Washington Township Health Care District
2000 Mowry Avenue, Fremont, California 94538-1716 | 510.797.1111
Kimberly Hartz, Chief Executive Officer

BOARD OF DIRECTORS MEETING
Wednesday, June 26, 2024 – 6:00 P.M.
Board Room of Washington Hospital, 2000 Mowry Avenue, Fremont and via Zoom
https://zoom.us/j/99897895588?pwd=ebUZYcJV2sFJYqWPGprE47Hhz07lR4.1
Passcode: 848411

Board Agenda and Packet can be found at:
June 2024 | Washington Hospital Healthcare System (whhs.com)

AGENDA

		PRESENTED BY:
I.	**CALL TO ORDER & PLEDGE OF ALLEGIANCE**	Jacob Eapen, MD President
II.	**ROLL CALL**	Cheryl Renaud District Clerk
III.	**COMMUNICATIONS**	
	A. Oral *This opportunity is provided for persons in the audience to make a brief statement, not to exceed three (3) minutes on issues or concerns not on the agenda and within the subject matter of jurisdiction of the Board. "Request to Speak" cards should be filled out in advance and presented to the District Clerk. For the record, please state your name.*	
	B. Written	
IV.	**CONSENT CALENDAR** *Items listed under the Consent Calendar include reviewed reports and recommendations and are acted upon by one motion of the Board. Any Board Member or member of the public may remove an item for discussion before a motion is made.*	Jacob Eapen, MD President
	A. Consideration of Medical Staff: Added Neurosurgery for Nurse Practitioner Privileges	*Motion Required*
	B. Consideration of Medical Staff: Revised Registered Nurse First Assistant Privileges	

C. Consideration of Medical Staff: Eliminated Supervising Physician Privileges

D. Consideration of Medical Staff: Added Cardiology Adult Structural Cardiac Procedures Special Privileges

E. Consideration of Medical Staff: Added Core Trauma Privileges

F. Consideration of Medical Staff: Trauma Handbook

G. Consideration of Medical Staff: Trauma Service Performance Improvement & Patient Safety (PIPS) Plan

V.	**PRESENTATIONS**	**PRESENTED BY:**
	A. Budget Estimate FY 2024-2025	Thomas McDonagh Vice President and Chief Financial Officer Jessica Haviland Senior Director of Financial Planning & Analysis and Treasury

VI. **ACTION**

A. Consideration of Resolution No. 1264: Budget for the Morris Hyman Critical Care Pavilion Infill Project	*Motion Required*
B. Consideration of Resolution No. 1265: Budget Estimate FY 2024-2025	*Motion Required*
C. Consideration of Bids for the UCSF-WHHS Cancer Center Project	*Motion Required*
D. Consideration of Phase I, Fremont Office Center, Project Management and Architectural Fees	*Motion Required*

VII. **ANNOUNCEMENTS**

VIII. **ADJOURN TO CLOSED SESSION**

A. Consideration of Closed Session Minutes of the Meetings of the District Board: May 20 & 22, 2024 — *Motion Required*

B. Reports regarding Medical Audit & Quality Assurance Matters pursuant to Health & Safety Code Section 32155 — *Motion Required*

- Medical Staff Committee Report

C. Conference Involving Trade Secrets pursuant to Health & Safety Code Section 32106

- Strategic Planning

IX. **RECONVENE TO OPEN SESSION & REPORT ON PERMISSABLE ACTIONS TAKEN DURING CLOSED SESSION** — Jacob Eapen, MD, President

X. **ADJOURNMENT** — Jacob Eapen, MD, President

In compliance with the Americans with Disabilities Act, if you need assistance to participate in this meeting, please contact the District Clerk at (510) 818-6500. Notification two working days prior to the meeting will enable the District to make reasonable arrangements to ensure accessibility to this meeting.

Washington Hospital Healthcare System

SINCE 1948

Memorandum

DATE: May 20, 2024

TO: Kimberly Hartz, Chief Executive Officer

FROM: Mark Saleh, MD, Chief of Staff

SUBJECT: MEC for Board Approval:

The Medical Executive Committee, at its meeting on May 20, 2024, approved the below-listed privileges:

1. Added - Neurosurgery for Nurse Practitioner
2. Revised - Registered Nurse First Assistant
3. Eliminated – Supervising Physician Privilege

Please accept this memorandum as a formal request for presentation to the Board of Directors for final approval of the attached above-listed privileges.

Neurosurgery for Nurse Practitioner
Delineation of Privileges

Required Qualifications

Membership	Hold current Nurse Practitioner Core Privileges
Education/Training	Current BLS certification from the American Heart Association. Document the successful completion of an ENLS certification from the Neurocritical Care Society.
Clinical Experience (Initial)	If the training under "Education/Training" is more than 12 months old the applicant must be able to provide documentation of the provision of Neurosurgery cases (successful management of a minimum of 10 cases) during the previous 24 months
Clinical Experience (Reappointment)	Applicant must be able to provide documentation of the provision of Neurosurgery cases (successful management of a minimum of 10 cases) during the previous 24 months

Privileges: Neurosurgery

- Intracranial Pressure Monitor - ICP, and External Ventricular Drain - EVD Management, Manipulation, and Removal
- Lumbar Drains - Management, Manipulation, and Removal
- Subdural Drains - Management, Manipulation, and Removal
- Ventriculoperitoneal Shunt - VP Shunt Management, Reprogramming, Tapping, and Manipulation

FPPE
Six concurrent case reviews by a physician currently holding Neurosurgery privileges.

Washington Hospital Medical Staff

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Registered Nurse First Assistant

Delineation of Privileges

Applicant's Name: Test, Provider

Instructions:

1. Click the **Request** checkbox to request a group of privileges such as *Core Privileges* or *Special Privileges*.
2. **Uncheck** any privileges you do not want to request in that group.
3. When requesting your privileges, please remember you must be able to demonstrate current competency to be granted or to have a privilege renewed.
4. Please pay close attention to make sure you submit all required forms (i.e., activity, case logs), as incomplete files cannot be processed
5. Electronically Sign/Date form.

Notes:

- Applicants are not required to apply for all specialty-specific Core Privileges. If requirements exist for a particular specialty, the criteria will be outlined under the required qualifications section of each privilege form.
- Applicants may request privileges that apply to multiple specialties if they qualify.
- **IMPORTANT-If you have not met the minimum activity requirements for any privileges; do not check the boxes for those privileges.**

Facilities

☑ **WH**

Required Qualifications

Licensure	Current license as an RN **AND** Applicant must have a supervising physician licensed in the State of California. The supervising physician must be a member of the Active or Provisional/Active WHHS Medical Staff in good standing within the Department of Surgery and has obtained prior approval from the Medical Board of California to be a Supervising Physician. **AND** Applicant may be employed by WHHS, but must still go through the credentialing process for this Allied Health Professional category.
Education/Training	Applicant must provide proof of documentation of a minimum of 5 years diversified operating room nursing experience. **AND** Completion of an RNFA program that meets the "AORN standards for RN first assistant education programs" and is accepted by CCI. These programs should be equivalent to one academic year of formal, post-basic nursing study; consist of curricula that address all of the modules in the Core Curriculum for the RN First Assistant; and award college credits and degrees or certificates of RNFA status upon satisfactory completion of all requirements. The RNFA programs should be associated with schools of nursing at universities or colleges that are accredited for higher education by an accrediting agency that is nationally recognized by the Secretary of the US Department of Education. **AND** The registered nursing program should be approved by a state licensing jurisdiction for nursing programs at the university, college, or community college level or by another national

	or regional agency that is nationally recognized by the Secretary of the US Department of Education as a specialized accrediting agency for nursing programs.
Continuing Education	Applicant must attest to having completed 50 CE credits within the previous 24 months directly related to the practice of RNFA services (waived for applicants who have completed training during the previous 24 months).
Certification	Current ACLS **AND** Certification in Operating Room Nursing (CNOR) by the Competency and Credentialing Institute (CCI). ~~**AND** Current certification as a CRNFA by the CCI.~~
Clinical Experience (Initial)	Applicant must be able to provide documentation of provision of RNFA services (at least 12 procedures of a variety of the procedures within the core) representative of the scope and complexity of the privileges requested during the previous 24 months.
Clinical Experience (Reappointment)	Applicant must be able to provide documentation of provision of RNFA services (at least 12 procedures of a variety of the procedures within the core) representative of the scope and complexity of the privileges requested during the previous 24 months.

Core Privileges in Registered Nurse First Assistant	
Description:	
Request WH	Check the Request checkbox to select all privileges listed below. **Uncheck** any privileges you do not want to request in that group. ☐ - Currently Granted privileges
	Perioperative Privileges
☐	Perform preoperative evaluation/focused nursing assessment (interview the surgical patient for a comprehensive health history)
☐	Provide patient education
☐	Communicate/collaborate with other health care providers regarding the patient plan of care
☐	Document preoperative orders in conformance with established protocols
	Intraoperative Surgical First-Assisting under Direct Physician Supervision
☐	Use and apply instruments/appliances/medical devices
☐	Cut tissue and provide wound/field exposure
☐	Provide hemostasis by applying hemostatic clamps or clips, coagulating bleeding points and ligating bleeding vessels
☐	Suturing fascia, subcutaneous, and skin tissues
	Postoperative Patient Management
☐	Document postoperative orders/operative notes in conformance with established protocols
☐	Participate in postoperative rounds to evaluate patient condition

☐	Perform postoperative activities, including removing sutures, chest tubes, drains or pacing wires
☐	Assist with discharge planning, provision of discharge instructions and identify appropriate community resources as needed

FPPE	
WH	
	Six direct observation case reviews. Proctored by an Active Medical Staff member.
	Feedback from OR Supervisor
	Feedback from anesthesiologist
	Evaluation of OPPE data collected for review of competency/performance.

Acknowledgment of Applicant

I have requested only those privileges for which I as qualified by education, training, current experience, and demonstrated current competency I am entitled to perform and that I wish to exercise at Washington Hospital and I understand that:

A. In exercising any clinical privileges granted, I am constrained by Hospital and Medical Staff Bylaws, policies and rules applicable generally and any applicable to the particular situation.
B. Any restriction on the clinical privileges granted to me is waived in an emergency situation and in such situation my actions are governed by the applicable section of the Medical Staff Bylaws or related documents.
C. I certify that I have no emotional or physical condition that would affect my ability to perform these privileges.
D. Furthermore, I attest that the information I have provided about my clinical activity is accurate and true.

Practitioner's Signature

WH

Department Chair Recommendation - Privileges

I have reviewed the requested clinical privileges and supporting documentation and my recommendation is based upon the review of supporting documentation and/or my personal knowledge regarding the applicant's performance of the privileges requested:

Privilege	Condition/Modification/Deletion/Explanation

Washington Hospital Medical Staff
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Supervising Physician

Delineation of Privileges

Applicant's Name: Test, Provider

Instructions:

1. Click the **Request** checkbox to request a group of privileges such as *Core Privileges* or *Special Privileges*.
2. **Uncheck** any privileges you do not want to request in that group.
3. When requesting your privileges, please remember you must be able to demonstrate current competency to be granted or to have a privilege renewed.
4. Please pay close attention to make sure you submit all required forms (i.e., activity, case logs), as incomplete files cannot be processed
5. Electronically Sign/Date form.

Notes:

- Applicants are not required to apply for all specialty-specific Core Privileges. If requirements exist for a particular specialty, the criteria will be outlined under the required qualifications section of each privilege form.
- Applicants may request privileges that apply to multiple specialties if they qualify.
- **IMPORTANT-If you have not met the minimum activity requirements for any privileges; do not check the boxes for those privileges.**

Facilities

☑ **WH**

Required Qualifications

Qualifications	Qualified practitioners within any of the Departments of the Medical Staff may apply for privileges contained in this document. The Department Chair or designee is responsible for reviewing the qualifications and making recommendation(s) for this privilege. **AND** The physician should be a member in good standing of the Active or Provisional Active Medical Staff.
Membership	Meet all requirements for medical staff membership if applicable.
Utilization of AHP in the Hospital Setting	The supervising physician shall not supervise more than (4) four Allied Health Professionals at one time. Advanced Practice Professionals are not permitted to function independently in the inpatient or outpatient Hospital setting. Medical Staff members who serve as Supervising Physicians to AHP's must agree to abide by the standards set forth in the Credentialing Policy. Advanced Practice Professionals are not granted inpatient admitting privileges and therefore may not admit patients independent of the Supervising Physician. An Advanced Practice Professional may assist his or her Supervising Physician in fulfilling his or her responsibility to round daily on all inpatients for whom the Supervising Physician is the designated attending physician, as appropriate.
Supporting Documentation	Delegation of Services Agreement outlining those specific duties that the PA would be permitted to perform under supervision and outside the immediate supervision and control. Protocols governing all procedures to be performed by the NP shall state the information to be given to the patient, the technique for the procedure and the follow up care. The minimum content for a protocol governing diagnosis and management as referred to in this section shall include the presence or absence of

symptoms, signs, and other data necessary to establish a diagnosis or assessment, any appropriate tests or studies to order, drugs to recommend to the patient, and education to be given the patient.

APP Definitions: Licensed Independent Practitioners practicing at the Hospital are as follows: 1) Nurse Practitioner, 2) Certified Nurse Midwife Advanced Practice Professionals practicing at the Hospital are as follows: 1) Physician Assistant, 2) Registered Nurse First Assist, 3) Perfusionist

Supervising Physician for Allied Health Professionals

Supervising Physician accepts full legal and ethical responsibility for the performance of all professional activities of the AHP.

Qualifications

Education/Training	Completion of accredited Physician Assistant training program including training in central venous access, chest tube insertion, chest tube removal, arterial line insertion, pulmonary artery/central venous catheter removal, thoracentesis, removal of temporary pacemaker wires, and/or intra-aortic balloon pump removal; or didactic course with "hands-on" experience for each privilege requested at an accredited facility deemed to be appropriate by the Department Chair or designee. Applicant must be able to provide proof of documentation for each privilege requested.
Clinical Experience (Initial)	Applicant must be able to provide documentation of provision of physician assistant - medicine services (at least 5 of each procedure requesting) representative of the scope and complexity of the privileges requested during the previous 24 months.
Clinical Experience (Reappointment)	Applicant must be able to provide documentation of provision of physician assistant - medicine services (at least 5 of each procedure requesting) representative of the scope and complexity of the privileges requested during the previous 24 months.
Additional Qualifications	Must qualify for and be granted core physician assistant privileges. Applicants who meet the criteria for Special Privileges under Physician Assistant - Medicine have Supervising Physicians in the following Specialties: Cardiology or Nephrology.

Request	WH	
		Check the Request checkbox to select all privileges listed below. **Uncheck** any privileges you do not want to request in that group. ☐ - Currently Granted privileges
		Supervising Physician for Allied Health Professionals
☐		Supervising Physician for Allied Health Professionals

FPPE

WH	
☐	Review of the first 3 cases of by a physician who has unrestricted Supervising Physician AHP privileges. The proctor does not need to be from the same specialty.
☐	Review of OPPE data collected related to Supervising AHP.

Acknowledgment of Applicant

I have requested only those privileges for which I as qualified by education, training, current experience, and demonstrated current competency I am entitled to perform and that I wish to exercise at Washington Hospital and I understand that:

A. In exercising any clinical privileges granted, I am constrained by Hospital and Medical Staff Bylaws, policies and rules applicable generally and any applicable to the particular situation.
B. Any restriction on the clinical privileges granted to me is waived in an emergency situation and in such situation my actions are governed by the applicable section of the Medical Staff Bylaws or related documents.
C. I certify that I have no emotional or physical condition that would affect my ability to perform these privileges.
D. Furthermore, I attest that the information I have provided about my clinical activity is accurate and true.

Practitioner's Signature

WH

Department Chair Recommendation - Privileges

I have reviewed the requested clinical privileges and supporting documentation and my recommendation is based upon the review of supporting documentation and/or my personal knowledge regarding the applicant's performance of the privileges requested:

Privilege	Condition/Modification/Deletion/Explanation

Washington Hospital Healthcare System

SINCE 1948

Memorandum

DATE: June 17, 2024

TO: Kimberly Hartz, Chief Executive Officer

FROM: Mark Saleh, MD, Chief of Staff

SUBJECT: MEC for Board Approval:

The Medical Executive Committee, at its meeting on June 17, 2024, approved the below-listed privileges and documents:

1. Cardiology – Added Special Privileges: Adult Structural Cardiac Procedures
2. General Surgery – Added Core Trauma Privileges
3. Trauma Handbook
4. Trauma Service Performance Improvement & Patient Safety (PIPS) Plan

Please accept this memorandum as a formal request for presentation to the Board of Directors for final approval of the attached above-listed privileges.

Washington Hospital Medical Staff
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Cardiology

Delineation of Privileges

Applicant's Name: Test, Provider

Instructions:

1. Click the **Request** checkbox to request a group of privileges such as *Core Privileges* or *Special Privileges*.
2. **Uncheck** any privileges you do not want to request in that group.
3. When requesting your privileges, please remember you must be able to demonstrate current competency to be granted or to have a privilege renewed.
4. Please pay close attention to make sure you submit all required forms (i.e., activity, case logs), as incomplete files cannot be processed
5. Electronically Sign/Date form.

Notes:

- Applicants are not required to apply for all specialty-specific Core Privileges. If requirements exist for a particular specialty, the criteria will be outlined under the required qualifications section of each privilege form.
- Applicants may request privileges that apply to multiple specialties if they qualify.
- **IMPORTANT-If you have not met the minimum activity requirements for any privileges; do not check the boxes for those privileges.**

Facilities

☑ **WH**

Required Qualifications

Licensure	Licensed M.D. or D.O.
Membership	Meet all requirements for medical staff membership.
Continuing Education	Applicant must attest to having completed 50 AMA PRA Category I CME credits within the previous 24 months directly related to the practice of cardiovascular services (waived for applicants who have completed training during the previous 24 months).
Education/Training	Completion of an ACGME or AOA accredited Residency training program in Cardiovascular Disease. **AND** Completion of an ACGME or AOA accredited Fellowship training program in Cardiovascular Disease.
Certification	Current certification through ABMS or AOA Board American Board of Internal Medicine in Cardiovascular Disease. Exceptions to this requirement can be found in the Credentialing Policy 2.A.1.p.
Clinical Experience (Initial)	Applicant must be able to provide documentation of provision of cardiovascular disease services (at least 20 procedures of a variety of the procedures within the core) representative of the scope and complexity of the privileges requested during the previous 24 months.
Clinical Experience	Applicant must be able to provide documentation of provision of cardiovascular disease services (at least 20 procedures of a variety of the procedures within the core) representative of the

(Reappointment) scope and complexity of the privileges requested during the previous 24 months.

