EMS DNR form.

Patients Arriving with Kentucky EMS DNR Form
1. When a patient arrives with an original, completed Kentucky EMS DNR form, the receiving medical staff member will notify the physician that DNR issues need to be addressed immediately.
2. The original Kentucky EMS DNR form will be given to the patient or responsible family member. If the patient has died in transit the Kentucky EMS DNR form will be retained by the transport personnel.

Patients Arriving with DNR Designations
Do Not Resuscitate designations (DNR) will be honored upon a patient’s initial arrival to our emergency department and upon Hospital admission. However, the attending physician must review treatment options with the patient (or proxy) shortly within 24 hours after admission to determine the level of treatment support desired.

Surgical, anesthesia, and invasive diagnostic procedures for patient with DNR order or other orders limiting life-saving measures.
A patient with a DNR order may require anesthesia and surgery for palliative care or other medical reasons. In such circumstances, discussion and clarification of the support status between the patient (or proxy) and attending surgeon and anesthesiologist will occur prior to admission to the operating room or procedure area. Consent to anesthesia and surgery requires delineating the usual treatments necessary to prevent foreseeable and unanticipated life-threatening events during surgery (e.g., endotracheal intubation, intravenous fluids, CPR, blood products and inotropic drugs, etc.). Written consent for surgery and anesthesia will be required by both surgeon and anesthesiologist. Following that discussion, a note will be written in the chart delineating which forms of life support will be utilized in the event of need during the perioperative or periprocedural period. After completion of the post-anesthesia or post-procedure recovery period, a new DNR order should be written. It seems reasonable to apply these principles to all procedures requiring informed consent. A review of the risks and benefits of the procedure and its alternatives should include a review of the DNR decision. DNR orders should not be automatically rescinded without discussion with patient or proxy.

When intraoperative or periprocedural arrest results in the death of a patient who has a DNR order in force, the death will be classified “expected” rather than “unexpected.”

Approved by Richard Lofgren, M.D., Chief Medical Officer
Authorized by Murray B. Clark, Jr., Associate VP for MC Operations
SECTION 8: DISASTER MANAGEMENT

UNIVERSITY OF KENTUCKY  HOSPITAL POLICY NUMBER: HP12-11
CHANDLER MEDICAL CENTER  FIRST ISSUED: 5/85
HOSPITAL POLICY  CURRENT AS OF: 3/06

SUBJECT: Mass Casualty Response Plan
SEE ALSO: Emergency Department Trauma Disaster Plan; Departmental Response Plans

Alert 1
UK Hospital utilizes the Hospital Emergency Incident Command System (HEICS) as its command and control structure to facilitate response to emergency situations. In addition, the Hospital has developed a contingency plan to guide Hospital personnel in the early stages of response to a mass casualty disaster, until a command center can be established.

Through community planning, UK Hospital has been designated a primary receiving hospital for acute and critical disaster victims.

This plan assumes that the Hospital and its operations have not been affected by the disaster. If the Hospital has been damaged or operations have been interrupted, the incident commander or liaison will notify DEEM to channel patients to alternate health care facilities until necessary operations can be restored.

Notification of Hospital and On-Duty Staff
The Hospital uses the code Alert 1 to notify staff that the community has experienced a mass casualty disaster and that the Hospital is preparing to receive an influx of patients. The Alert 1 announcement is made over the paging system and preceded by chimes.

1. The external agency of jurisdiction will notify Aeromedical Dispatch that a disaster has occurred and that casualties will be transported to the Hospital.
2. The dispatcher will connect the caller to the ED charge nurse, 323-5901.
3. Dispatch will call the Fire Department, 252-1124, or Metro Police, 258-3600, to verify.
4. ED Charge will notify the ED attending and Hospital operations administrator (HOA).
5. HOA will notify
   • administrator-on-call
   • Hospital safety officer
   • chief of staff
6. The Hospital administrator-on-call will:
   • determine whether to issue an Alert 1 (in consultation with the ED attending and ED charge.)
   • notify paging operator, 323-5200, to issue an Alert 1 page over the public address system and to activate the Alert 1 call list.

Notification of Incident Command Staff and Off-Duty Personnel
UK Communications maintains a list of incident command staff who must be notified if an Alert 1 is issued. The list is update twice a year.

1. After making the Alert 1 page, the paging operator will activate the Alert 1 call list.
2. When key personnel are notified by announcement or call that a disaster has occurred, they will consult with their section chief or unit leader to determine what additional steps must be taken immediately.
3. If off-duty employees are needed, the departmental representatives will activate their call-in lists.

Triage and Patient Care
During a disaster, certain standing rules and regulations of the medical staff may be selectively waived by the chief of staff, Hospital administrator, or chiefs of clinical services to facilitate essential patient care.

For the purposes of this plan, triage is defined as the sorting and classifying of incoming patients so that they can be channeled to appropriate treatment areas. Although medical care may be available, treatment at the triage point will be kept to a minimum to facilitate prompt attention to all disaster victims.

To facilitate triage, patients will be classified as:
   • Dead (black)
   • Critical (red)
   • Acute (yellow)
   • Minor (green)
Treatment Areas

- Triage—ED parking lot
- Critical and Acute Treatment—ED trauma bays
- Acute Overflow Treatment—Pre-operative holding area
- Minor Treatment, General Adult—Cardiac Cath recovery area
- Minor Treatment, Adult Psychiatric—3 West
- Minor Treatment, Obstetric—Labor and Delivery
- Minor Treatment, Pediatric—Children’s Hospital
- Morgue—Morgue

Medical Center PPD will hold both CCC patient transport elevators w on the ground floor. One will be used to transport victims from the Emergency Department to other treatment areas. The second patient transport elevator will be used to transport patients from OR and ICU to inpatient units.

Other Established Alert 1 Areas

- Command Center (EOC)—N102
- Family Center—H116
- Media Center—HSC 307
- Inpatient Discharge Point—Kentucky Clinic lobby, Limestone entrance
- General Personnel Pool—Hospital Cafeteria
- Physician Pool—H133
- Nursing Resources Allocation Center—H178

The Kentucky Clinic will close all clinics when an Alert 1 has been confirmed and issued. Kentucky Clinic personnel who do not have specific disaster response assignments will report to the personnel pool. Clinic areas may be used as back-up treatment areas as needed during disaster response.

Personnel Assignments and Direction

Personnel essential to command and control in a mass casualty incident have been given assigned specific roles under the Hospital Emergency Incident Command System (HEICS). Alternates also have been named to facilitate response. Staff will assume those roles as they are activated by the section chief.

To facilitate immediate response while the command center is being established, the Alert 1 responsibilities of certain staff are outlined in this plan and in departmental plans. Staff who has specific assignments will report to designated locations to assume their roles.

Nurses who do not have specific assignments will report to the Nursing Resources Allocation Center. Other employees who do not have specific assignments will report to the personnel pool.

Off duty employees who are reporting for emergency response duties will enter the Hospital grounds from University Drive and park in the Hospital or KY Clinic parking structure. Staff will be required to present their Medical Center ID badges to enter hospital grounds.
**Work Shifts**
During emergency response all Hospital employees are considered essential personnel.

- If an employee is on duty at the time the Alert 1 is announced, they are expected to remain on duty until notified that disaster response efforts are complete or until they are officially relieved of duty.
- If an employee is notified to report to the Hospital for disaster response duty, they are expected to report as soon as possible and to remain on duty until the disaster response effort is complete or until they are officially relieved of duty.

If a supervisor needs replacement or back-up personnel, they should telephone, page, or send a runner to the appropriate personnel pool to request assistance.

**Departmental Planning Responsibilities**
Each director will develop a service area response plan that outlines roles and responsibilities of designated employees under the HEICS, in general, and Alert 1 contingency plan, in particular. Each plan must include a procedure for notifying off-duty staff.