Core Privileges in Cardiology	
Description: Evaluation, diagnosis, consultation and treatment of patients with acute and chronic cardiovascular conditions.	
Request WH	Check the Request checkbox to select all privileges listed below. **Uncheck** any privileges you do not want to request in that group. - Currently Granted privileges
☐	Admit to inpatient or appropriate level of care
☐	Perform history and physical examination
☐	Evaluate, diagnose, provide consultation and medically manage and treat patients with cardiovascular complaints. Privileges include medical management of general medical conditions which are encountered in the course of caring for the cardiovascular patient.
	Procedures
☐	Arterial catheter insertion
☐	Elective cardioversion
☐	Electrocardiogram (EKG) interpretation including ambulatory monitoring
☐	Insertion of central venous catheter
☐	Transthoracic echocardiography
☐	Stress testing: exercise or pharmacologic
☐	Tilt table test
☐	Coronary arteriography
☐	Diagnostic right and left heart catheterization
☐	Endomyocardial biopsy
☐	Insertion of intra-aortic balloon counter pulsation device
☐	Placement of temporary transvenous pacemaker
☐	Pericardiocentesis
☐	Implantation of temporary pacemaker
☐	Bundle of HIS Electrography
☐	Pulmonary Angiography
☐	Overdrive Pacing (Implantation of permanent pacemaker including programming, reprogramming and interrogation)

☐	Aortogram for Iliac Visualization (Therapeutic vascular radiology including balloon angiography; angioplasty; stent placement; atherectomy; thrombolic therapy; and embolization/ablation including transarterial chemoembolization (excludes carotid and intracranial intervention) and treatment of aneurysms; IVC filter placement and fistula repair/creation.)

FPPE	
WH	
☐	A minimum of six retrospective case reviews of a variety of cases within the Core reflected in this document.
☐	Review of OPPE data collected for review of competency/performance.

Special Privileges: Clinical Cardiac Electrophysiology Privileges

Description: Clinical Cardiac Electrophysiology encompasses the special knowledge and skills required of cardiologists who care for patients with complex cardiac rhythm disorders, particularly those receiving diagnostic and therapeutic intervention electrophysiologic procedures. Clinical cardiac electrophysiology focuses on diagnosis, consultation and treatment of atrial and ventricular arrhythmias, including the use of cardiac implantable electrical devices (CIEDs), and the application of other interventional ablative techniques and pharmacologic treatments

Qualifications

Education/Training	Pathway 1 - Completion of an ACGME or AOA accredited Fellowship training program in Cardiovascular Disease. **AND** Pathway 1 Continued - Completion of an ACGME or AOA accredited Fellowship training program in Clinical Cardiac Electrophysiology. **AND** Pathway 1 Continued - Fellowship(s) included training in invasive electrophysiological studies and participation as operator or co-operator in a minimum of 100 invasive electrophysiological procedures with acceptable complication rates and outcomes. **OR** Pathway 2 - Completion of an ACGME or AOA accredited Fellowship training program in Cardiovascular Disease, but without specific emphasis on invasive electrophysiological procedures. **AND** Pathway 2 Continued - Attend approved didactic courses of at least 50 AMA PRA Category 1 CME hours to encompass the specialty of invasive electrophysiology. **AND** Pathway 2 Continued - Perform as primary/co-operator in 100 invasive electrophysiological procedures with documentation of techniques, acceptable results and complication rates.
Clinical Experience (Reappointment)	Applicant must be able to provide documentation of provision of cardiovascular disease services (at least 15 procedures) representative of the scope and complexity of the privileges requested during the previous 24 months.
Additional Qualifications	Applicant must qualify for and be granted privileges in cardiovascular disease (non-invasive).

Request

Check the Request checkbox to select all privileges listed below.

Uncheck any privileges you do not want to request in that group.

WH	
☐	- Currently Granted privileges
	Electrophysiology Procedures
☐	Evaluation and management of patients with: - Disorders of cardiac rhythm, including but not limited to sinus node dysfunction; atrioventricular (AV) and intraventricular block; and supraventricular and ventricular tachyarrhythmias - Unexplained syncope - Palpitations - Wolff-Parkinson-White (WPW) syndrome - Prolonged QT syndrome
☐	Comprehensive EP Studies
☐	Epicardial ablation
☐	Therapeutic catheter ablation procedures
☐	Implantation of biventricular ICD including programming, reprogramming and interrogation
☐	Lead extraction

FPPE	
WH	
☐	Evaluation of OPPE data collected for review of competency/performance.

Special Privileges: Catheter Ablation

Description: Clinical Cardiac Electrophysiology encompasses the special knowledge and skills required of cardiologists who care for patients with complex cardiac rhythm disorders, particularly those receiving diagnostic and therapeutic intervention electrophysiologic procedures. Clinical cardiac electrophysiology focuses on diagnosis, consultation and treatment of atrial and ventricular arrhythmias, including the use of cardiac implantable electrical devices (CIEDs), and the application of other interventional ablative techniques and pharmacologic treatments

Qualifications

Education/Training	Completion of an ACGME or AOA accredited Fellowship training program in Cardiovascular Disease. **AND** Completion of an ACGME or AOA accredited Fellowship training program in electrophysiology with specific training in invasive electrophysiological studies. **AND** Applicant must be able to provide documentation of participation as operator or co-operator in a minimum of 50 catheter ablation procedures with a mix of AV nodal reentrant tachycardia, atrial flutter, AV junction ablation, and ventricular tachycardia and accessory pathway ablations.
Clinical Experience (Reappointment)	Applicant must be able to provide documentation of provision of cardiovascular disease services (at least 10 procedures) representative of the scope and complexity of the privileges requested during the previous 24 months.

Request	Check the Request checkbox to select all privileges listed below. **Uncheck** any privileges you do not want to request in that group.
WH	☐ - Currently Granted privileges
	Catheter Ablation
☐	Therapeutic catheter ablation procedures

FPPE	
WH	
☐	Evaluation of OPPE data collected for review of competency/performance.

Special Privilege: Percutaneous Coronary Intervention (PCI)

Description: The competent performance of PCI requires not only a complete knowledge base and technical skills but also sound clinical judgment based on specific experience. Privileges for Specialized Cardiovascular Procedures during PCI applies to: 1. Those procedures that are currently approved by the Federal Drug Administration for unrestricted use and not to experimental devices and are available at Washington Hospital. 2. As of 10-15-04 these procedures include but are not limited to: -Rotational coronary atherectomy -Directional coronary atherectomy -intracoronary ultrasound -intracoronary rheolytic therapy.

Qualifications

Education/Training	Pathway 1 - Applicant must be able to provide documentation of successful completion of a full cardiovascular training program. **AND** Pathway 1 Continued - The program must meet the requirements of the ABIM for certification in Cardiovascular Disease and conform to the ACC 17th Bethesda Conference on Adult Cardiology Training. These requirements are the following: 1. Minimum of 12 months in a cardiac catheterization laboratory a. Participated in or performed a minimum of 300 coronary angiographic procedures; and, b. documentation of 200 angiographies as primary operator. 2. Additional year of formal PCI training a. Participated in or performed a minimum of 75 angioplasties; and, b. documentation of 35 angioplasties as primary operator. 3. Certification of a candidate's experience and competence by the program director or supervisor. **OR** Pathway 2 - Completion of an ACGME or AOA accredited Fellowship training program in Cardiovascular Disease. Training sufficient to be board eligible or certified but did not include PCI training. **AND** Pathway 2 Continued - Applicant must be able to provide documentation of a minimum of 2 years experience in performing cardiac catheterization without supervision with: a. minimum 250 cardiac catheterizations with documentation of complication rates within accepted guidelines. **AND** Pathway 2 Continued - Applicant must provide documentation of certification of competence by director of cath lab or a colleague with recognized competence. **AND** Pathway 3 - Applicant must be able to provide documentation of one of the following under this Pathway: **AND** Pathway 3a - 25 hours of AMA PRA Category I CME instruction in PCI. **OR** Pathway 3b - Performance of a minimum of 75 PCI procedures, 35 as primary operator under supervision of a physician with unrestricted PCI privileges. **OR** Pathway 3c - Certification of results by a physician with unrestricted PCI privileges. **OR** Pathway 3d - If experience gained prior to 1989, documentation of competence by laboratory director only.
Clinical Experience (Reappointment)	Pathway 1 - Applicant must be able to provide evidence of performance of 35 PCI procedures during the previous 24 months as primary operator (at any Joint Commission accredited facility) with quality indicator results equal to or greater than the benchmarks approved by the Cardiology Section.* The quality indicators will be selected by the Cardiology Section. If a practitioner meets the volume indicator, but fails to meet one or more of the quality benchmarks, s/he may be recredentialed but there must be a quality monitoring plan in place developed by the chair of the Cardiology Section and approved by the Medicine Committee. If a physician loses his/her PCI privileges, s/he must meet the original criteria for PCI. *Quality Criteria: - Rate of PCI directly to OR - Rate of death following PCI - Rate of vascular complication following PCI. **OR** Pathway 2 - If the practitioner has performed less than 35 PCIs, he/she must provide evidence of a combined total of 75 invasive cardiology procedures within that time period that include femoral artery catheterization. The combined total must include a minimum of 20 PCI's. The quality indicator results for the PCI procedures must be equal to or greater than the benchmarks approved by the Cardiology Section. There are no alternatives to Pathway 2. The practitioner must meet both the volume criteria and the quality criteria or lose privileges to perform PCI. If a practitioner loses his/her privileges, they must meet original criteria to perform PCI.

Request	Check the Request checkbox to select all privileges listed below. **Uncheck** any privileges you do not want to request in that group.
WH	☐ - Currently Granted privileges

	Procedures
☐	Coronary angioplasty and stent placement
☐	Coronary flow reserve
☐	Extraction, rotational and directional atherectomy
☐	Fractional flow reserve
☐	Intracoronary thrombolysis
☐	Intracoronary thrombectomy
☐	Intravascular ultrasound (IVUS) of coronaries

FPPE	
WH	
☐	One direct observation case review. (First case done with a physician who has privileges to perform the procedure.) Attendance at the first procedure by a company representative familiar with the technique is preferable.
☐	Evaluation of OPPE data collected for review of competency/performance.

Special Privileges: Transesophageal Echocardiography (TEE)

Description: Placement of the transesophageal probe, image acquisition and interpretation.

Qualifications

Education/Training	Pathway 1 - Completion of an ACGME or AOA accredited Fellowship training program in Cardiovascular Disease, which included transesophageal echocardiography with a letter from the course director. **OR** Pathway 2 - If not during fellowship, then applicant must be able to provide documentation of an approved course in transesophageal echocardiography and completion of 10 hours of AMA PRA Category I CME concerning TEE, or the individual responsible for the formal TEE training can submit a letter regarding the applicant's training.
Clinical Experience (Initial)	Applicant must be able to provide documentation of provision of cardiology services (at least six cases with a physician with current and unrestricted TEE privileges) representative of the scope and complexity of the privileges requested during the previous 24 months.
Clinical Experience (Reappointment)	Applicant must be able to provide documentation of provision of cardiology services (at least 4 cases) representative of the scope and complexity of the privileges requested during the previous 24 months.
Additional Qualifications	TEE for Monitoring in the Operating Room: The patient's own physician with these privileges should have the option of monitoring transesophageal echocardiography during any surgical procedure.

Request	Check the Request checkbox to select all privileges listed below. **Uncheck** any privileges you do not want to request in that group.
WH	☐ - Currently Granted privileges
	Procedures
☐	Transesophageal Echocardiography (TEE) including probe placement, image acquisition and interpretation.

FPPE	
WH	
☐	One direct observation case review.
☐	Evaluation of OPPE data collected for review of competency/performance.

Special Privileges: ICD Implamentation

Description: The competent performance of implantable cardioverter-defibrillator (ICD) device placement requires not only a complete knowledge base and technical skills, but also sound clinical judgment based on specific experience. The following guidelines for the training necessary to perform ICD device placement are established. This procedure will be performed either in the Operating Room or Cath Lab.

Qualifications

Education/Training	Pathway 1 - Completion of an ACGME or AOA accredited Fellowship training program in Cardiovascular Disease. **AND** Pathway 1 Continued - Completion of an ACGME or AOA accredited Fellowship training program in electrophysiology with specific training in invasive electrophysiological studies. **AND** Pathway 1 Continued - Applicant must be able to provide documentation of participation as operator or co-operator in a minimum of 15 ICD implantation procedures with acceptable complication rates and outcomes with a letter of recommendation from Program Director stating that s/he is adequately trained and clinically competent in the applied for procedure. **OR** Pathway 2 - Fellowship trained cardiologists with proof of attendance at didactic courses designed to provide competence in and at which the indications, pathophysiology, complications and techniques of ICD device placement and management are presented, and "hands on" experience obtained. The course should carry a minimum of 10 qualified AMA PRA Category I CME credits concerning ICD implants. In addition, the candidate must have proof of participation in 15 ICD implantations as primary operator in the past three years. Proof shall consist of didactic procedure or operative reports, detailing method and procedure, the indications for the procedure, the patient's condition and complications at the termination of the procedure.
Clinical Experience (Reappointment)	Applicant must be able to provide documentation of provision of cardiovascular disease services (at least 5 procedures) representative of the scope and complexity of the privileges requested during the previous 24 months.

Request	Check the Request checkbox to select all privileges listed below. **Uncheck** any privileges you do not want to request in that group.
WH	☐ - Currently Granted privileges
	ICD Implantation
☐	ICD Implantation

FPPE	
WH	
☐	Six direct observation case reviews.
☐	Three retrospective case reviews.
☐	Evaluation of OPPE data collected for review of competency/performance.

Special Privilege: Bi V ICD Implantation

Description: The competent performance of implantable biventricular cardioverter-defibrillator device (Bi V ICD) placement requires not only a complete knowledge base and technical skills, but also sound clinical judgment based on specific experience. The following guidelines for the training necessary to perform Bi V ICD placement are established. This procedure will be performed either in the Operating Room or Cath Lab.

Qualifications

Education/Training	Pathway 1 - Completion of an ACGME or AOA accredited Fellowship training program in Cardiovascular Disease. **AND** Pathway 1 Continued - Completion of an ACGME or AOA accredited Fellowship training program in electrophysiology with specific training in invasive electrophysiological studies. **AND** Pathway 1 Continued - Applicant must be able to provide documentation of participation as operator or co-operator in a minimum of 15 Bi V ICD implantation procedures with acceptable complication rates and outcomes with a letter of recommendation from Program Director stating that s/he is adequately trained and clinically competent in the applied for procedure. **OR** Pathway 2 - Fellowship trained cardiologists with proof of attendance at didactic courses designed to provide competence in and at which the indications, pathophysiology, complications and techniques of Bi V ICD device placement and management are presented, and "hands on" experience obtained. The course should carry a minimum of 15 qualified CME credits concerning Bi V ICD implants. In addition, the candidate must have proof of participation in 15 Bi V ICD implantations as primary operator in the past three years. Proof shall consist of didactic procedure or operative reports, detailing method and procedure, the indications for the procedure, the patient's condition and complications at the termination of the procedure.
Clinical Experience (Reappointment)	Applicant must be able to provide documentation of provision of cardiovascular disease services (at least 5 procedures) representative of the scope and complexity of the privileges requested during the previous 24 months.

Request	
WH	Check the Request checkbox to select all privileges listed below. **Uncheck** any privileges you do not want to request in that group. ☐ - Currently Granted privileges
	Procedures
☐	Bi V ICD Implantation

FPPE

WH	
☐	Six direct observation case reviews.
☐	Three retrospective case reviews.
☐	Evaluation of OPPE data collected for review of competency/performance.

Special Privileges: Cardiac Catheterization and Coronary Angiography

Description:

Qualifications	
Education/Training	Completion of an ACGME accredited residency training program in Pediatrics **AND** Completion of an ACGME accredited fellowship training program in Pediatric Cardiology
Certification	Current certification in Pediatrics by the American Board of Pediatrics **AND** Current certification in Pediatric Cardiology by the American Board of Pediatrics
Clinical Experience (Initial)	Applicant must provide documentation of provision of pediatric cardiology services representative of the scope and complexity of the privileges requested during the previous 24 months (waived for applicants who completed training during the previous year).
Clinical Experience (Reappointment)	Applicant must provide documentation of provision of clinical services representative of the scope and complexity of privileges requested during the previous 24 months.

Request	WH	Check the Request checkbox to select all privileges listed below. **Uncheck** any privileges you do not want to request in that group. ☐ - Currently Granted privileges
		Procedures - Invasive (includes interpretation where applicable)
☐		Diagnostic cardiac catheterization
☐		Therapeutic cardiac catheterization
☐		Inferior vena cava filter insertion
☐		Percutaneous cardiopulmonary support
☐		Placement/removal of percutaneous LV assist

FPPE	
WH	
☐	One direct observation case review (First case done with a physician who has privileges to perform the procedure.) Attendance at the first procedure by a company representative familiar with the technique is preferable.
☐	Evaluation of OPPE data collected for review of competency/performance.

Special Privileges: CT Coronary Angiography
Description:

Qualifications	
Qualifications	Licensed M.D. or D.O. **AND** Qualified practitioners within the Department of Medicine (Cardiologists) or Department of Radiology (Radiologists) may apply for privileges contained in this document. No other specialists are eligible to apply.
Education/Training	Pathway 1 - Completion of an ACGME or AOA accredited Fellowship training program in Radiology-Diagnostic. **OR** Pathway 2 - Completion of an ACGME or AOA accredited Fellowship training program in Cardiovascular Disease. **OR** Pathway 3 - Successful completion of the equivalent of Level II training as defined by the American College of Cardiology. **OR** Pathway 4 - If nor prior experience reading CT angiograms, application must be able to provide documentation of successful completion of 4 weeks of cumulative training, which includes AMA PRA Category 1 CME in cardiac imaging (including cardiac CT anatomy, physiology and pathology), which includes a minimum of 50 mentored exams performed an interpreted (performed and interpreted which is to be distinguished from studies that are interpreted only, which do not count towards this requirement) as defined by the American College of Cardiology. **AND** Pathway 5 - If currently performing non cardiac chest CT, then applicant must be able to provide documentation of successful completion of 40 hours of accredited AMA PRA Category I CME in cardiac imaging which includes a minimum of 50 mentored exams performed and interpreted (performed and interpreted which is to be distinguished from studies that are interpreted only which do not count towards this requirement) as defined by American College of Radiology.
Clinical Experience (Reappointment)	Applicant must be able to provide documentation of 20 Cardiac CT angiography (CTA) cases or approved case reviews as under Pathways 1, 2 or 3 below during the previous 24 months. **AND** Pathway 1 - Applicant must be able to provide documentation of 20 Cardiac CTA cases via activity report within current reappointment cycle. **OR** Pathway 2 - Applicant must be able to provide documentation of Cardiac CTA cases via activity report and approved Cardiac CTA case reviews via reference letter from Chair of member's Department totaling 20 cases within current reappointment cycle. **OR** Pathway 3 - Applicant must be able to provide documentation of 20 approved Cardiac CTA case reviews within current reappointment cycle via reference letter from Chair of member's Department. **AND** If applying for a Pathway requiring case reviews, approved case reviews can be obtained via the Cardiac CTA Case DVD developed by Matthew J. Budoff, M.D., FACC, Division of Cardiology Harbor-UCLA Medical Center. The DVD can be obtained by contacting the Chair of the Department of Radiology.

Request	WH	
		Check the Request checkbox to select all privileges listed below. **Uncheck** any privileges you do not want to request in that group. ☐ - Currently Granted privileges
		Procedures
☐		CT Coronary Angiography

FPPE	
WH	
☐	Evaluation of OPPE data collected for review of competency/performance.

Special Privilege: Peripheral Angiography
Description: Privileges under this section will be limited to abdominal aortograms, upper and/or lower extremity arteriograms, and renal aortograms for the purpose of excluding renal artery stenosis.

Qualifications

Qualifications	Qualified practitioners within the Department of Surgery (Vascular, General Surgery, or Neurosurgery Specialists), or Department of Medicine (Cardiology Specialists) may apply for primary and/or special privileges contained in this document. No other specialists are eligible to apply. Department of Radiology (Neurointerventional Radiology or Vascular and Interventional Radiology Specialists) should apply for primary and/or special privileges contained in this document via their Primary Core. Core Peripheral Angiography privileges are not required to apply for special privileges contained in this document. Please refer to specific criteria.
Education/Training	Pathway 1 - Completion of an ACGME or AOA accredited Residency or Fellowship training program in Vascular Surgery, or Cardiology with specific training in peripheral angiography with specific emphasis on peripheral and renal angiography. **AND** Pathway 1 Continued - Applicant must be able to provide documentation of participation in 50 peripheral angiographic procedures with acceptable complication rates and outcomes. **AND** Pathway 2 - Completion of an ACGME or AOA accredited Residency or Fellowship training program in Vascular Surgery or Cardiology, but without specific emphasis on peripheral vascular angiography, should meet one of the criteria under Pathway 2a, 2b, or 2c. **AND** Pathway 2a - Applicant must be able to provide documentation of attendance at an approved didactic course, acceptable to the Department Chair or designee, of at least 20 AMA PRA Category 1 CME hours to encompass anatomy, diagnostic evaluation and treatment of peripheral vascular disease. **AND** Pathway 2a Continued - Applicant must be able to provide documentation of performance as primary/co-operator in 20 diagnostic peripheral angiograms over the last 48 months with documentation of appropriate indications, technique, acceptable results, and complication rates and lifetime experience of at least 200 intra-operative or percutaneous angiographic procedures as primary operator. **OR** Pathway 2c - Applicant must be able to provide documentation of performance as primary operator in 50 diagnostic peripheral angiograms over the last 48 months with documentation of appropriate indications, technique, acceptable results, and complication rates.
Clinical Experience (Initial)	Applicant must be able to provide documentation of provision of endovascular services (at least 10 cases) representative of the scope and complexity of the privileges requested during the previous 24 months.
Clinical Experience (Reappointment)	Applicant must be able to provide documentation of provision of endovascular services (at least 10 cases) representative of the scope and complexity of the privileges requested during the previous 24 months.

Request	
WH	Check the Request checkbox to select all privileges listed below. **Uncheck** any privileges you do not want to request in that group. ☐ - Currently Granted privileges
	Procedures
☐	Peripheral Angiography

FPPE	
WH	
☐	Five direct observation case reviews. (First 5 cases)
☐	Evaluation of OPPE data collected for review of competency/performance.

Special Privilege: Peripheral Vessel Stent Placement

Description:

Qualifications

Qualifications	Licensed M.D. or D.O. **AND** Applicants applying for this privilege must have unrestricted peripheral angiography privileges at Washington Hospital or meet all criteria for peripheral angiography at Washington Hospital.
Continuing Education	Applicant must be able to provide documentation of successful completion of 10 hours of AMA PRA Category 1 CME representative of the scope and complexity of the privileges requested deemed appropriate by the Department chair or designee.
Clinical Experience (Initial)	Applicant must be able to provide documentation of at least 5 cases representative of the scope and complexity of the privileges requested during the previous 24 months.
Clinical Experience (Reappointment)	Applicant must be able to provide documentation of at least 5 cases representative of the scope and complexity of the privileges requested during the previous 24 months.

Request	
WH	Check the Request checkbox to select all privileges listed below. **Uncheck** any privileges you do not want to request in that group. ☐ - Currently Granted privileges
	Procedures
☐	Peripheral Vessel Stent Placement

FPPE	
WH	
☐	Five direct observation case reviews. (First 5 cases)
☐	Evaluation of OPPE data collected for review of competency/performance.

Special Privilege: Percutaneous Transluminal Peripheral Angioplasty

Description:

Qualifications

Qualifications	Licensed M.D. or D.O. **AND** Applicants applying for this privilege must have unrestricted peripheral angiography privileges at Washington Hospital or meet all criteria for peripheral angiography at Washington Hospital.
Education/Training	Pathway 1 - Completion of an ACGME or AOA accredited Residency or Fellowship training program in Vascular Surgery or Cardiology. Applicant must also meet criteria under Pathway 1a and 1b as defined in this document. **AND** Pathway 1a - Applicant must be able to provide documentation of successful completion of 20 hours of approved AMA PRA Category 1 CME encompassing indications for performance and complications of peripheral vascular interventions deemed appropriate by the Department Chair or designee. **AND** Pathway 1b - Applicant must be able to provide documentation of performance of 25 cases of peripheral angioplasty procedures as the primary/co-operator over the last 48 months with documentation of appropriate indications, technique, acceptable results, and complication rates, and lifetime experience of at least 100 intra-operative or percutaneous vascular interventions as primary operator with documentation of appropriate indications, technique, acceptable results, and complication rates. **OR** If unable to qualify under Pathway 1, refer to Pathway 2. See "Clinical Experience (Initial)."
Clinical Experience (Initial)	Pathway 2 - If you were unable to qualify under Pathway 1, use this Pathway. Applicant must be able to provide documentation of performance of 50 peripheral angioplasties with 25 being the primary operator over the last 48 months. **AND** All applicants must be able to provide documentation of at least 5 cases representative of the scope and complexity of the privileges requested during the previous 24 months.

Request	
WH	Check the Request checkbox to select all privileges listed below. **Uncheck** any privileges you do not want to request in that group. ☐ - Currently Granted privileges
	Procedures
☐	Percutaneous Transluminal Peripheral Angioplasty

FPPE

WH	
☐	Five direct observation case reviews. (First 5 cases)
☐	

	Evaluation of OPPE data collected for review of competency/performance.

Special Privilege: Thoracic Aneurysm Stent Graft Placement

Description: The competent performance of thoracic aneurysm stent graft placement requires not only a complete knowledge base and technical skills, but also sound clinical judgment based on specific experience. The following guidelines for the training necessary to perform thoracic aneurysm stent graft placement at Washington Hospital are being established. This procedure will be performed in the Operating Room under the direction of a qualified team consisting of a cardio-thoracic surgeon and qualified interventionalist.

Qualifications

Qualifications	Licensed M.D. or D.O. **AND** Applicants applying for this privilege must have unrestricted peripheral angiography privileges at Washington Hospital or meet all criteria for peripheral angiography at Washington Hospital.
Education/Training	Pathway 1 - Completion of an ACGME or AOA accredited Residency or Fellowship training program in Vascular Surgery or Cardiology with specific training in thoracic aneurysm stent graft placement. **AND** Pathway 2 - Completion of an ACGME or AOA accredited Residency or Fellowship training program in Vascular Surgery or Cardiology. Applicant must also meet criteria under Pathway 2a and 2b as defined in this document. **AND** Pathway 2a - Applicant must be able to provide documentation of attendance and successful completion of a didactic program or course to encompass anatomy, diagnostic evaluation and treatment of thoracic aortic aneurysm with endovascular stent graft placement. The outcome of this training should include a certificate of completion of hands-on laboratory skills deemed to be satisfactory by the Peripheral Vascular and related credentialing committees. **AND** Pathway 2b - Applicant must be able to provide documentation of performance as primary/co-operator in 10 abdominal aortic aneurysm stent graft placements over the last 48 months, with documentation of appropriate indications, technique, acceptable results and complication rates.
Clinical Experience (Initial)	Applicant must be able to provide documentation of at least 2 cases representative of the scope and complexity of the privileges requested during the previous 24 months.
Clinical Experience (Reappointment)	Applicant must be able to provide documentation of at least 2 cases representative of the scope and complexity of the privileges requested during the previous 24 months.

Request	
WH	Check the Request checkbox to select all privileges listed below. **Uncheck** any privileges you do not want to request in that group. ☐ - Currently Granted privileges
	Procedures
☐	Thoracic Aneurysm Stent Graft Placement

FPPE	
WH	
☐	Three direct observation case reviews. (First 3 cases)
☐	Evaluation of OPPE data collected for review of competency/performance.

Special Privilege: Endovascular Abdominal Aortic Aneurysm Stent Graft Placement (Under Supervision)

Description: The competent performance of abdominal aortic aneurysm (AAA) stent graft placement requires not only a complete knowledge base and technical skills, but also sound clinical judgment based on specific experience. The following guidelines for the training necessary to perform AAA stent graft placement are established as temporary criteria, to be updated as additional experience is gained at Washington Hospital. This procedure will be performed in the Operating Room under the direction of a qualified team consisting of a vascular surgeon and qualified interventionalist.

Qualifications

Qualifications	Licensed M.D. or D.O. **AND** Applicants applying for this privilege must have unrestricted peripheral angiography privileges at Washington Hospital or meet all criteria for peripheral angiography at Washington Hospital.
Education/Training	Pathway 1 - Completion of an ACGME or AOA accredited Residency or Fellowship training program in Vascular Surgery or Cardiology with specific training in endovascular AAA stent graft placement, and participation and documentation in at least 10 endovascular AAA stent placements during training, with acceptable complication rates and outcomes. **OR** Pathway 2 - Completion of an ACGME or AOA accredited Residency or Fellowship training program in Vascular Surgery or Cardiology without specific emphasis on endovascular AAA stent graft placement. Applicant must also meet criteria under Pathway 2a as defined in this document. **AND** Pathway 2a - Applicant must be able to provide documentation of attendance and successful completion of a didactic program or course to encompass anatomy, diagnostic evaluation and treatment of abdominal aortic aneurysm with endovascular stent graft placement specific to the device selected for use. The outcome of this training should include a certificate of completion of hands-on laboratory skills deemed to be satisfactory by the credentialing committee.
Clinical Experience (Initial)	Applicant must be able to provide documentation of at least 4 cases representative of the scope and complexity of the privileges requested during the previous 24 months.
Clinical Experience (Reappointment)	Applicant must be able to provide documentation of at least 4 cases representative of the scope and complexity of the privileges requested during the previous 24 months.

Request

Check the Request checkbox to select all privileges listed below.

Uncheck any privileges you do not want to request in that group.

WH	
	☐ - Currently Granted privileges
	Procedures
☐	Endovascular Abdominal Aortic Aneurysm Stent Graft Placement (Under Supervision)

FPPE	
WH	
☐	Five direct observation case reviews. (First 5 cases)
☐	Evaluation of OPPE data collected for review of competency/performance.

Special Privilege: Endovascular Abdominal Aortic Aneurysm Stent Graft Placement

Description: The competent performance of abdominal aortic aneurysm (AAA) stent graft placement requires not only a complete knowledge base and technical skills, but also sound clinical judgment based on specific experience. The following guidelines for the training necessary to perform AAA stent graft placement are established as temporary criteria, to be updated as additional experience is gained at Washington Hospital. This procedure will be performed in the Operating Room under the direction of a qualified team consisting of a vascular surgeon and qualified interventionalist.

Qualifications	
Qualifications	Licensed M.D. or D.O. **AND** Applicants applying for this privilege must have unrestricted peripheral angiography privileges at Washington Hospital or meet all criteria for peripheral angiography at Washington Hospital.
Education/Training	Pathway 1 - Completion of an ACGME or AOA accredited Residency or Fellowship training program in Vascular Surgery or Cardiology with specific training in endovascular AAA stent graft placement, and participation and documentation in at least 10 endovascular AAA stent placements during training, with acceptable complication rates and outcomes. **AND** Pathway 2 - Completion of an ACGME or AOA accredited Residency or Fellowship training program in Vascular Surgery or Cardiology without specific emphasis on endovascular AAA stent graft placement. Applicant must also meet criteria under Pathway 2a and 2b as defined in this document. **AND** Pathway 2a - Applicant must be able to provide documentation of attendance and successful completion of a didactic program or course to encompass anatomy, diagnostic evaluation and treatment of abdominal aortic aneurysm with endovascular stent graft placement specific to the device selected for use. The outcome of this training should include a certificate of completion of hands-on laboratory skills deemed to be satisfactory by the credentialing committee. **AND** Pathway 2b - Applicant must be able to provide documentation of performance as primary/co-operator in 5 endovascular AAA stent graft placements over the last 48 months, with documentation of appropriate indications, technique, acceptable results and complication rates.
Clinical Experience (Initial)	Applicant must be able to provide documentation of at least 4 cases representative of the scope and complexity of the privileges requested during the previous 24 months.
Clinical Experience (Reappointment)	Applicant must be able to provide documentation of at least 4 cases representative of the scope and complexity of the privileges requested during the previous 24 months.

Request	
	Check the Request checkbox to select all privileges listed below. **Uncheck** any privileges you do not want to request in that group.
WH	☐ - Currently Granted privileges
	Procedures
☐	Endovascular Abdominal Aortic Aneurysm Stent Graft Placement

FPPE	
WH	
☐	Five direct observation case reviews. (First 5 cases)
☐	Evaluation of OPPE data collected for review of competency/performance.

Special Privilege: Intra Carotid And Cerebral Thrombolysis

Description:

Qualifications

Qualifications	Licensed M.D. or D.O. **AND** Applicants applying for this privilege must have unrestricted intravascular thrombolysis and carotid angioplasty and stenting privileges at Washington Hospital.
Certification	Current certification through ABMS or AOA Board American Board of Internal Medicine in Interventional Cardiology. **OR** Current certification through ABMS Board American Board of Surgery in Vascular Surgery.
Clinical Experience (Initial)	Applicant must be able to provide documentation of at least 10 cases (in carotid stenting) representative of the scope and complexity of the privileges requested during the previous 24 months.
Clinical Experience (Reappointment)	Applicant must be able to provide documentation of at least 4 cases representative of the scope and complexity of the privileges requested during the previous 24 months.

Request	WH	
		Check the Request checkbox to select all privileges listed below. **Uncheck** any privileges you do not want to request in that group. ☐ - Currently Granted privileges
		Procedures
☐		Intra Carotid And Cerebral Thrombolysis

FPPE

WH	
☐	Three retrospective case reviews.
☐	Evaluation of OPPE data collected for review of competency/performance.

Special Privilege: Percutaneous Transluminal Carotid Angioplasty, Stenting, and Thrombolysis

Description:

Qualifications	
Qualifications	Licensed M.D. or D.O. **AND** Applicants applying for this privilege must have unrestricted peripheral angiography privileges at Washington Hospital or meet all criteria for peripheral angiography at Washington Hospital.
Education/Training	Pathway 1 - Completion of an ACGME or AOA accredited Residency or Fellowship training program in Vascular Surgery or Cardiology with specific training in carotid interventional stent graft placement, and participation and documentation in at least 50 stent placements during training, with acceptable complication rates and outcomes. **OR** Pathway 2 - Completion of an ACGME or AOA accredited Residency or Fellowship training program in Vascular Surgery or Cardiology without specific emphasis on carotid stent graft placement. Applicant must also meet criteria under Pathway 2a and 2b as defined in this document. **AND** Pathway 2a - Applicant must be able to provide documentation of attendance and successful completion of a didactic program or course to encompass anatomy, diagnostic evaluation and treatment of carotid disease and carotid intervention. **OR** Pathway 2b - Applicant must be able to provide documentation of current unrestricted privileges for carotid angiography and unrestricted peripheral angioplasty with documentation of appropriate indications, technique, acceptable results and complication rates.
Clinical Experience (Initial)	Applicant must be able to provide documentation of at least 4 cases representative of the scope and complexity of the privileges requested during the previous 24 months.
Clinical Experience (Reappointment)	Applicant must be able to provide documentation of at least 4 cases representative of the scope and complexity of the privileges requested during the previous 24 months.

Request	
WH	Check the Request checkbox to select all privileges listed below. **Uncheck** any privileges you do not want to request in that group. ☐ - Currently Granted privileges
	Procedures
☐	Percutaneous Transluminal Carotid Angioplasty, Stenting, and Thrombolysis

FPPE	
WH	
☐	Five direct observation case reviews. (First 5 cases)
☐	Evaluation of OPPE data collected for review of competency/performance.

Special Privilege: Neuroangiography

Description: Privileges under this section will include all angiographic procedures utilized to visualize the carotid and vertebral arteries and their branches in the head and neck. It is the standard in this hospital to always evaluate the extra cranial carotid and vertebral and intracranial circulation during these procedures. These privileges are prerequisite to interventional neuroangiographic privileges if such procedures are ultimately determined to be offered at this hospital.