Before finalizing the plan, the service director will submit the plan to the Hospital safety officer and Emergency Management Subcommittee for approval. Once the plan has been finalized, the director will provide comprehensive training for their employees. New employees will be trained as a part of departmental orientation.

The director will review the plan at least annually and will revise the plan whenever personnel, location, or structural changes occur.

**Employee Education and Training**
All hospital employees are introduced to the Hospital’s emergency management plan and the HEICS during Hospital orientation.

Each employee learns about their role in emergency management and specific contingency plans during departmental orientation and completes the emergency management CBL. Continuing education is provided annually and whenever the plan changes.

Approved by Richard Lofgren, M.D., Chief Medical Officer
Approved by Sandra E. Chambers, Assistant Hospital Administrator
Authorized by Murray B. Clark, Jr., Associate VP for MC Operations
Appendix 1
Initial Roles and Responsibilities under Plan

Triage Unit Leader
• Report to ED parking lot
• Oversee triage area set up
• Organize and direct staff
• As casualties arrive, assess casualties and direct appropriately

Incident Commander
• When notified of community disaster (Alert 1)
• Gather information about disaster from ED Attending
• Type and nature of incident
• Number of casualties
• Number of patients coming to UK
• Nature of injuries
• ETA
In consultation with ED Attending, determine whether to initiate Alert 1. If decision is made to initiate Alert 1:
• Notify paging operator, 3-5200.
• Report to N102, establish Command Center
• Assign HEICS roles as appropriate to disaster

Hospital Operations Administrator (Medical Care Director)
If Alert 1 occurs when an administrator is not on site, the HOA may assume the role of incident commander until the administrator-on-call arrives.

Under normal circumstances, the HOA will serve as the medical care director, reporting directly to the operations chief.
• Establish auxiliary command center (H-178).
• Activate HEICS section positions.
• Assess bed and staffing availability.
• Organize information and send to operations administrator.

Environmental Services Staff
• Initially, report to H16.
• If assigned to triage, report to triage unit leader: (2 employees)
• Deliver triage supply box to triage area.
• Bring stretchers and wheelchairs from ED to parking lot or area where triage is established.
• Gather stretchers and wheelchairs from throughout Hospital. Bring to vendor area for staging.
• As needed, transport stretchers and wheelchairs from vendor area to ED ambulatory entrance. Note: One ES staff member should be stationed in triage to provide stretchers and wheelchairs as needed.
• If assigned to stretcher/wheelchair clean up, report to materials supply unit leader: (one to two employees).
• Set up cleaning area in HA063.
• Clean stretchers/wheelchairs.
• Deliver clean stretchers/wheelchairs to vendor area.
• If assigned to transport, report to triage unit leader: (two to three employees)
• Report to ED parking lot or area where triage is established.
• After casualties are triaged, transport to designated treatment area.
• After transport, if stretcher/wheelchair is soiled, take to HA063 for cleaning.
• Return to ED entrance to continue transport.
• If assigned to clean patient rooms: (All remaining staff)
  • Stand by in H16 for assignment.

Medical Center PPD
• Report to facility unit leader, H43.
  • If assigned to CCC patient transport elevators, secure on elevator on ground floor for transport of casualties to OR.

Appendix 2
Patient Tracking

Initial patient information will be transmitted from triage to the Command Center by fax or runner. The planning chief will assure that the patient tracking officer receives the information.
• The patient tracking officer will share information with the patient information officer so that family notification can begin.
• The patient tracking officer will maintain a log of patient locations. Patient location and condition updates will be transmitted to the Command Center using a logging system kept on each treatment unit.
• The patient information officer, working with the Red Cross and other agencies, will attempt to notify the victim's family, using information on the tag. When the family is reached, the patient information officer will document notification and send information to public information officer in Command Center.
SUBJECT: Mutual Aid Plan
SEE ALSO: Hospital policy HP12-11, Mass Casualty Response Plan

INFORMATION
University of Kentucky Hospital recognizes the potential for a chemical, biological agent, or radiation exposure posed by Hospital operations, University and community research, local industry, terrorism, or interstate transport. In an effort to respond more effectively to such an event, the Hospital has adopted an all-hazard approach to all disasters, using the Emergency Incident Command System (HEICS). HEICS provides for a simplified chain of command or management structure for communications decision-making during disasters.

University of Kentucky Hospital has a mutual aid agreement with other hospitals in the Lexington-Fayette county area and with several community hospitals throughout the state.

This agreement acknowledges the Hospital’s commitment to accept patients evacuated from those hospitals due to emergency situations, based on the Hospital’s bed availability and operating capabilities at the time of the event. This mutual aid agreement also acknowledges the other hospitals’ commitment to accept patients evacuated from the University of Kentucky Hospital in the event of a disaster. Procedural aspects of that part of the mutual aid agreement are outlined in the Hospital’s evacuation contingency plan.

The Hospital may allow the evacuating facility to transfer staff to care for patients.

Departments that have specific responsibilities for implementation will document procedures for their areas to comply with this policy.

Notification and Plan Activation

When a hospital within the region has an emergency situation that necessitates facility evacuation, the evacuating hospital or the Lexington-Fayette County Emergency Operations Center will notify the Capacity Command Center in Admitting and request that UK Hospital assess its ability to accept evacuated patients.

The Capacity Command Center may provide preliminary bed availability information, but plan activation is the decision of the Hospital administrator-on-call.

Assessing Current Inpatient Status

1. When a unit is notified that the Hospital is expecting patients evacuated from another facility, the Hospital operations administrators (HOA) and Capacity Command Center will consult with the physicians and staff nurses to determine whether any patient is eligible for immediate discharge.
2. The division charge nurse/HOA will complete the nursing disaster report.
3. If patients on the unit are eligible for discharge, the physician will write orders for discharge, follow-up, and prescriptions.

The bed assignment clerk will:
• notify the administrator-on-call
• notify the Hospital operations administrator
• gather appropriate information, including a contact name and telephone number
• notify the Admitting supervisor-on-call
  2 -- HP12-15, Mutual Aid Plan

The administrator-on-call will confer with appropriate parties and determine the Hospital’s ability to accept evacuated patients. (Plan activation assumes that patients will remain at UK Hospital for at least 24 hours.)

If a decision is made to activate the mutual aid plan, the administrator-on-call will notify:
• Evacuating hospital or LFUCG EOC (258-3847 or 258-3870)
• Admitting supervisor-on-call
• Emergency Department charge nurse
• Chief of staff
• Hospital safety officer
• Security director
• Emergency Transport communications officer
• Pharmacy director

These representatives will notify other appropriate staff, as outlined in their departmental or area plans, and will form a command center to oversee response operations and resource allocation.

Command Center
The Hospital recognizes that success of emergency response activities is due to an integrated effort by all functional areas of the Hospital. In order to ensure coordination of all Hospital resources allocated to the disaster response effort, the Hospital will establish a command center in N102 or other suitable location.

Like most disaster response efforts, mutual aid response requires significant real-time planning and implementation, based on the specific situation. The primary purpose of the command center is to identify and allocate resources appropriately and to provide administrative coordination and support for all Hospital resources allocated to the response effort.

Command Center Personnel
The Hospital administrator-on-call initially assumes the role of response coordinator. After consultation with other command center staff, the administrator-on-call may relinquish responsibility to another administrator, if appropriate.

In most cases, Hospital administrators, the chief of staff, and other key staff will assume disaster response responsibilities consistent with their primary responsibilities.

To ensure appropriate coordination and documentation of disaster response activities, the response coordinator may assign the following functions to members of the administrative or support staffs and other functions as needed.