Qualifications

Qualifications	Licensed M.D. or D.O.
Education/Training	Pathway 1 - Completion of an ACGME or AOA accredited Residency or Fellowship training program with demonstrated equivalent training including direct supervision and instruction by a Board certified radiologist/cardiologist/surgeon with specific competence in neuroangiography. Letter of recommendation from the program director/instructor as well as the residency or fellowship program director must be submitted. Letters must state that the candidate is adequately trained in neuroangiography. **AND** Pathway 1 Continued - Training shall include: a. Anatomy, physiology and pathophysiology of neurovascular disease. b. Pre-procedural assessment of the patient including indications for the procedure, results of preceding non-invasive testing and the neurologic status of the patient. c. Technical aspects of performing the procedure, including the use of different catheters and guidewire systems, injection rates and volumes of appropriate contrast material, filming sequences, technique and indications for selective angiography and specialized views for optimal visualization. d. Performance and interpretation of at least 25 neuroangiographic exams as the primary operator. e. Familiarity with fluoroscopic and radiographic equipment, mechanical injectors, rapid film changers and digital subtraction techniques. f. Post-procedural patient management, especially recognition and initial management of complications. **OR** Pathway 2 - In the absence of residency or fellowship training, should have current un-restricted privileges to do peripheral vascular angioplasty and successful completion of 25 neuroangiographic procedures in the past five years in which the candidate was the primary operator in the procedure and demonstrated technique in engagement of carotid/vertebral arteries. All cases must have included intracranial vascular assessment. These cases shall have been documented on cut films and/or digital films using appropriate technique and dictated reports describing specific techniques, catheters and guide wires utilized, and any complications and their management shall be provided. These reports shall include indications for the procedure and results of pre-procedural non-invasive testing as well. All complications shall be included and the rate of complications shall be within acceptable limits.
Clinical Experience (Initial)	Applicant must be able to provide documentation of at least 4 cases representative of the scope and complexity of the privileges requested during the previous 24 months.
Clinical Experience (Reappointment)	Applicant must be able to provide documentation of at least 4 cases representative of the scope and complexity of the privileges requested during the previous 24 months.

Request	
WH	Check the Request checkbox to select all privileges listed below. **Uncheck** any privileges you do not want to request in that group. ☐ - Currently Granted privileges

	Procedures
☐	Neuroangiography

FPPE	
WH	
☐	Five direct observation case reviews.
☐	Evaluation of OPPE data collected for review of competency/performance.

Special Privilege: Intra Carotid And Cerebral Thrombolysis

Description:

Qualifications

Qualifications	Licensed M.D. or D.O. **AND** Applicants applying for this privilege must have unrestricted intravascular thrombolysis and carotid angioplasty and stenting privileges at Washington Hospital.
Certification	Current certification through ABMS or AOA Board American Board of Internal Medicine in Interventional Cardiology. **OR** Current certification through ABMS Board American Board of Surgery in Vascular Surgery.
Clinical Experience (Initial)	Applicant must be able to provide documentation of at least 10 cases (in carotid stenting) representative of the scope and complexity of the privileges requested during the previous 24 months.
Clinical Experience (Reappointment)	Applicant must be able to provide documentation of at least 4 cases representative of the scope and complexity of the privileges requested during the previous 24 months.

Request

Check the Request checkbox to select all privileges listed below.

Uncheck any privileges you do not want to request in that group.

WH

☐ - Currently Granted privileges

	Procedures
☐	Intra Carotid And Cerebral Thrombolysis

FPPE	
WH	

☐	Three retrospective case reviews.
☐	Evaluation of OPPE data collected for review of competency/performance.

Special Privilege: Adult Structural Cardiac Procedures

Description:

Qualifications

Qualifications

Licensed M.D. or D.O.

AND Current certification or active participation in the examination process leading to certification in Interventional Cardiology or Electrophysiology by the Board American Board of Internal Medicine in Interventional Cardiology. Board certification must be achieved within five years of completion of training and must be continuously maintained. Include a letter from the Program Director if an applicant has completed training within the past two years. Exceptions to this requirement can be found in Bylaws Section 2.2-2 OR Successful completion of an ACGME approved fellowship training program in Interventional Cardiology, Cardiology, or an ACGME approved fellowship training program in Structural Heart Disease or Electrophysiology. Has had to have completed ABMS boards in one of the above. AND Equivalent experience as defined by active percutaneous coronary intervention or electrophysiology privileges at Washington Hospital Healthcare System for more than 20 years.

AND Active Fluoroscopy license

AND Successful completion of lifetime 25 Transeptal Procedures documented as the primary operator (provide documentation of such). 10 of which have been done in the last year. OR Successful completion of interventional or electrophysiology cardiac training program in the last 5 years with 10 transeptal procedures in the last year. AND Must maintain Moderate Sedation privileges as defined in the Moderate Sedation Policy of the Washington Hospital Healthcare System

AND A minimum of 20 combined transseptal cases documented in the last two years as the primary operator. A minimum of 2 cases must be from each specific procedure in the last 2 years. Some procedures may have specific recredentialing requirements as required by the FDA or by the specific device company which must be met. Certification must be required.

Request	
WH	Check the Request checkbox to select all privileges listed below. **Uncheck** any privileges you do not want to request in that group. ☐ - Currently Granted privileges
	Procedures
☐	Atrial Septostomy
☐	Patent Foramen Ovale (PFO)
☐	Atrial Septal Defect (ASD) closure
☐	Transcatheter Left Atrial Appendage Occlusion
☐	Transcatheter Paravalvular Leak Closure
☐	Transcatheter Mitral Valve Repair or Replacement

☐	Transcatheter Tricuspid Valve Repair or Replacement

FPPE	
WH	
☐	1. On-site direct proctoring of the first five procedures. Proctoring must be completed in 12 months. And 1. Some procedures may have specific proctoring requirements as required by the FDA or by the specific device company. Certification must be provided.

Acknowledgment of Applicant

I have requested only those privileges for which I as qualified by education, training, current experience, and demonstrated current competency I am entitled to perform and that I wish to exercise at Washington Hospital and I understand that:

A. In exercising any clinical privileges granted, I am constrained by Hospital and Medical Staff Bylaws, policies and rules applicable generally and any applicable to the particular situation.
B. Any restriction on the clinical privileges granted to me is waived in an emergency situation and in such situation my actions are governed by the applicable section of the Medical Staff Bylaws or related documents.
C. I certify that I have no emotional or physical condition that would affect my ability to perform these privileges.
D. Furthermore, I attest that the information I have provided about my clinical activity is accurate and true.

Practitioner's Signature

WH

Department Chair Recommendation - Privileges

I have reviewed the requested clinical privileges and supporting documentation and my recommendation is based upon the review of supporting documentation and/or my personal knowledge regarding the applicant's performance of the privileges requested:

Privilege	Condition/Modification/Deletion/Explanation

Washington Hospital Medical Staff

2000 Mowry Avenue • Fremont, California 94538 • 510.818.7446

General Surgery

Delineation of Privileges

Applicant's Name: Test, Provider

Instructions:

1. Click the **Request** checkbox to request a group of privileges such as *Core Privileges* or *Special Privileges*.
2. **Uncheck** any privileges you do not want to request in that group.
3. When requesting your privileges, please remember you must be able to demonstrate current competency to be granted or to have a privilege renewed.
4. Please pay close attention to make sure you submit all required forms (i.e., activity, case logs), as incomplete files cannot be processed
5. Electronically Sign/Date form.

Notes:

- Applicants are not required to apply for all specialty-specific Core Privileges. If requirements exist for a particular specialty, the criteria will be outlined under the required qualifications section of each privilege form.
- Applicants may request privileges that apply to multiple specialties if they qualify.
- **IMPORTANT-If you have not met the minimum activity requirements for any privileges; do not check the boxes for those privileges.**

Facilities

☑ **WH**

Required Qualifications

Licensure	Licensed M.D. or D.O.
Membership	Meet all requirements for medical staff membership.
Continuing Education	Applicant must attest to having completed 50 AMA PRA Category 1 CME credits within the previous 24 months directly related to the practice of general surgery (waived for applicants who have completed training during the previous 24 months).
Education/Training	Completion of an ACGME or AOA accredited Residency training program in Surgery (General Surgery).
Certification	Current certification through ABMS or AOA Board American Board of Surgery in Surgery. Exceptions to this requirement can be found in the Credentialing Policy 2.A.1.p. **AND** Successful completion of ATLS within 6 months of granting privileges (Only required for Trauma Privileges)
Clinical Experience (Initial)	Applicant must be able to provide documentation of provision of general surgery services (at least 100 procedures of a variety of the procedures within the core) representative of the scope and complexity of the privileges requested within the previous 24 months.
Clinical Experience (Reappointment)	Applicant must be able to provide documentation of provision of general surgery services (at least 100 procedures of a variety of the procedures within the core) representative of the scope and complexity of the privileges requested within the previous 24 months.

AND Active/Provisional Staff Only: Of the 100 procedures, 10 must be performed at Washington Hospital Healthcare System and/or the Washington Outpatient Surgery Center.

AND If applicable, applicants who hold special privileges must meet the activity requirements as defined in the medical staff documents.

Core Privileges in General Surgery	
Description: Diagnosis and preoperative, operative, and postoperative management of patients to correct or treat diseases, disorders and injuries of the alimentary tract, abdomen and its contents, skin and soft tissue and endocrine system.	
Request	Check the Request checkbox to select all privileges listed below. **Uncheck** any privileges you do not want to request in that group.
WH	☐ - Currently Granted privileges
	General privileges
☐	Admit to inpatient or appropriate level of care
☐	Perform history and physical examination
☐	Evaluate, diagnose, consult, and provide pre- and post-operative care to patients, to correct or treat various conditions, diseases, disorders, and injuries of the alimentary tract, abdomen and its contents, extremities, breast, skin and soft tissue, head and neck, and endocrine systems
	Vascular access procedures
☐	Insertion and management of central venous catheter, arterial lines, dialysis access, pulmonary artery catheters, pumps and ports
	Alimentary tract procedures
☐	Esophageal procedures including esophagectomy, esophago-gastrectomy, esophageal bypass procedure, esophageal diverticulectomy and esophageal repair.
☐	Gastric procedures excluding bariatric surgery
☐	Bowel procedures including biopsy; enterolysis; small bowel, colon and rectum resections; anastomosis and stomas; diverticulectomy; appendectomy
☐	Procedures on the anus and rectum including hemorrhoidectomy; rectal prolapse procedures; anal fissures, fistula, abscess incision/drainage and resection/restoration
☐	Abdomino-perineal resection
☐	Ileo anal pull through procedure (Ileal Pouch Anal-Anastomosis)
	Abdominal and pelvic procedures
☐	Biliary tract surgery including cholecystectomy and common duct exploration; biliary enteric anastomosis
☐	Drainage intra-abdominal abscess
☐	Splenic procedures including splenectomy

☐	Incidental hysterectomy, salpingo-oopherectomy.
☐	Adrenalectomy
☐	Drainage pancreatic abscess
☐	Pancreaticoduodenectomy
☐	Pancreaticojejunostomy
☐	Resection of pancreas
☐	Abdominal wall hernia repair/abdominoplasty
☐	Repair of diaphragmatic hiatal hernia
☐	Inguinal hernia repair
☐	Exenteration - pelvic or abdominal
	Liver procedures
☐	Drainage liver abscess
☐	Liver biopsy and excision
☐	Liver resection
	Skin/soft tissue procedures
☐	Head and neck surgery including thyroidectomy; parathyroidectomy; tracheotomy.
☐	Skin biopsy, excision, soft tissue repair, treatment of burns, muscle biopsy and graft placement
☐	Lymphatic excisions including cervical, supraclavicular, axillary, retroperitoneal and extremities
	Laparoscopy
☐	Basic laparoscopic procedures, including appendectomy, cholecystectomy, bile duct, closure of intestinal perforations; biopsy; and hernia repair
☐	Performance of advanced or complex laparoscopic or minimally invasive technique/approach in a procedural area not separately delineated where the applicant is a concurrent privilege holder.
	Additional thoracic procedures available to the general surgeon.
☐	Vagotomy
	Endoscopic Procedure Privileges
☐	Esophago-gastro-duodenoscopy (EGD) including biopsy
☐	Sclerotherapy/banding esophageal varices
☐	Sigmoidoscopy with biopsy and polypectomy
☐	Colonoscopy with/without biopsy or polypectomy including colonic dilatation and placement of stent
☐	Percutaneous endoscopic gastrostomy (PEG)
☐	ERCP including sphincterotomy, stent placement, stone removal and stricture dilation
	Breast Disease and Surgical Privileges
☐	Lymph node dissection (Axillary)

☐	Sentinel node biopsy
☐	Breast biopsies, including stereotactic core breast biopsy, percutaneous core biopsy
☐	Duct excision
☐	Simple (total) mastectomy, subcutaneous mastectomy, skin-sparing mastectomy, modified radical and radical mastectomy
	Trauma Privileges
☐	Initial Resuscitation and management of the acutely injured patient
☐	Placement of a surgical airway in patients unable to be intubated
☐	Focused Assessment with Ultrasound to assess for hemorrhage, tamponade and pneumothorax
☐	Chest thoracostomies including chest catheter placement
☐	Central line placement (if not already credentialed)
☐	Emergent thoracotomy for control of hemorrhage
☐	Emergent vascular exposure, clamping, ligation and repair for control of hemorrhage
☐	Emergent nephrectomy for control of hemorrhage
☐	Emergent pelvic packing for control of hemorrhage
☐	Emergent rigid and flexible sigmoidoscopy
☐	Management of the trauma patient throughout their hospital stay in the acute care facility as well as coordinate care by subspecialty consultants, institute transition to rehabilitation and discharge planning

FPPE	
WH	
☐	Six direct observation case reviews of a variety of cases within the Core.
☐	Evaluation of OPPE data collected for review of competency/performance

Privilege Cluster: Specialized Privileges in Surgical Critical Care
Description: Surgical Critical Care is a subspecialty of surgery that manages complex surgical and medical problems in critically ill surgical patients.

Qualifications

Education/Training	Completion of an ACGME or AOA accredited fellowship training program in surgical critical care.
Certification	Current certification in surgical critical care by the relevant ABMS or AOA board.
Clinical Experience - Initial Privileges	Applicant must provide documentation of provision of clinical services representative of the scope and complexity of the privileges requested during the previous 24 months (waived for applicants who completed training during the previous year).
Clinical Experience - Renewal of Privileges	Applicant must provide documentation of provision of clinical services representative of the scope and complexity of the privileges requested during the previous 24 months.

Check the Request checkbox to select all privileges listed below.

Uncheck any privileges you do not want to request in that group.

Request	WH	
		- Currently Granted privileges
		Procedures
☐		Insertion and management of intra-aortic balloon assist device
☐		Percutaneous Endoscopic Gastrostomy (PEG) tube placement, including magnetic gastropexy, under ultrasound guidance (PUG), when utilized
☐		Tracheostomy placement, revision, and closure

FPPE

WH	
☐	Retrospective review of 2 cases representative of the scope and complexity of privileges requested.

Acknowledgment of Applicant

I have requested only those privileges for which I as qualified by education, training, current experience, and demonstrated current competency I am entitled to perform and that I wish to exercise at Washington Hospital and I understand that:

A. In exercising any clinical privileges granted, I am constrained by Hospital and Medical Staff Bylaws, policies and rules applicable generally and any applicable to the particular situation.
B. Any restriction on the clinical privileges granted to me is waived in an emergency situation and in such situation my actions are governed by the applicable section of the Medical Staff Bylaws or related documents.
C. I certify that I have no emotional or physical condition that would affect my ability to perform these privileges.
D. Furthermore, I attest that the information I have provided about my clinical activity is accurate and true.

Practitioner's Signature

WH

Department Chair Recommendation - Privileges	
I have reviewed the requested clinical privileges and supporting documentation and my recommendation is based upon the review of supporting documentation and/or my personal knowledge regarding the applicant's performance of the privileges requested:	
Privilege	Condition/Modification/Deletion/Explanation

Trauma Handbook

These management protocols are intended to serve as guidelines only. Individual circumstances need to be considered, as there may be times when it is appropriate or desirable to deviate from these guidelines. These educational guidelines will be reviewed and updated periodically.

This handbook provides a quick reference but is not exhaustive and should not be considered a substitute for a trauma textbook or current literature.

Table of Contents

Mission:

The mission of the Division of Trauma is to be a multidisciplinary clinical team dedicated to providing high-quality trauma care to injured members of the community and to uphold the highest standards in the management and prevention of injury in this vulnerable population

Vision:

The vision for the Division of Trauma is to become a highly reliable organization that promotes optimal care of the injured patient from the time of injury through rehabilitation via injury prevention, clinical excellence, medical research & education, organizational excellence, and health policy.

Role of Trauma Team Members

The following guidelines are for the management of severely or multiple-injured adult patients and apply to both Alpha and Bravo activations. Variations from these guidelines will occasionally occur based on staffing, clinical situation, and other factors.

General Protocols for Trauma Team Members:
The ED attending, upon first examination of the patient, shall have the authority to retriage the patient based on activation criteria.

Upon arrival of the patient to the Trauma Room, QUIET should be observed by all team members so that the report from pre-hospital personnel may be heard by everyone. The report shall be in DMIST format (Demographics, Mechanism, Injuries, Signs/Symptoms, and Treatments). Additional personnel who may be allowed to enter the trauma room as observers should stand where directed and remain QUIET throughout the resuscitation. One or more observers may be asked to step out of the room at any time, as circumstances require.

The physician Team Leader in charge of the resuscitation should be the only physician giving verbal orders to the nursing team members. Orders from other physicians should be passed through the Team Leader. The respective roles of the Trauma Team members are as follows.

ED Attending:
- Direct trauma response team until trauma surgeon arrives, then collaboratively with surgeon.
- Initiate resuscitation of the patient per ATLS guidelines.
- Establish airway patency and/or intubate.
- Coordinate disposition of patient in conjunction with the appropriate departments (CT, OR, ICU, etc.)
- Perform or delegate procedures necessary for resuscitation collaboratively with the trauma team (central line, chest tube, etc.)
- Communicate with family.
- Complete ED Adult Note

Trauma Surgeon (or, in his/her absence, ED Attending):
- Assume primary responsibility for and authority over the patient.
- Initiate and/or continue resuscitation of patient per ATLS guidelines
- Intervene clinically at any level, as necessary.
- Coordinate disposition of patient in conjunction with ED physician
- Coordinate communication with family with ED physician
- Complete appropriate documentation
- Place appropriate orders in electronic health record

Primary Trauma Nurse:
- Communication patient's condition, all lab results, and/or response to therapy to Trauma Team Leader.
- Responsible for continuity of care until patient reaches final destination.
- Give nursing report when patient is transferred.
- Responsible for all documentation in the absence of a trauma scribe.

- Assess the need for a secondary nurse and trauma scribe
- Perform or delegate initial and ongoing assessment of trauma patient to include:
  - Place patient on monitor and obtain initial vitals, including pulse ox and temp.
  - Glasgow Coma Scale on arrival and with each set of vitals.
  - Responsible for medication and blood administration.
  - Remain with patient throughout stay accompanying patient to diagnostic studies, as well as to OR, ICU, Interventional Radiology when indicated, based upon patient need. (Alpha activation required, Bravo activation preferred)
  - Provide report to ICU or if indicated.
  - Obtain peripheral venous access, 2 large bore peripheral IVs (16g or 14g preferred)
  - Obtain blood for trauma panel labs, type and cross match.
  - Ensure completion of EKG.
  - Assist with procedures as needed
- Responsible for notification of ancillary team members (includes but not limited to spiritual care, case management, etc.)
- Ensure communication with family
- Assure disposition of patient belongings

Emergency Department Tech:

- Trauma room setup - check availability and working order of all equipment at start of shift.
- Assist with transport of patient, including monitor and oxygen.
- Place patient on cardiac monitor and obtain initial set of vital signs
- Obtain equipment and set-up for procedures as needed (e.g. ultrasound/FAST machine, central line, arterial line, chest tube, splinting, etc.)
- Ensure completion of EKG and other diagnostics as directed by emergency nurses and within scope of practice.
- Assist with undressing/cutting off clothing, obtaining warming blankets, securing clothing and belongings as needed to maintain security of evidence.
- Assist with procedures.

ED Secretary:

- Records time of notification/activation, patient arrival, and team member arrival times
- Notifies or pages, security, social work, pastoral care, etc. as indicated.
- Copies trauma chart prior to patient leaving ED for trauma staff documentation.

Radiology:

- Assure completion of imaging exams in resuscitation room as requested by physicians.
- Makes disk of studies if needed for transfer of patients.

Respiratory Care Practitioner:

- Assist with airway management.
- Provide supplemental oxygen via nasal cannula, mask, or bag valve mask.
- Set up and maintain ventilator while patient is in the ED or being transported.
- Accompany the patient to CT, Interventional Radiology, OR, or ICU.

Spiritual Services:

- Crisis intervention with patient and family members
- Liaison between trauma team and family.
- Provide crises intervention and event decompression and assist in debriefing for staff involved in the event.

Security:

- Crowd control or assistance with patient restraint as deemed necessary.
- Provide emergency department security in accordance with hospital numbered memorandums to control hospital lockdowns.

Trauma Team Activation Criteria and Response

Activation Level	Criteria
Alpha	○ Confirmed blood pressure less than 90 mm Hg at any time in adults and children aged 11 years and older, and age-specific hypotension in children aged 1 – 10 years (SBP less than 70 mmHg plus twice age in years) ○ Gunshot wounds to the neck, chest, or abdomen ○ Glasgow Coma Scale (GCS) less than 9 (with mechanism attributed to trauma) ○ Patients intubated in the field and directly transported to the trauma center ○ Patients who have respiratory compromise or are in need of an emergent airway ○ Transfer / re-triaged patients from another hospital: ○ Require ongoing blood transfusion ○ With ongoing respiratory compromise (excludes patients intubated at another facility who are now stable from a respiratory standpoint) A patient that does not meet the above criteria may be called an Alpha Trauma at the discretion of the Emergency Physician.
Bravo	Physiologic criteria: ○ Glasgow Coma Scale (GCS) less than or equal to 13 OR ○ Respiratory rate less than 10 or greater than 29 or need for ventilatory support. For infants (less than one year), rate less than 20 in infant or need for ventilatory support Anatomic injury criteria: ○ Penetrating injury to the torso, head, neck, groin, or extremity proximal to the knee or elbow ○ Flail chest ○ Evidence of two or more proximal long bone fractures (femur, humerus) ○ Crushed, degloved, mangled, or pulseless extremity ○ Traumatic amputation above the wrist or ankle ○ Evidence of pelvic fracture ○ Open or depressed skull fracture ○ Traumatic paralysis Mechanism of injury criteria: Falls: ○ Falls greater than twenty (20) feet ○ Falls greater than ten (10) feet for patients aged 14 years or less OR greater ≥ 55 years High-risk auto crash: ○ Intrusion including roof: greater than 12 inches on occupant site; and/or greater than 18 inches any site of the vehicle ○ Ejection of patient (partial or complete) from a moving object (automobile, motorcycle, scooter, horse, etc.) ○ Death of an occupant in the same passenger space ○ Vehicle telemetry data consistent with high risk of injury ○ Auto versus pedestrian or bicyclist (patient thrown, run over, or with significant impact greater than 20 miles per hour MPH) ○ Motorcycle crash greater than 20 mph ○ Suspected closed head injury SPECIAL PATIENT CONSIDERATIONS: ○ Children (less than or equal to 14 years) should be triaged preferentially to a pediatric-capable trauma center (e.g. Benioff Children's Hospital Oakland) ○ Anticoagulation and bleeding disorders ○ Burns

	○ Pregnancy greater than 20 weeks A patient that does not meet the above criteria may be called a Bravo Trauma at the discretion of the Emergency Physician.
Delta	Definition: ○ Limited activation for patients aged 55 or older with multi-system injuries or significant co-morbidities (cirrhosis, diabetes, immunosuppression, morbid obesity, bleeding disorders, and antithrombotic therapy) who do not meet Alpha or Bravo criteria. Mechanism of Injury: Falls: ○ Ground level fall (patients on anticoagulation or antithrombotic therapy) ○ Ground level fall (patients with head trauma and GCS less than 14) A patient that does not meet the above criteria may be called a Delta Trauma at the discretion of the Emergency Physician. Patients who experience a significant clinical change may be upgraded to Alpha or Bravo Trauma.

TRAUMA CONSULT CRITERIA

- The trauma attending must first be notified for any injured patient under consideration for transfer in or out of Emergency Department.
- Any patient who presents to the Emergency Department 24 hours after experiencing a significant mechanism of trauma and is now complaining of symptoms (significant mechanism refers at least to the Bravo trauma criteria mechanisms detailed above)
- Any trauma patient with unrelenting complaints of neck, chest or abdominal pain in the ED
- Any trauma patient who requires an abdominal, pelvic, or chest CT in order to rule out traumatic injury
- Any trauma patient with weakness or paresthesia following injury
- DNR patients who do not wish to have progressive treatment should get a trauma consult
- Transferred patient with single long bone fracture, isolated thoracic or lumbar fracture without neurologic compromise.

Trauma Team Notification

The Emergency Department physician will utilize a four-tiered system for identifying trauma patients and notifying the Trauma Team. The first three tiers will be known as "Alpha Trauma, Bravo Trauma, and Delta Trauma Team Activation. The fourth tier will be known as a "Trauma Consult."

Alpha Trauma

The Alpha Trauma activation criteria are based on physiologic findings that are assessed in the field, at a prior hospital, or in the ED. The physical findings in an Alpha Trauma patient reflect a severe injury and require the immediate presence of the Trauma Team and the Attending Trauma Surgeon on call or backup Trauma Surgeon who must be present at the bedside within 15 minutes from the time the trauma patient arrives. **Any trauma patient may be upgraded to Alpha Trauma status at the discretion of the ED Attending if the patient's condition warrants, and such an upgrade must be signaled through the overhead and pager systems.** The Trauma Attending Surgeon will be notified via personal phone and pager immediately after Alpha Trauma Activation page.

Bravo Trauma

The Bravo Trauma activation criteria are based both on physical findings and mechanism of injury. The physical criteria include those injuries associated with serious life-or-limb-threatening conditions. In addition, the mechanisms identified in these criteria are often related to specific patterns of organ injury. All of the conditions listed in the activation criteria have the potential to become life-threatening at any time. Therefore, careful monitoring and reassessment are imperative. **A Bravo Trauma patient can be upgraded to an Alpha Trauma at any time at the discretion of the ED physician, and such an upgrade must be signaled through the overhead and pager systems.** The Trauma Team should be present within 15 minutes of the patient's arrival. The Attending Trauma Surgeon must be contacted via their pager or cell phone immediately after the primary and secondary survey (within 30 minutes), or sooner if the patient becomes less stable. The Attending Trauma Surgeon should also be notified immediately if there is any question of deterioration in the patient's condition and/or the patient needs to be upgraded to Alpha Trauma status. An upgrade to Alpha Trauma status must be signaled through the overhead and pager systems. The patient identified as a Bravo Trauma will be seen by a Trauma Attending Surgeon <u>within 2 hours of notification.</u>

Delta Trauma

The Delta Trauma activation criteria are based on physical findings, mechanism of injury, and patient risk factors greater than 55 years of age. Geriatric patients meeting these criteria have the potential to have injuries associated with serious life-threatening conditions. In addition, the mechanisms identified in these criteria are often related to specific patterns of injury, even if low energy, such as ground level falls or low speed motor vehicle crashes. Therefore, careful monitoring and reassessment are imperative. The Emergency Department physician will evaluate the patient and determine is trauma needs to consult. **A Delta Trauma patient can be upgraded to an Alpha or Bravo Trauma at any time at the discretion of the ED physician, and such an upgrade must be signaled through the overhead and pager systems.** All re-triaged patients will be reviewed in the weekly PI process.

The Attending Trauma Surgeon should also be notified immediately if there is any question of deterioration in the patient's condition and/or the patient needs to be upgraded to Alpha or Bravo Trauma status. An upgrade to Alpha or Bravo Trauma change in status must be signaled through the overhead and pager systems. The patient identified as a Delta Trauma will be seen by a Trauma Attending Surgeon within the timeframe of an ED surgical consult.

Trauma Consult

The Emergency Department Physician should designate a patient that does not meet the criteria for an Alpha, Bravo and Delta Trauma to be a Trauma Consult if they meet consult criteria or at the discretion of the ED physician. The Trauma Service is expected to respond to the Emergency Department Trauma Consult in a timely manner and the Trauma Team should promptly notify the Trauma Attending Surgeon of the consult for direction in management. The patient may be upgraded to an Alpha or Bravo if deemed appropriate, and such an upgrade must be signaled through the overhead and pager systems. The plan of care is to be determined by the Trauma Service prior to admission to the hospital or discharge from the Emergency Department.

Trauma consults may also be ordered at the discretion of inpatient treating physicians to rule out occult injury on patients who are admitted for other medical conditions that may cause occult injury, or sustain falls in hospital.

TRAUMA RE-TRIAGE PROCEDURE: PEDIATRIC

Step 1	**Determine if patient meets Emergency Trauma Re-Triage Criteria**	See Criteria Below – Pediatric Patients are **Age ≤14**
Step 2	**Contact Pediatric Trauma Center**	Children's Hospital and Research Center – Oakland
Step 3	**Determine appropriate level of transport and arrange transport (should be done simultaneously to Trauma Center contact)**	If within Paramedic Scope of Practice and timely transport needed: **Call 911** to request a ***"Code 3 Ambulance"*** If exceeds paramedic scope of practice, contact appropriate transport agencies (CCT-RN or Air Ambulance) or arrange for nursing staff to accompany paramedic or EMT Ambulance.
Step 4	**Prepare patient and paperwork for immediate transport.**	Fax additional paperwork that is not ready at time of transport departure. Do not delay transport. (SEE FAX LIST BELOW)

Trauma Center Contact Information

	Emergency Re-Triage	Other Transfers	Fax Number for Records
Children's Hospital Oakland/UCSF Benioff	(510) 428-3240	(855) 246-5437	(510) 601-3934

Normal Vitals (Broselow)

AGE	WEIGHT	HEART RATE	SYSTOLIC BP	BROSELOW COLOR
Newborn	3-5 Kg	80-190	65-104	Grey -Pink
1 Year	10 Kg	80-160	70-112	Purple
3 Years	15 Kg	80-140	75-116	White
5 Years	20 Kg	75-130	75-116	Blue
8 Years	25 Kg	70-120	80-112	Orange
10 Years	30 Kg	65-115	85-126	Green

Important Pediatric Re-Triage Exceptions:

1. **Pregnant patients of any age may be cared for in an adult trauma center.**
2. **Major Burns should be preferentially transferred to one of the burn centers.**
3. **Contact hospital first for major extremity injuries with vascular compromise.**

Pediatric Clinical Signs of Poor Perfusion

Cools, mottled, pale or cyanotic
Low urine output
Lethargic
Prolonged capillary refill

Pediatric GCS-Verbal Scale (<2)

5	Coos and babble
5	Irritable
3	Only cries to pain
2	Only moans to pain
1	None

PRIMARY SURVEY

Prediction and Management of the Difficult Airway

The incidence of difficult airway has not been clearly delineated in the trauma population; however, up to 1% of trauma patients requiring intubation require a surgical airway and may require more than one attempt before a successful airway is secured. It is imperative that the trauma physician be able to identify patients with potentially difficult airways, and understand how best to manage them.

EAST Practice Management Guidelines: Airway Assessment Recommendations:

1. A careful airway assessment should be performed before initiating efforts to secure the airway. The goals of this assessment are to identify potential markers of difficulty with the following: bag-valve mask ventilation, laryngoscopy, and surgical airway.
2. The application of structured assessment tools (e.g., the LEMON law) is recommended:

    - L: Look externally (facial trauma, large incisors, beard or moustache, large tongue)
    - E: Evaluate the 3- 3-2 rule (incisor distance <3 fingers, hyoid mental distance <3 fingers, thyroid to mouth < 2 fingers)
    - M: Mallampati Score
    - O: Obstruction (presence of any condition that could cause obstruction)
    - N: Neck mobility (all patients with blunt trauma require cervical in-line stabilization that makes visualization of the glottis more difficult)

3. When significant difficulty is anticipated, neuromuscular blockade should be used with caution, and airway rescue devices, including surgical airway equipment, should be immediately available.

EAST Practice Management Guidelines: Indications for Emergency Tracheal Intubation (ETI) Recommendations:

1. ETI is indicated in trauma patients with the following traits:
    - Airway obstruction
    - Hypoventilation
    - Persistent hypoxemia (SaO2 <90%) despite supplemental oxygen
    - Severe cognitive impairment (Glasgow Coma Scale [GCS] score <8)
    - Severe hemorrhagic shock
    - Cardiac arrest

2. ETI is indicated for patients experiencing smoke inhalation with any of the following traits:
    - Airway obstruction
    - Severe cognitive impairment (GCS score < 8)
    - Major cutaneous burn (>40%)
    - Major burns and/or smoke inhalation with an anticipated prolonged transport time to definitive care
    - Impending airway obstruction (moderate-to-severe facial burn, moderate-to-severe oropharyngeal burn, and moderate-to- severe airway injury seen on endoscopy)

3. ETI may also be indicated in trauma patients with the following traits:
    - Facial or neck injury with the potential for airway obstruction
    - Moderate cognitive impairment (GCS score 9-12)
    - Persistent combativeness refractory to pharmacologic agents
    - Respiratory distress (without hypoxia or hypoventilation)
    - Preoperative management (i.e., patients with painful injuries or undergoing painful procedures before non-emergent operation)
    - Early ETI is indicated in cervical spinal cord injury with any evidence of respiratory insufficiency (complete cervical SCI or incomplete injuries C5 and above).

EAST Practice Management Guidelines: Procedural Options Recommendations:

1. Orotracheal intubation guided by DL (direct laryngoscopy) is the ETI procedure of choice for trauma patients.
2. Rapid sequence intubation (RSI) should be used to facilitate orotracheal intubation unless markers of significant difficulty with intubation are present. An RSI drug regimen should be given to achieve the following clinical objectives:
    - Adequate sedation and neuromuscular blockade
    - Maintenance of hemodynamic stability and CNS perfusion
    - Maintenance of adequate oxygenation
    - Prevention of increases in intracranial hypertension
    - Prevention of vomiting and aspiration

    There are no recommendations regarding the use of specific induction agents used for RSI in trauma. Succinylcholine is the recommended agent of choice for neuromuscular blockade, in the absence of any contraindications to its use.
3. Enhancements for safe and effective ETI in trauma patients include the following:
    - Availability of experienced personnel
    - Pulse-oximetry monitoring
    - Maintenance of cervical neutrality
    - Confirmation of tube placement using auscultation of bilateral breath sounds and end-tidal CO2 detection
    - Continuous end-tidal CO2 monitoring for patients with severe traumatic brain injury.
4. Cricothyroidotomy is appropriate when emergent/urgent tracheal intubation is needed and cannot be achieved rapidly with DL or with the use of alternative airway techniques and devices.

When ETI cannot be achieved rapidly with DL, a number of airway rescue devices may be used as follows: Blind-insertion supraglottic devices (i.e., LMA, Combitube, and King Airway), Gum-elastic bougie, Video laryngoscopy, and surgical cricothyroidostomy.

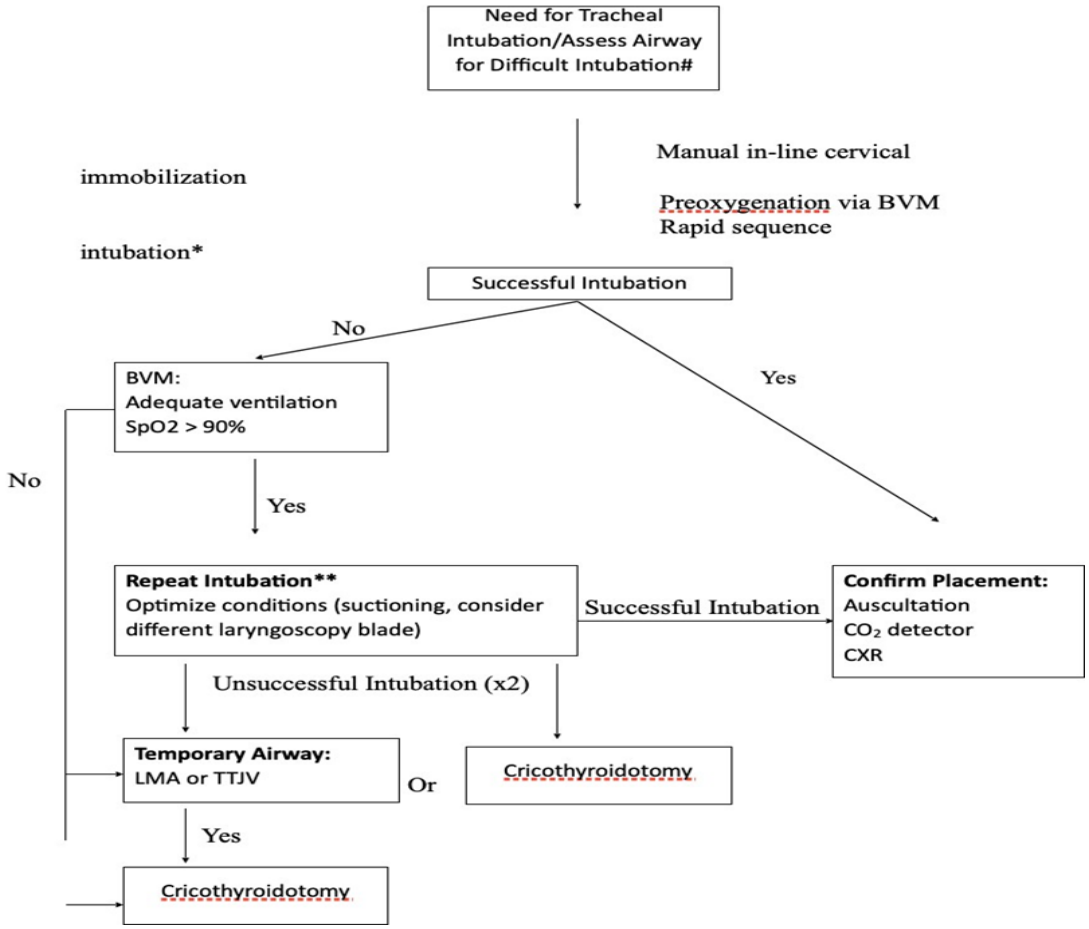
Decisions regarding the most appropriate rescue technique should be guided by the clinical scenario at hand, resource availability, and the skill and experience of the treating clinician.