Operations: The operations officer will work with key personnel to ensure that the goals and assignments of the command center are carried out and that all necessary patient care and support functions are appropriately staffed. In some cases, a personnel pool may be formed from which essential functions are staffed. Representatives from the chief of staff’s office will work to ensure appropriate physician resources.
Logistics: The logistics officer will work with key personnel to ensure that patient care and support services have the supplies, equipment, and utilities necessary to perform essential functions.

Finance Officer: The finance officer will work with key personnel to track expenditures for cost recovery and to ensure that funds can be allocated for special purchases essential to disaster response.

Liaison: The liaison will establish contact and work with external agencies responding to the disaster.

Public Relations Officer: The public relations officer will establish a media center and provide official information to the media. The public relations officer will coordinate release of patient information with the command center and the family center.

Security Officer: The security officer will work with Security and other assigned staff to limit building and grounds access.

Administrative assistants will work with assigned administrators to:
- answer command center telephone lines
- document actions taken during disaster response
- act as runners
- assume other duties as assigned.

**Communicating with External Agencies and Patients’ Families**
The liaison will communicate with external agencies to obtain necessary resources and to help ensure a successful transfer of patients.

The liaison will notify the Red Cross that the mutual aid plan has been activated and that the Hospital is accepting patients evacuated from another facility. The Red Cross will assist in notifying families.

If necessary, Patient & Family Services staff may establish a family center to assist in communicating with patients’ families.

**Transportation Resources**
The administrator-on-call, in consultation with Emergency Transport, will determine whether UK Hospital-based transportation resources can be allocated to assist in moving patients from the evacuating facility to the UK Hospital.

**Triage and Room Assignment**
Since patients being evacuated from another hospital are assumed to be stable, unless otherwise indicated, a triage and holding area will be established in the north lobby of the Hospital or other designated area. The Emergency Department nurse or designee will oversee the set-up of the triage area. Housekeeping staff will be dispatched to transport necessary tables, beds, and stretchers to the north lobby and to assist with the set-up. Respiratory Care will be notified to provide oxygen cylinders and respiratory services to the area. Materials Management will be notified to provide supplies for the triage area.

Triage will be coordinated by an Emergency Department nurse and a medical/surgical divisional charge nurse or manager-on-call.
If the incident has resulted in casualties or the evacuating hospital is transferring seriously ill patients, arrangements will be made for these patients to be transported directly to and triaged in the Emergency Department.

Triage personnel will assess arriving patients and work with the Capacity Command Center to provide expeditious bed assignment. In some cases, a boarding ward may be established in the holding area only until beds become available. Once a room is assigned, transport aids will transport patients and all available patient records from the holding area to the unit.

If the Hospital segregates patients evacuated from the other hospital by opening a vacant patient care unit, the Hospital may request clinicians from the evacuating hospital to care for transferred patients. This decision will be based on the identified staffing needs of UK Hospital, as the receiving facility.

Triage personnel will include:
- registration counselors
- two nurses
- physician
- transport team (transports or Rehabilitation Services staff)
- respiratory therapist
- security (a secure area and two tables for registration)

Assessing Additional Bed Availability
Although the UK Hospital has agreed to accept patients evacuated from another facility based on bed availability, in some cases the Hospital may assess its ability to fill additional beds for incoming patients.

Plan Termination
The Hospital command center will oversee a phased-approach to plan termination. Primary response will cease when all evacuated patients, designated to be transferred to University of Kentucky Hospital, have been received, triaged, and appropriately placed.

Additional response efforts, primarily involving the continuing care of patients transferred from the evacuated hospital, may continue over an indefinite period of time.