Video laryngoscopy may offer significant advantages over DL, including the following: superior views of the glottis (Cormack-Lehane I/II); higher intubation success rates for patients with anatomically difficult airways, in obese patients, in those with the cervical spine held in-line; and higher intubation success rates by inexperienced airway providers.

Additional Notes on Equipment/Procedures:

Management: Failed intubation in a patient that has also failed BVM requires a prompt surgical airway. Laryngeal mask airway (LMA), or transtracheal jet ventilation (TTJV) are temporary measures that may serve as a bridge to creation of a definitive airway.

- **LMA~** Size 4 is used for adults <70kg, and size 5 for >70kg. The LMA rests in the hypopharynx over the laryngeal opening, and does not require visualization of the cords. Supraglottic pathology may preclude placement. The LMA does not separate the respiratory and alimentary tracts, and thus carries a risk of aspiration, particularly in pregnant or obese patients or in patients with a full stomach LMA is unreliable at delivering high pulmonary pressures, and ventilation may be compromised.
- **TTJV ~** requires placement of a 12-16 gauge catheter through the cricothyroid membrane and attachment to a high pressure (50psi) oxygen source. One second inspiratory time followed by 4 seconds for exhalation should be given.
- **Cricothyroidotomy ~** Definitive airway (does not mandate conversion to tracheostomy) using a 6-mm cuffed ETT or a 4-6 mm tracheostomy tube. Pediatric patient (<12 years old), or patients with a laryngeal fracture should undergo tracheostomy.



If multiple risk factors for difficult airway exist, only experienced physicians should manage airway. Consider calling for back-up.

*Rapid sequence intubation should be avoided in cases of patients that are difficult to ventilate via BVM to avoid a "cannot intubate, cannot ventilate" scenario.

**Senior ED, surgical, or anesthesia staff should perform repeated attempts at intubation. Individuals should not make more than two attempts at intubation before abdicating to a more experienced individual.

References:

1. Blanda M, Gallo UE. Emergency Airway Management. Emerg Med Clin North Am. 2003 Feb; 21(1): 1-26.
2. Pollack CV. The laryngeal mask airway: a comprehensive review for the emergency physician. J Emerg Med. 2001 Jan;20(1):53-66.
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Rapid Sequence Induction: Adult

The technique of rapid sequence induction (RSI) has been demonstrated to increase intubation success rates and reduce complications compared to pre-RSI techniques in a variety of emergent settings. RSI benefits include provision of optimal intubating conditions for injured patients, rapid airway control, high success rates, and reduction of pulmonary aspiration.

The nine P's of rapid sequence induction and intubation:

1. **Preparation** – assemble all necessary personnel, equipment, backup equipment, devices, drugs, and surgical airways. Ensure oxygen access and suction availability.

2. **Preoxygenation** – Deliver supplemental oxygen with a BVM at high flow for up to 5 minutes. End-tidal O2 with a reliable mask seal should be at least 80%.

3. **Pretreatment** – Airway stimulation (laryngoscopy and endotracheal tube placement) results in an intense autonomic sympathetic discharge producing tachycardia, hypertension, and increased intracranial, intragastric, and intrathoracic pressure. Pre-intubation medications may mitigate that response:
   - Lidocaine —1.5 mg/kg IV, given 3 minutes prior to intubation (contraindicated in allergy or high-grade heart block)
   - Midazolam – 1-2 mg IV, given 1-3 minutes prior to intubation
   - Fentanyl 1-2 mcg/kg IV, given 1- 3 minutes prior to intubation
   - Atropine — all children <1yr and <5yo if using succinylcholine, 0.02 mg/kg IV with a minimum dose of 0.1 mg and a maximum dose of 0.5 mg. (Most pediatric patients < 10 years old will not require succinylcholine for intubation). Have atropine available for secondary bradycardia in adults.

4. **Preservation** of blood pressure —**important in trauma patients**
   - Shock index (heart rate divided by systolic blood pressure) of greater than 0.8 are at increased risk for developing peri-intubation hypotension or cardiac arrest
   - Crystalloid, plasma, blood products as needed
   - May reduce induction medication doses by up to 50%, especially in patients with compromised mental status
   - May need push dose of pressors or inotropes. Have pre-mixed syringes of phenylephrine and ephedrine available. Consider preparing dilute epinephrine (10 mcg/mL) in a syringe.
   - **If epinephrine elected (rare)** In 10-mL syringe, draw up 1 mL of epinephrine 1:10,000 and 9 mL of normal saline (equals 10 mL of epinephrine 10 mcg/mL).
   - Administer 0.5 to 2 mL every 2 to 5 minutes (5–20 mcg)

5. **Paralysis** with induction – Administer sedative induction agent followed immediately by administration of paralytics via IV push.

Induction:
- Propofol: Ideal in hemodynamically stable patients. Use extreme caution with most trauma patients requiring intubation and in those with head injury

- Etomidate: Preferred for hemodynamically unstable patients (rapid onset and clearance, reduction in cerebral metabolic rate, and negligible effects on hemodynamics), may have side effect of adrenal insufficiency
  - Dose Etomidate: 0.3 mg/kg IV, onset in 15 to 45 seconds, duration of action is 3 to 12 minutes
- Ketamine: Dissociative agent. Potentiates analgesics and amnestics, preserves respiratory drive, and maintains hemodynamic stability. May cause tachycardia and increase secretions.
  - 1 to 2 mg/kg IV, with an onset of action in 45 to 60 seconds and a 10 to 20 min duration of action

- Benzodiazepines: Midazolam, use caution in hypotensive and head- injured

Paralysis:

- Succinylcholine: Gold standard, contraindications are related to hyperkalemia (thermal injury >24h, crush, rhabdomyolysis, myopathies, subacute and chronic upper and motor neuron denervation including paralysis and polyneuropathy of critical illness, history of malignant hyperthermia and pseudocholinesterase deficiency). May raise intracranial pressure.
- 0.5 to 1.5 mg/kg
  Rocuronium: 1.0 mg/kg (useful in maintaining paralysis after intubation)

6. **Passive** oxygenation — expose the oropharynx to high-flow supplemental oxygen despite no intrinsic respiratory effort. Hold a mask seal with the BVM without ventilating until ready to intubate. Alternatively use nasal cannula at 15L/min after preoxygenating and during the intubation process.

7. Protection & Positioning

- Protect cervical spine from any unnecessary motion. Maintain in-line immobilization.
- Sellick maneuver (Cricoid Pressure) is recommended but optional: May reduce gastric insufflation, but Minimal evidence that it reduces aspiration, and may contribute to airway obstruction and difficult intubations.
- Position patient for optimal laryngoscopy: Appropriate bed height for intubator, and a towel under the occiput to lift and extend the head if cervical spine is cleared.

8. **Placement** with proof – perform intubation, confirm placement. Usually 21cm for adult women and 23 cm for adult men at the corner of the mouth. Proof with ETCO2, lung auscultation, tube visualization through vocal cords. Confirm placement with chest radiograph

9. **Post-intubation** management – secure tube, address hypotension if present and long-term sedation/analgesia/paralysis as indicated

**Consult Anesthesiology if airway problems anticipated (i.e., short neck, cervical spine or facial trauma, clinical suspicion of c- spine fracture).

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Intravenous Access and the Trauma Patient

All trauma patients undergo placement of an IV catheter, with many receiving central venous lines. Unfortunately, IV access related complications are common and by and large are preventable. The following recommendations should be observed in order to minimize line-related complications and decrease the risk of superficial thrombophlebitis, cellulitis, catheter-related bloodstream infections, infiltration/extravasation, sepsis and septic shock, DVT/PE and death.

1. All lines placed in the field, ED or OR are considered suspect and should be replaced as soon as feasible. Exceptions include central lines placed utilizing full barrier precautions (see below).
2. For injuries below the diaphragm: at least one intravenous (IV) line should be placed in a tributary of the superior vena cava, as there may be vascular disruption or obstruction of the inferior vena cava.
3. In patients with severe multiple trauma in whom occult thoracoabdominal damage is suspected, it is ideal to have one IV access site above the diaphragm and one below the diaphragm, thus accessing both the superior vena cava and inferior vena cava, respectively.
4. Short large-bore (14 or 16 gauge) peripheral IV cannulas are recommended for upper access. Recalling Poiseuille's law, doubling the internal diameter of the venous cannula increases the flow through the cannula 16-fold.
5. Subclavian and internal jugular catheters should be inserted on the side of injury in patients with chest wounds, reducing the chances of collapse of the uninjured lung. Internal jugular not usually used in trauma patients because of cervical collar immobilization and are relatively contraindicated in patients with a known cervical spine injury
6. In patients with hemodynamic shock and in situations where percutaneous peripheral or central venous access is either contraindicated or impossible to achieve, intraosseous (IO) line can be used for both volume replacement and infusion of therapeutic agents; there is some evidence that they should be the preferred initial access in patients with profound shock. however, massive transfusions may not be achieved using the IO route, and intravenous access should be obtained on these patients when practicable Preferred locations are the proximal or medial tibia or lateral aspect of the greater tubercle of the humerus. I/O lines must be discontinued as soon as is feasible when reliable peripheral or central IV access is established.
7. ALL central lines should be placed under "full barrier precautions" defined as sterile gown and gloves, cap and mask, and FULL draping (3/4 sheet, lap drape, etc). Chlorhexidine is the preferred prep agent and is available on most central line kits. Cap and masks are recommended for those nearby (i.e. bedside RN), while full barrier precautions should be observed by those assisting. Choice of central line will be dictated by the patient circumstances and trauma surgeon preference
8. All patients who have a central line placed should have ALL peripheral IV cannulas removed in order to decrease the incidence of thrombophlebitis as well as "save' the veins for IV insertion upon transfer from the ICU.
9. Central lines should be dressed with clear adhesive dressings unless the site is bleeding, or the patient is diaphoretic, in which the preferred dressing is sterile gauze. Chlorhexidine-impregnated disks have been shown to reduce line infections threefold.
10. Emergently placed Central lines will be considered contaminated and removed in 48 hrs; central lines will be removed upon transfer to the ward

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Initial Resuscitation and Massive Transfusion Protocol

The Massive Transfusion Policy outlines the process and considerations for transfusing exsanguinating patients under the direction of the attending surgeon, Emergency Medicine, Anesthesia, or Critical Care physician.
Exception: Patient's <15 years of age that would require massive transfusion for stabilization prior to transfer would be at the discretion of the Surgeon or Emergency Medicine Specialist.

Procedure:

Initial Resuscitation Cooler

- An initial cooler containing 2 units of Universal Donor Type O Rh(-) PRBCs and 2 units of AB Rh(+ or-) Liquid Plasma may be requested prior to initiation of MTP.
- Upon activation of Level 1/Code Alpha Trauma, the ED unit secretary or designee will call and notify Blood Bank of request for the Initial Resuscitation Cooler and will provide the patient's name and medical record number. An electronic order must be placed in the Electronic Health Record. THIS DOES NOT ACTIVATE MASSIVE TRANSFUSION PROTOCOL.
- Unit/department staff will deliver the Initial Resuscitation Cooler to the Emergency Department.

- If Massive Transfusion is indicated, use the following Protocol.

Massive Transfusion Protocol

1. **Triggers**: Evidence of class IV hemorrhagic shock adult patients (15 years or older): Heart Rate (HR)>120 and Systolic Blood Pressure (SBP)<90 with penetrating trauma, positive abdominal ultrasound or massive hemothorax on chest radiograph
2. **Activation**:
    a. The attending surgeon, Emergency Medicine, Anesthesia, or Critical Care physician must initiate the Massive Transfusion Protocol by electronic order unless actively resuscitating the patient, in which case a verbal order will be accepted.
    b. The unit liaison (RN or designee) will call the Blood Bank with the patient's name and medical record number. An electronic order must be placed in the Electronic Health Record to record MTP activation time.
    c. The Blood Bank technologist will notify other lab personnel including the Laboratory Director and/or Blood Bank Manager/Designee to expedite laboratory testing and preparation of all blood products.
3. **Infusion of Tranexamic Acid *TIME CRITICAL* For Trauma Patients: <3 hours from injury**: A designated trauma team RN will administer Tranexamic Acid 1gram IVPB over 10 minutes, then 1 gram IVPB infusion over 8 hours. If ordered by the attending trauma or ED physician, the order for Tranexamic Acid must be placed electronically in the Electronic Health Record. An alternative is a single 2 g bolus that may also be placed by anesthesia in the OR
4. Blood Bank/Blood Products: All coolers will be labeled with the number of products, ice packs, and duration of time products will remain within an acceptable temperature.
    a. The following coolers will be set up on a rotating basis:
        - Cooler A: 4 units PRBCs Type-specific or O Rh(-) (universal donor type)
        - Cooler B: 4 units Plasma (liquid universal donor type) or FFP (type-specific or group AB universal donor type)

- Cooler C: 1 10-pack platelets)

b. Staff from the patient location will retrieve blood products.

c. The designated liaison (OR circulating nurse, ED/ICU unit secretary, RN, or designee) will notify the Blood Bank when coolers are depleted as a prompt for the Blood Bank to repeat the preparation of repeating coolers. **If Blood Bank it not notified within ONE HOUR from initiation of MTP, the Blood Bank will stop preparing additional MTP packs**.

d. Unused product should be returned to the Blood Bank promptly.

e. Calcium, either Calcium gluconate or calcium chloride, should be given after the second round of blood products and every second cooler thereafter. Calcium levels should also be checked frequently along with other laboratory parameters.

5. **Infusion of Blood Product**: All contents of cooler will be warmed and rapidly infused into the patient via a high-pressure infuser. Platelets, cryo-precipitates, and/or granulocyte suspensions should not be infused via high-pressure infuser. The MTP nurse will notify the attending/ordering physician when each cooler infusion is completed.
6. **Guidelines for Termination of Massive Transfusion Protocol**:
   a. The cessation of hemorrhage or the absence of hemorrhagic shock should be considered as an opportunity for terminating the Massive Transfusion Protocol.
   b. Termination of the Massive Transfusion Protocol will be ordered by attending surgeon, Emergency Medicine, Anesthesia, or Critical Care physician and promptly communicated to the Blood Bank.

7. **Concurrent Management**:
   a. **Attainment of Vascular Access: obtain IV as per vascular access protocol. REMINDER:** Femoral Vein Introducer if NO pelvic region trauma, Subclavian or Internal Jugular Vein Introducer (if pelvic trauma, but no upper chest /clavicle trauma), Radial Arterial or Femoral Arterial Line for hemodynamic monitoring & ABGs.
   b. **Auto-transfusion** - After approval from the attending surgeon, transfuse all blood from any available collection device.
   c. **Arrest Bleeding** - stop bleeding from all named arteries & their branches by means of direct pressure, tourniquet, ligation/ligature, clamp, pelvic binder, or deliberate embolization.
   d. **Prevention of Hypothermia & Active Warming** - keep patient covered with blankets, apply Bair Hugger, warm IV fluids, heated circuits for ALL blood product infusions, minimize time that body cavities are left open, warmed gases on mechanical ventilator circuit. Monitor temperatures with thermistor Foley catheter and seek to maintain core temperature > 36 degrees Celsius.
   e. **Goal-Directed Therapy**- Maximize O2 Delivery and Reverse Acidosis: CVP should be maintained > 12 mmHg, urine output should be maintained > 0.5 mL/Kg/Hour, pH should be maintained above 7.25, and abnormal serum lactate and base deficit values should be deemed as global measures of tissue perfusion and should be corrected toward normal.
   In addition to warmed blood products. Lactated Ringers or alternative balanced salt solution should be infused to meet above guidelines. Vasopressor and inotrope support should be used cautiously as adjunct measures of hemodynamic support. 100% FiO2 should be utilized until hypotension is resolved and Massive Transfusion Protocol has been terminated.
   PH <7.25 should be addressed with a sodium bicarbonate infusion or individual amps of sodium bicarbonate intravenously. If available, the use of TEG to guide further resuscitation during and after the massive transfusion should be done
   f. **Cerebral Perfusion Pressure in Traumatic Brain Injury (TBI) Patients**
   In non-trauma or trauma patients with a GCS motor score of 6 and a normal CT of the brain, the MAP should be maintained between 60 and 70 mmHg. In trauma patients with a GCS motor score

<6 or abnormal CT of the brain, the MAP should be maintained >90 mmHg with a norepinephrine infusion as an adjunct as indicated.
In addition, the mechanical ventilator settings should be adjusted to maintain PCO2 35-40 to prevent extreme cerebral vasoconstriction or vasodilation.

g. **Hemostatic Vehicles & Pharmacologic Agents** - Liberal use of QuickClot, Flo Seal, Gelfoam with Topical Thrombin, Surgicel, Avitene, Evarrest, and other local hemostatic vehicles should be used when clinically indicate indicated.
h. **Damage Control** when the Massive Transfusion Protocol fails to correct microvascular bleeding: i.e. open abdomen packed with a KCI AbThera Temporary Abdominal Closure VAC Dressing or Steridrape + Sterile Towels + Closed Suction Catheters + Ioban Drape, transport to ICU for immediate warming, correction of acidosis, and reversal of coagulopathy [attempt reversal of "Lethal Triad"]

8. **Trauma Performance Review**: Every activation of the Massive Transfusion Protocol will be reviewed. At least annually, the protocol will be reviewed for potential revisions to incorporate advances from the literature and enhanced institutional processes.

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Hypothermia and Cold Water Drowning and/or Submersion Injuries

When presented with patients who have experienced cold water drowning or submersion injuries, it is important to remember that treatment and ultimate patient outcomes depend on multiple factors. These factors include time or duration of the event, patient age, water temperature, aspiration, contaminates in water, and co-morbid conditions the patient may have.

Hypothermia Definition (using core body temperature)

	Hypothermia	Hypothermia + Injury*	Signs
Hypothermia	<35°C or 95°F		
Mild Hypothermia	32-35°C or 89.6-95°F	<36°C or 96.8°F	Shivering, cool skin
Moderate Hypothermia	30-32°C or 86-89.6°F	<32-36°C or 89.6-96.8°F	Confusion, apathy, slurred speech, loss of fine motor skills
Severe Hypothermia	<30°C or 86°F	<32°C or 89.6°F	Fixed & dilated pupils, bradycardia, hypotension, pulmonary edema, apnea, or cardiac arrest

* Synergy of hypothermia and injury can lead to increased organ failure and mortality

Hypothermia and Associated Physiologic Changes

Temperature	System					
	Cardiovascular	CNS	Renal	Coagulation/hematologic	Respiratory	Other
35–36°C	Vasoconstriction Tachycardia ↑ Cardiac output	Shivering			↑ Resp rate	↑ Metabolic activity
32–34°C	Bradycardia ↓ Cardiac output	↓ ICP Abn EEG Confusion Lethargy	Cold diuresis	"Enzymatic" coagulopathy[a] Hemoconcentration (2% per 1°C decrease)	Bronchorrhea Inhibited ciliary function	↓ Metabolic activity
28–32°C	↑ Myocardial irritability "Osborne J" waves on ECG		Hypokalemia Hypomagnesemia	Thrombocytopenia (sequestration) Increased infectious risk	↓ Resp rate	Hyperglycemia Abn drug metabolism
≤28°C	Ventricular arrhythmias Cardiac arrest	Obtundation		Apnea		

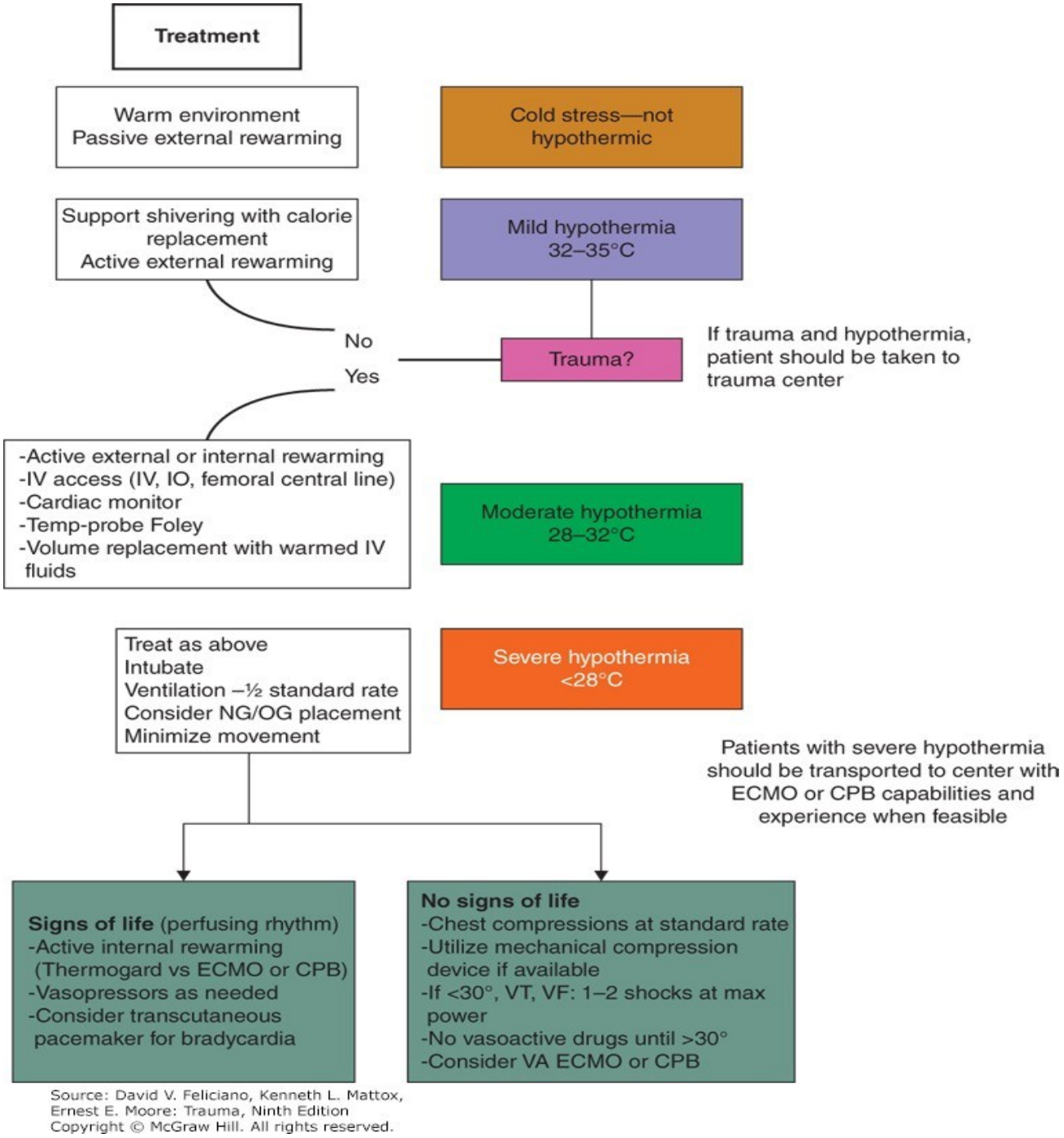
[a] As a broad estimate, for every degree Celsius below 34°C, coagulation factor activity decreases by 10%.

Abn, abnormal; CNS, central nervous system; ECG, electrocardiogram; EEG, electroencephalogram; ICP, intracranial pressure; Resp, respiratory.

Hypothermia and Physiologic Changes

Management:

- Immediate attention focused on addressing ABCDEs, including initiating CPR if patient is in cardiopulmonary arrest and establishing IV access.
- Mild hypothermia usually treated with noninvasive, passive external rewarming: dry patient, warm environment with ambient overhead heaters, warm blankets or forced-air blankets, cover head, warmed IVF.
- Moderate hypothermia usually treated with passive external rewarming
- Severe hypothermia may require active rewarming
  - External: heating pad, warm water/blankets, warm water immersion, external convection
  - Internal: heated IVF, gastric or colonic lavage, peritoneal lavage, mediastinal lavage, warmed inhalation air or oxygen , venous catheters
  - Extracorporeal: hemodialysis, continuous arteriovenous or venovenous rewarming, cardiopulmonary bypass
- Recommended temperature: IVF 43°C , oxygen 42-46°C
- Place in the intensive care unit, search for associated disorders (diabetes, sepsis, drug or alcohol ingestion) and occult injuries. Treat as disorders/injuries diagnosed.
- Blood samples: CBC, CMP, coagulation profile, fibrinogen, alcohol, blood glucose, and blood cultures
- Monitor with a Foley catheter with an integral temperature probe
- Subclavian or internal jugular catheter placement is avoided because the guide wire can trigger ventricular fibrillation of the cold myocardium
- In patients who appear to have suffered a cardiac arrest or death as a result of hypothermia, do not pronounce them dead until all efforts have been made to rewarm. However, there are a number of identified markers strongly correlated with death despite aggressive resuscitation: potassium of more than 12 mEq/L, lethal traumatic injury, core temperature less than 10°C, unwitnessed cardiac arrest, or chest wall too stiff to permit cardiopulmonary resuscitation.



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2. Advance Trauma Life Support 10h Ed, 2018

ED Thoracotomy

Emergency department thoracotomy (EDT) was introduced in 1996 as a life-saving measure for patients with thoracic injuries. Since then, multiple critical analyses of EDT have prompted a more selective application of the procedure. Survival with intact neurologic status (meaningful survival) should be the goal of EDT.

Selective Approach
In deciding whether to perform EDT, the following variables should be considered: Mechanism of injury (blunt vs. gunshot vs. stab), vital signs, and signs of life at the scene and on presentation of the ED. The same criteria for performing EDT should apply to children, as their survival closely parallels that of adults.

The major goals of potential therapeutic maneuvers of EDT are as follows: release pericardial tamponade; control cardiac, intrathoracic and/or great vessel bleeding; control bronchovenous air embolism; perform open cardiac massage; redistribute blood to myocardium and brain and limit sub-diaphragmatic hemorrhage via aortic cross-clamping.

Survival:

- Penetrating injury: 10.6%, neuro intact 90.4%
  - GSW: 7.2%
  - Stab: 15.8%
- Blunt: 2.3%, neuro intact 59.4%
- Location: cardiac 17.3%, thoracic 10.5%, abdominal 7%, neck/extremity 7%
- Prehospital CPR: yes 5.2%, No 13.6%
- ED signs of life: Yes 19%, No 2.9%

Technique

- EDT is performed through a left antero-lateral incision at the level of the fifth intercostal space or inferior border of the pectoralis major muscle. The skin, subcutaneous tissue, and chest wall musculature should be incised with one knife pass.
- The intercostal muscles and pleura should then be incised with heavy Mayo scissors along the superior margins of the rib.
- A rib spreader is inserted with the handle toward the axilla.
- The pericardium is opened with a longitudinal incision anterior to the phrenic nerve.
- Any blood clot should be evacuated, and attempts made to control cardiac bleeding with sutures (pledgets used in the RV).
- Trans sternal extension into the right chest (“clamshell” incision) may be helpful in exposing the heart for repair, or if the source of hemorrhage is located on the right.
- Open cardiac massage can then be performed.
- Air embolism or massive bleeding from the lung is controlled with a clamp across the pulmonary hilum.
- The thoracic aorta is visualized be elevating the left lung anteriorly and superiorly.

- The aorta is differentiated from the esophagus by palpating the nasogastric tube, a vascular clamp is placed across the aorta.
- The patient will then need to be urgently transported to the Operating Room.

Risks to Trauma Team

ED thoracotomy involves the use of sharp instruments and contact with the patient's blood in an often chaotic atmosphere. In urban trauma populations, the rate of HIV and hepatitis B and C infection range from ten to twenty times that of the general population. This rate may be even higher in the population most likely to require ED thoracotomy, **making universal precautions and selective use of the procedure essential.**

EAST Evidence-Based Recommendations to perform EDT

Pulseless Patient	No Signs of Life	Signs of Life*	EDT
Penetrating thoracic		X	Strong YES
Penetrating thoracic	X		Conditional YES
Penetrating extra- thoracic		X	Conditional YES
Penetrating extra- thoracic	X		Conditional YES
Blunt		X	Conditional YES
Blunt	X		Conditional NO

*Signs of life include: pupillary response, spontaneous ventilation, presence of carotid pulse, measurable or palpable blood pressure, extremity movement, or cardiac electrical activity.

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SECONDARY SERVICE / DEFINITIVE CARE

Traumatic Brain Injury

Trauma causes 150,000 deaths in the United States each year, about half due to fatal head injuries. Not all neurologic damage occurs at the moment of injury; further injury can occur over the ensuing hours and days. Early goals of therapy are to evacuate surgically correctable intracranial mass lesions and avoid secondary brain injury by protecting brain perfusion by meticulous critical care.

Patients may be stratified into categories of Mild, Moderate or severe based on their Glasgow Coma Score (GCS). Mild TBI is defined as GCS 13 or greater, moderate as GCS 9-12, and severe TBI shall be defined as GCS < or equal to 8

Patients should be evaluated, resuscitated and treated accordingly to ATLS guidelines (1° and 2° survey). A majority of patients with severe closed head injury can be managed with relatively simple, but meticulous care. They will be referred to as 1st Tier Therapies (see Table). Patients with more severe injury need more aggressive therapy. This will be called 2nd Tier Therapies. (see Figure)

Time to therapy is a factor in the outcome of these patients, and the following conditions will merit a response time from the neurosurgeon of 30 minutes or less:

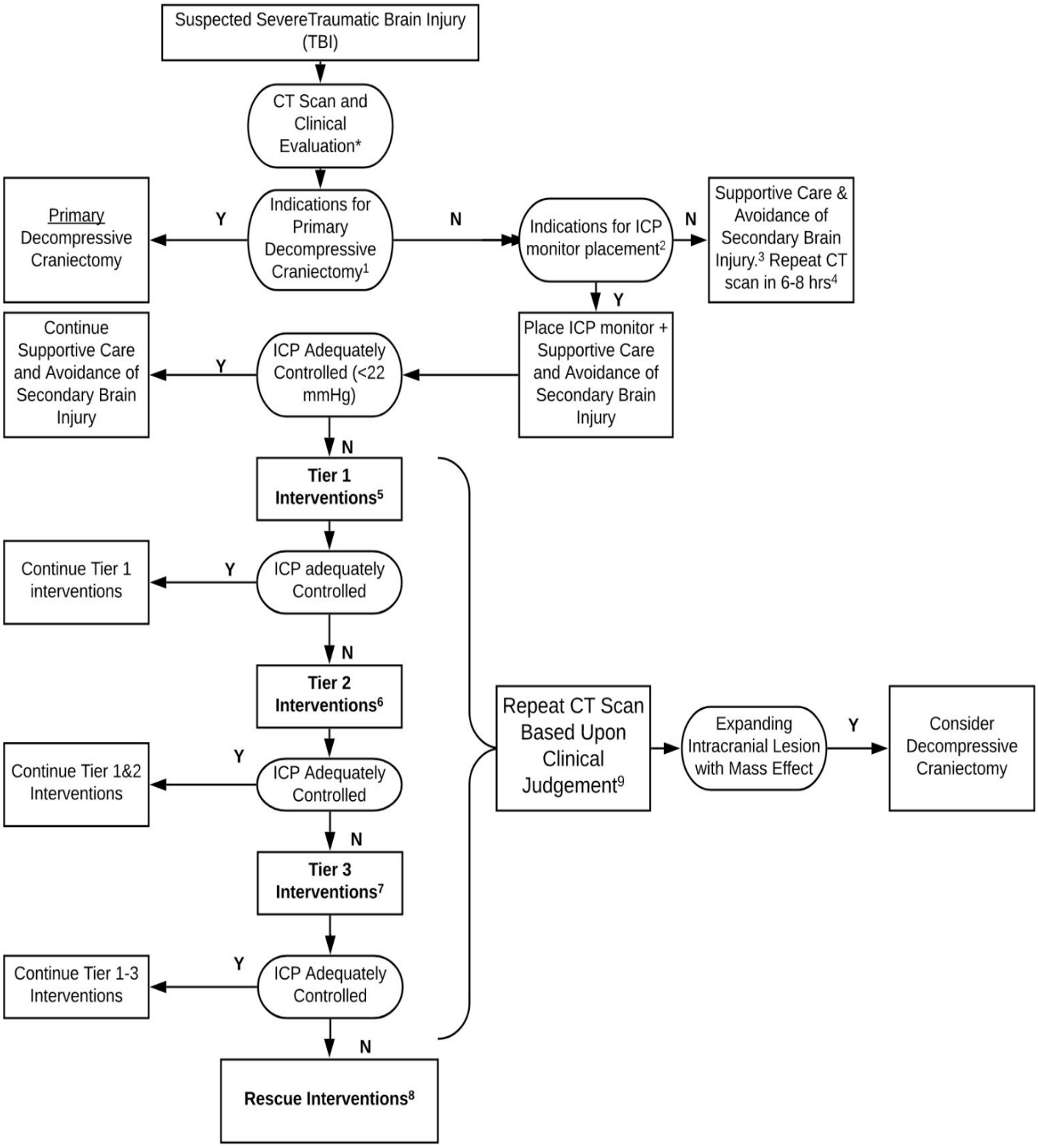
- Severe TBI (GCS less than 9) with head CT evidence of intracranial trauma
- Moderate TBI (GCS 9–12) with head CT evidence of known or potential intracranial mass lesion

In patients who are not responding to therapy, repeat CTs early can be considered to detect delayed, undiagnosed, or evolving injury. Status epilepticus and need for EEG should also be considered. The following therapies are offered for severe TBI:

- Endotracheal Intubation / Mechanical Ventilation. Target SaO2 > 95 %, PaO2 ≥ 100 mmHg, $PaCO_2$ 35-40 mmHg*
- Euvolemic Resuscitation, consideration of central venous access
- ICP Monitoring – EVD (ventriculostomy) for drainage**
- Seizure Prophylaxis (e.g levetiracetam 20 mg/kg load, then 500 mg q12H x 7 days)
- Normothermia
- Euglycemia (80 – 180 mg/dL)
- Stress ulcer prophylaxis
- DVT prophylaxis, ideally LMWH
  - Low risk of progression: when CT brain normal x 24 hours
  - Moderate risk of progression (SDH/EDH > 8mm, IPH > 2 cm, worsening of CT brain at 24 hours): Attempt to start with 72 hours of stability
  - High risk (ICP monitor, s/p craniectomy, worsening of CT brain at 72 hours, concomitant injuries): Consider IVC filter
- Short-acting sedative / analgesics
- Head of bed 30°
- Consider early goal directed correction of coagulopathy, e.g. TEG
  - Hemoglobin greater than 7 – 8 mg/dL
  - Platelets > 75 x 103/mm3
  - TXA if within 3 hours of injury
- Close electrolyte monitoring, avoidance of hyponatremia (Na goal 135-145)
- Initiate enteric feeds within 24 -72 hours, increase to full nutritional support within 7 days
- Consider early use of beta blockade (e.g. propranolol 20 mg enteric q12H)

* There is no role for prophylactic or prolonged hyperventilation to decrease ICP. Temporary hyperventilation may be considered in acute neurologic deterioration.

** Some patients with a GCS ≤ 8 may not need an EVD. Young (age <40), hemodynamically stable (SBP > 90) patients with normal CT scans on admission can be observed and followed clinically without an EVD. This to be determined by the attending neurosurgeon.