Approved by Anna L. Smith, Assistant Hospital Administrator
Approved by Richard Lofgren, M.D., Chief Medical Officer
Authorized by Murray B. Clark, Jr., Associate VP for MC Operations
SUBJECT: Decontamination Plans for Chemical, Biological Agent, and Radiation Exposures

SEE ALSO: Hospital policies HP06-01, Medico-Legal Specimens; HP10-29, Handling of Chemical Waste; HP12-11, External Disaster Response; Bioterrorism Plan

INFORMATION

University of Kentucky Hospital recognizes the potential for a chemical, biological agent, or radiation exposure posed by Hospital operations, University and community research, local industry, terrorism, or interstate transport. In an effort to respond more effectively to such an event, the Hospital has adopted an all-hazard approach to all disasters, using the Emergency Incident Command System (HEICS). HEICS provides for a simplified chain of command or management structure for communications decision-making during disasters.

This plan has been developed to establish guidelines for treating patients who present to the Emergency Department and are thought to be contaminated with chemicals, biological agents, or radioactive materials. The plan has been developed in consultation with the Lexington-Fayette County Division of Environmental and Emergency Management (DEEM), which assumes responsibility for community emergency response planning.

The Emergency Department maintains medical management information regarding exposure to chemicals or biological agents known to be used or stored within our geographical region or recognized as potential terrorist agents.

Each Hospital area and department that uses hazardous or radioactive materials or handles biological agents will, in collaboration with the Hospital Environment of Care Committee, have written procedures specific to their areas for dealing with exposures.

Note: If exposures seem crime-related, all personnel will treat personal belongings and clothing as medico-legal specimens.

Internal Exposure Incident (Hospital, Medical Center, or University Exposures)
1. If a hazardous chemical, radiation, or biological agent exposure occurs within the Hospital, the Medical Center, or University campus, call 911 (UK Police) immediately.
2. Before transporting any exposure victim to the Emergency Department, call 3-5901 for instructions. To reduce the risk of further contamination and/or additional exposures, the initial decontamination should proceed according to the area’s procedures or under the direction of the Lexington Fire Department’s Hazardous Materials team before the victim is transported to the Emergency Department.

External Exposure Incident
1. If the Emergency Department or Air Medical Communications receives a call that a chemical, radiation, or biological agent exposure incident has occurred, the person receiving the call should notify the Emergency Department charge nurse and the Emergency Department attending physician. The UK Air Medical dispatcher or ED charge nurse receiving the call should obtain the following information:
   • type and nature of incident.
   • telephone number of caller so that call can be verified, if information is received by
other than normal emergency channels.

- number of victims.
- signs/symptoms of exposure.
- nature of injuries.
- name of chemicals, radioactive materials, or biological agents involved.
- extent of decontamination (MSDS, if available).
- if radiation victim, whether patient is contaminated or irradiated, and the physical identity of the contaminant.
- estimated time of arrival of victims.

2. The Emergency Department charge nurse/dispatch will request that clothing be removed and left at the scene, if possible. Remind Emergency Medical Services to bring patients to ambulance entrance.

3. Request assistance from Lexington Fire Department by calling the Lexington Fire Department dispatch if assistance is needed for unknown chemicals or biological agents, primary contamination, or for specific information. The Lexington Fire Department Hazardous Materials team may fax information on identified chemicals or biological agents.
Additional information may be obtained or requested as necessary from:
 ATSDR Hotline at 1-404-639-6360,
 CHEMTREC at 1-800-424-9300 and/or Poison Control,
 CDC 24-hour emergency response at 1-770-488-7100
 Micromedex

4. The ED charge nurse, attending physician, and Hospital operations administrator will determine if the Hospital Incident Command Center should be established for
• communication with the ED, DEEM, CSEPP, media, CDC, and other agencies; and
• allocation of resources to care for existing ED patients as well as contaminated patients.
2 -- 12-13, Decontamination Plan

Emergency Department charge nurse will notify:
• nursing decontamination team.
• attending physician, who will contact the chair of Emergency Medicine at 259-8326.
• financial counselors.
• Hazardous Materials Management, if chemical or biological agent exposure, at on-call pager 323-5728 during the day or 222-4805 during evenings.
• paging operator.
• ED attending physician.
• UK Hospital Security

Emergency Department financial counseling staff will notify:
• Pharmacist on duty to assist with preparation of antidotes or selected medications, as appropriate.
• Infection Control at 3-6337 Monday through Friday from 8:00 a.m. to 5:00 p.m., or 259-7009 for evenings, weekends, and holidays (if biological agent suspected).
• PPD at 323-6285.
• Materials Management, if trauma involved.
• OR, if trauma involved.
• additional nursing staff, as directed by the ED charge nurse.

Paging operator will notify:
• Hospital operations administrator.
• Hospital safety officer.
• UK Public Relations.
• Hospital administrator on-call.

ED attending physician will notify:
• chair of Emergency Medicine

Departmental Response

Emergency Department staff will:
• Establish and prepare decontamination area, at the direction of the charge nurse or decontamination leader.
• Before patient decontamination begins, the charge nurse or decontamination leader will assign decontamination responsibilities, inspect the set-up, and brief the decontamination team to ensure that all protocols for decontamination appropriate to the situation and all other safety precautions are being followed.

PPD personnel will:
• Turn off air handlers in affected areas (internal exposures).
• Turn on air line valves.
Medical Center Security will:
• Station guard at ambulatory and ambulance entrances of Emergency Department to ensure that no contaminated patients enter the Emergency Department.
• Block off ambulance entrance area with hazardous material tape.
• Direct all other ambulances to alternative entrance.
• Block the entrance to the Children’s Hospital.
• Block off entrance to decontamination zone.
• Direct pedestrian traffic on the Hospital walkway.
• Secure the contaminated area until the waste is removed.
• Station guard at all other public entrances to the Hospital.

Air Medical Communications will:
• Instruct incoming ambulances that establish radio contact to use alternative entrance.

Materials Management will:
• Bring necessary supplies to the area as requested by Emergency Department.
• Obtain additional supplies, if needed.

Radiation safety officer (in the event of a radiation incident) will:
• Check equipment and take background test.
• Survey victims as they enter area; ambulance crew may be included.
• Remain in area to monitor all victims, personnel, equipment, and samples leaving area.
• Check dosimeters every 15 minutes. Personnel who experience 75 or higher rems exposure will be replaced.

Note: Attendants will stay with ambulance until they and the ambulance have been monitored for contamination.
• If attendants are not contaminated, they will be released for duty.
• If attendants are contaminated, they will proceed to decontamination area.

Cleaning and Disposal
Hazardous Materials Management will oversee and coordinate cleanup of decontamination area and disposal of rinsate, clothing, protective equipment, and supplies, as appropriate.

If the incident involves radiation Hazardous Materials Management will coordinate clean up and disposal with the radiation safety officer.

Hazardous Materials Management will maintain contracts with outside agencies to assist in clean up and disposal if necessary. In some cases, Physical Plant, under the direction of Hazardous Materials Management, may assist in clean up and disposal. No rinsate resulting from decontamination activities will be disposed of without authorization from Hazardous Materials Management. In some cases, Hazardous Materials Management may assist in identifying contaminants or otherwise act as a consultant in the decontamination process or plan.

When the Hazardous Materials Management is notified that the Hospital has implemented the decontamination plan, designated personnel will stand by for notification to begin clean up and disposal activities. In cases in which mass
casualties are transported to the Hospital for decontamination, Hazardous Materials Management may be asked to assist in set-up of decontamination equipment and to pump rinsate into a reservoir during decontamination activities.

Staff Education and Training

Emergency Department nursing staff involved in decontamination procedures will be trained, including a two-day haz-mat operations level course and two annual refresher courses.

The Hospital will conduct decontamination or other disaster response drills in compliance with the standards established by JCAHO and in accordance with recognized facility and community needs.

Approved by Anna L. Smith, Assistant Hospital Administrator
Approved by Byron Young, M.D., Chief of Staff
Authorized by Joseph O. Claypool, FACHE, Hospital Director