Categories	Interventions
Supportive Care and Measures to Avoid Secondary Brain Injury	• Standard Trauma Care • Hemorrhage control • Adequate Resuscitation and Administration of Blood Products • Elevation of the head of bed • Analgesics/Sedatives • Fluid and Electrolyte Management • Avoidance of Hyponatremia • Prevention of Hyperpyrexia • Treatment for Hyper/Hypoglycemia • Supplemental Oxygen to Maintain Oxygen Saturation >90% and pO2 > 60 mmHg • Normocarbic Ventilation (pCO2 35-40 mm Hg) • Correction of Coagulopathy • Early Delivery of Nutrition (Preferentially Enteral) • Treatment of Infections
Tier 1	• Additional Analgesia/Sedation • Cerebrospinal Fluid Drainage
Tier 2	• Hyperosmolar Therapy • Neuromuscular Paralysis
Tier 3	• High Dose Barbiturates • High Dose Propofol
Rescue Strategies	• Decompressive Craniectomy • Experimental Therapies

Table 2. Goals of Treatment

Pulse Oximetry ≥ 95%	ICP 20 - 25 mmHg	Serum sodium 135-145
PaO_2 ≥ 100 mmHg	$PbtO_2$ ≥ 15 mmHg	INR ≤ 1.4
$PaCO_2$ 35-45 mmHg	CPP ≥ 60 mmHg *	Platelets ≥ 75 x 10^3 / mm^3
SBP ≥ 100 mmHg	Temperature 36.0-38°C	Hemoglobin ≥ 7 g/dl
PH 7.35-7.45	Glucose 80-180 mg/dL	

PaO2: partial pressure of oxygen; PaCO2: partial pressure of carbon dioxide; SBP: systolic blood pressure; ICP: intracranial pressure; PbtO2: brain tissue oxygen tension; CPP: cerebral perfusion pressure; INR: international normalized ratio; *depending on status of cerebral autoregulation

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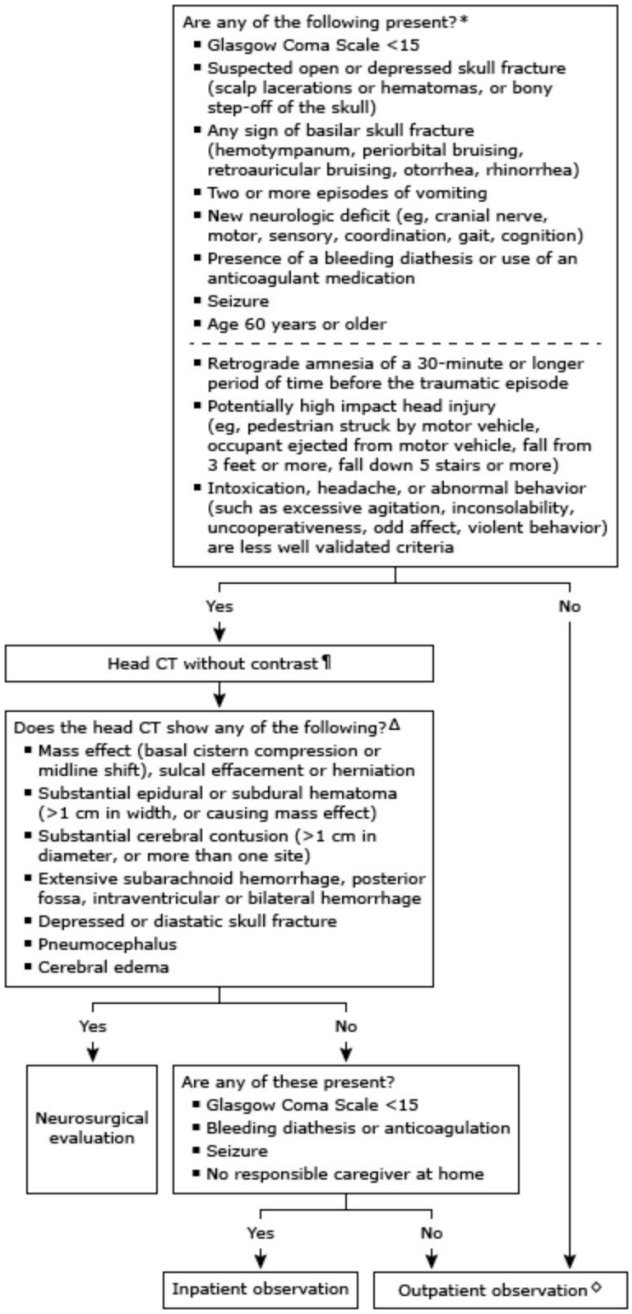
Minor Head Injury (GCS 13-15)

Traumatic brain injury (TBI) occurs in 2,000,000 patients per year with a significant number of these resulting in lifelong debilitation. The majority of these head injuries are considered minor (GCS 13- 15). However, this patient population is not homogeneous. The incidence of clinically significant traumatic brain injury in patients with a GCS of 13 or 14 (15-30%) is much higher than in patients who present with a GCS of 15 (4-6%). Some centers have proposed a liberal policy of using CT scan to diagnose head injury, however, centers that obtain more CT scans do not necessarily have fewer missed injuries.



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Cervical/ Thoracic / Lumbar / Sacral (TLS) Spine Evaluations in Adult Trauma Patients

A trauma patient may be obtunded, have an altered sensorium, or be too hemodynamically unstable to obtain a dependable clinical examination of their entire spinal axis. Alternatively, trauma patients may have distracting injuries that make an accurate assessment of the patient's report of pain, as well as their clinical examination unreliable. It is thus critical that patients with suspected spine injuries get evaluated in rapid fashion. Neurologic deficit as a result of potential spinal cord injury (applicable to spine surgeon, whether a neurosurgeon or orthopaedic surgeon) should prompt immediate spine consultation with the expectation of response time within 30 minutes

Procedure:

1. **General Considerations:**
    - Any patient with injuries above the clavicles, involved in a high energy mechanism or, complaining of head, neck, or back pain regardless of injury mechanism should have their cervical spine immobilized with a rigid cervical collar according to local and state EMS protocols as well as hospital protocol.
    - If the patient arrives via EMS with a backboard in place: immediately after transfer of the patient from the ambulance stretcher to the emergency department gurney, the hard long backboard should be safely removed with the patient properly log-rolled. Correct logrolling of the patient requires sufficient personnel (at least 3-4 individuals), including a dedicated person providing manual cervical immobilization.
    - After addressing the ABC's of the primary survey, lateralizing signs are identified along with other gross motor or sensory deficits to assess the patient for spinal cord injury. If not compromising the patient's care and in addition to observation of extremity movement, digital rectal examination and sensory examination in the perianal region should be completed prior to administration of any neuromuscular blockade. It is most appropriate to thoroughly inspect and palpate the patient's back when the patient is log-rolled during removal of the long backboard, or alternatively, when the patient is being examined for signs of injury during the primary survey.
2. **Clearance of Cervical Spine without Imaging Studies:**
    - According to Level I and Level II evidence, radiographic studies are not indicated in patients who meet all of the following criteria:
        - No mental status changes (and no evidence of alcohol or drugs). Note: altered mental status can include GCS<15; disorientation to person, place, time or events; inability to remember 3 objects at 5 minutes; delayed response to external stimuli. Evidence of alcohol or drugs includes information from the history, physical findings (slurred speech, ataxia, and odor of alcohol on breath) or positive blood or urine tests.
        - No neck pain or posterior midline tenderness (and no distracting pain).
        - No focal neurologic deficit (on motor or sensory examination).
        - Do not have significant associated injuries that detract/distract from their evaluation.

Based on the above, cervical immobilization may be discontinued without cervical spine imaging in these patients.

3. **A cervical collar is not needed in trauma patients who meet the following criteria:**
    - Asymptomatic patients as in above who are alert, without neurologic deficits or distracting injuries who have NO neck pain or tenderness and full ROM of the cervical spine.
    - Penetrating brain trauma: unless the trajectory suggests direct cervical spine injury

Level II and Level III guidelines dictate that patients who are awake WITH neck pain or have tenderness and a normal cervical CT scan should obtain adequate dynamic flexion-extension cervical spine x-rays and must include a well visualized C7-T1 junction. Alternatively, an MRI of the cervical spine may be obtained and if the flexion/extension x-rays or the MRI is negative, the collar may be cleared. It is of note, the American Association of Neurologic Surgeons and Congress of Neurologic Surgeons recommend completing the MRI within 48 hours of the index injury to be diagnostic otherwise, and fluid signal changes may drop out.

In obtunded patients with normal CT of the cervical spine and gross movement of all 4 extremities:

- Flexion-extension cervical spine x-rays should NOT be performed.
- Options in this scenario include: maintain cervical collar until a clinical exam can be performed, remove the collar on the basis of the normal CT scan alone (the incidence of ligamentous injury with a negative CT is <5% and the incidence of clinically significant injury is unknown but is much <1%) or, obtain an MRI of the cervical spine.

Clinical Clearance of the Axial Spine:

1. The thoracic and lumbosacral spine may be individually clinically cleared if cervical spine clearance has been achieved and a dedicated clinical exam performed during the secondary survey or soon thereafter.
2. No tenderness on palpation along the spinous processes from T1 to T12 for the thoracic spine region.
3. No tenderness on palpation along the spinous processes from L1 to L5 and continuing down to the tip of the coccyx for the lumbar/sacral spine region.
4. If the cervical spine has a documented acute skeletal injury, then even if the thoracic and lumbosacral spine are nontender clinically, these regions of the axial spine should have dedicated radiographic imaging. For patients with any axial spine tenderness, the preferred imaging technique is by CT scanning with 2 mm thin cuts; reconstruction views of the thoracic and lumbar/sacral spine from already completed chest, abdomen, and pelvic CT scans are sufficient for such dedicated radiographic imaging.
5. If the images of the axial spine are negative or if no images were needed due to satisfaction of the above criteria, then a nontender exam of the thoracic and lumbosacral spine permits clinical clearance of the entire axial spine. A note documenting this clearance should be documented in the medical chart. The head of the patient's gurney / bed may then be elevated (flexion of the thoracic spine).

4. **Practice Guidelines for Radiographic Imaging in Trauma Patients who are Obtunded or Unevaluable:**
   This includes unresponsive patients or an unreliable exam (altered mental status, distracting pain or distracting injuries).

   Level I guidelines: High quality thin cut CT is the imaging modality of choice. A 3-view cervical spine x-ray is not recommended. If high quality thin cut CT is not available, a 3-view cervical spine

x-ray (AP, lateral and, open mouth odontoid view) are recommended. Supplement with a CT when it becomes available if needed to further define areas that are suspicious.

Level II guidelines: If a high quality CT imaging is normal but the index of suspicion is high, further management should fall to the physician trained to diagnosis and treat spine injuries. *Level III guidelines:* If high quality CT imaging is normal, options include: continue cervical collar immobilization until asymptomatic, obtain cervical MRI within the first 48 hours or, discontinue the collar at the discretion of the physician trained to diagnose and treat spine injuries.

5. **Suspected or Known Cervical Spine Injury:**
   If the patient is unable to satisfy criteria as stated above, the patient must be maintained in a rigid cervical collar and evaluated by a dedicated CT scan of the cervical spine with thin cuts of 2 mm each and without IV contrast.

   If CT scan demonstrates an acute skeletal injury, then prompt consultation should be obtained with neurosurgery. If patient has a neurological deficit, then as guided by the neurosurgeon, obtain emergent MRI studies to identify spinal cord and/or ligamentous injuries. These patients should also be considered for CT angiography of the head and neck (with 64-slice scanner) or MRA to evaluate the carotid and vertebral artery vessels.

   If CT scan demonstrates NO acute fracture but the patient does not meet requirements in Item 3:
   - If patient has a neurological deficit, then consultation should be sought with neurosurgery, and as guided by the neurosurgeon, obtain emergent MRI studies to identify spinal cord and/or ligamentous injuries. These patients should also be considered for CT angiography of the head and neck (with 64-slice scanner) or MRA to evaluate the carotid and vertebral artery vessels.
   - If patient has NO neurological deficit, then:
     - Further evaluation should be deferred to when patient can be more reliably evaluated (i.e. after long-bone fracture fixation).
     - If patient has persistent cervical spine tenderness or suspicion of cervical spine ligamentous injury, then evaluation should be performed with flexion/extension plain films under the patient's own voluntary efforts or obtaining an MRI study as soon as feasible as outlined in Item 3.

   - If the patient's cervical spine cannot be clinically cleared, then the rigid, hard plastic cervical collar provided by the Emergency Medical Services (EMS) should be replaced with an aspen vista collar within the first 24- hours to avoid decubitus ulcers. This should be completed by at least two individuals so that one person provides in-line cervical immobilization while the other(s) remove the existing collar and positions the new collar without causing or permitting any flexion, extension, or rotational movement of the cervical spine.

   - Any patient suspected of an acute skeletal spine injury must be log-rolled for all transfers and to mobilize the patient at least every 2 hours to avoid early stage decubitus ulcer formation.

6. **Suspected or Known Axial Spine Injury:**
   Patients unable to satisfy Items 2, 3 or, 4 should be maintained on strict spine precautions in a rigid cervical collar and kept supine with head and foot of the bed/gurney flat at all times (spine immobilization). These patients should have dedicated CT scans with thin cuts of 2 mm each of the

thoracic and lumbosacral spine depending on mechanism, anatomical site of complaint, or nerve roots associated with focal neurological deficits.

A. If CT scan demonstrates an acute skeletal injury, then prompt consultation should be obtained with neurosurgery. If patient has a neurological deficit, then as guided by the neurosurgeon, obtain an MRI study of the involved spine region(s).
B. If CT scan demonstrates NO acute skeletal injury, and patient still cannot satisfy conditions in Items 2, 3 or, 4, then patient must remain on strict spine precautions.
   - If patient has a neurological deficit, then consultation should be sought with neurosurgery, and as guided by the neurosurgeon, obtain an MRI of the spine axis associated with the suspected affected nerve roots.
   - If patient has NO neurological deficit, then further evaluation should be deferred to when patient can be better evaluated (i.e. after long-bone fracture fixation).

7. **Neurological Deficit(s) with Suspected Cervical or Axial Spine Injury:**
   Regardless of whether or not there is an acute skeletal injury, the presence of a neurologic deficit consistent with a complete or incomplete spinal cord injury in a patient sustaining blunt trauma should have the following factors taken into consideration:

A. Level I guidelines find that methylprednisolone (MP) for the treatment of spinal cord injury (SCI) is NOT recommended. Likewise, GM-1ganglioside (Sygen) for the treatment of acute SCI is NOT recommended. Class I, II and, III evidence exists that high dose steroids are associated with harmful side effects and even death. There is no Class I or II evidence supporting the benefit of MP in SCI.
B. There is not enough evidence to support the use or argue against the use of hypothermia in SCI as outlined from the American Association of Neurologic Surgeons or the Congress of Neurologic Surgeons.
C. Prophylactic treatment of DVTs in patients with SCI should include: LMW heparin, rotating beds, adjusted dose heparin or, low dose heparin in conjunction with pneumatic compression stockings or electric stimulation. DVT prophylaxis should be started within 72 hours. Prophylactic placement of IVC filters in SCI patients is not advised.

8. **Hypotension (SBP < 90 mmHg) Associated with Suspected Cervical or Upper Thoracic Spinal Cord Injury (Neurogenic Shock):**

A. Hypotension (SBP < 90 mmHg) associated with suspected cervical or upper thoracic spinal cord injury should initially be addressed with boluses of warmed intravenous isotonic solutions, such as Lactated Ringer's.
B. Sources of blood loss should continue to be sought expeditiously and controlled promptly, with administration of blood products as needed to restore oxygen delivery to critical tissue beds.
C. Consider other sources of shock such as tension pneumothorax, cardiac tamponade, cardiogenic shock, and septic shock before concluding the existence of neurogenic shock. Neurogenic shock is classically manifested by hypotension (SBP < 90 mmHg) associated with relative bradycardia (normal sinus rhythm) with rate of 60-100 beats per minute.
D. Central Venous Pressure (CVP) monitoring should be utilized to ensure that the CVP is > 10-12 mmHg.
E. Given the benefits of oxygenated blood flow to the injured spinal cord, the addition of vasopressor agents is warranted with preference for the use of dopamine (due to its chronotropic effects) to achieve the goal of MAP > 85-90 mmHg for the first 7 days after SCI. Dopamine is preferred over

fluids for MAP goal maintenance. *Phenylephrine (Neosynephrine) should be avoided because of its non-ionotropic effects and possible reflex increase in vagal tone leading to bradycardia.* Global parameters of shock, such as base deficit and lactic acid, should also be monitored to ensure adequate peripheral tissue perfusion.

9. **Example Treatment Paradigm for Patient with a SCI in the Hospital Setting as adopted by Greenberg et al:**

A. Immobilization with collar/backboard particularly when transferring to CT table with log rolling precautions. Upon completion of CTs, back board may be removed with exercising spine precautions.
B. Maintain SBP>90mmHg with vasopressors as dictated above. SCI patients have increased propensity for development of pulmonary edema. Oxygenation with room air, NC, face mask or, intubation. If intubation is required, use chin lift (not jaw thrust) without neck extension.
C. NG tube to suction prevents vomiting and aspiration and decompresses the abdomen which can interfere with respirations if distended.
D. Indwelling urinary catheter to monitor I's and O's and prevent bladder distention.
E. DVT prophylaxis as outlined above.
F. Temperature regulation: SCI and paralysis may produce poikilothermy as a result of loss of cutaneous vasomotor response to temperature changes.
G. Attention to electrolytes as hypovolemia and hypotension cause increased plasma aldosterone which may lead to hypokalemia.
H. Detailed neurologic examination focusing on mechanism of injury, palpation of the spine for step-offs as dictated above, motor level assessment, sensory level assessment, evaluation of reflexes (muscle stretch reflexes are usually absent initially in SCI)
I. Additional radiographic imaging as outline above.
J. Medical management.

Standard Neurological Classification of Spinal Cord Injury

MOTOR

KEY MUSCLES

R			L	
C2				
C3				
C4				
C5				
C6				
C7				
C8				
T1				
T2				
T3				
T4				
T5				
T6				
T7				
T8				
T9				
T10				
T11				
T12				
L1				
L2				
L3				
L4				
L5				
S1				
S2				
S3				
S4-5				
TOTALS				

Elbow flexors
Wrist extensors
Elbow extensors
Finger flexors (distal phalanx of middle finger)
Finger abductors (little finger)

0 = total paralysis
1 = palpable or visible contraction
2 = active movement, gravity eliminated
3 = active movement, against gravity
4 = active movement, against some resistance
5 = active movement, against full resistance
NT = Not testable

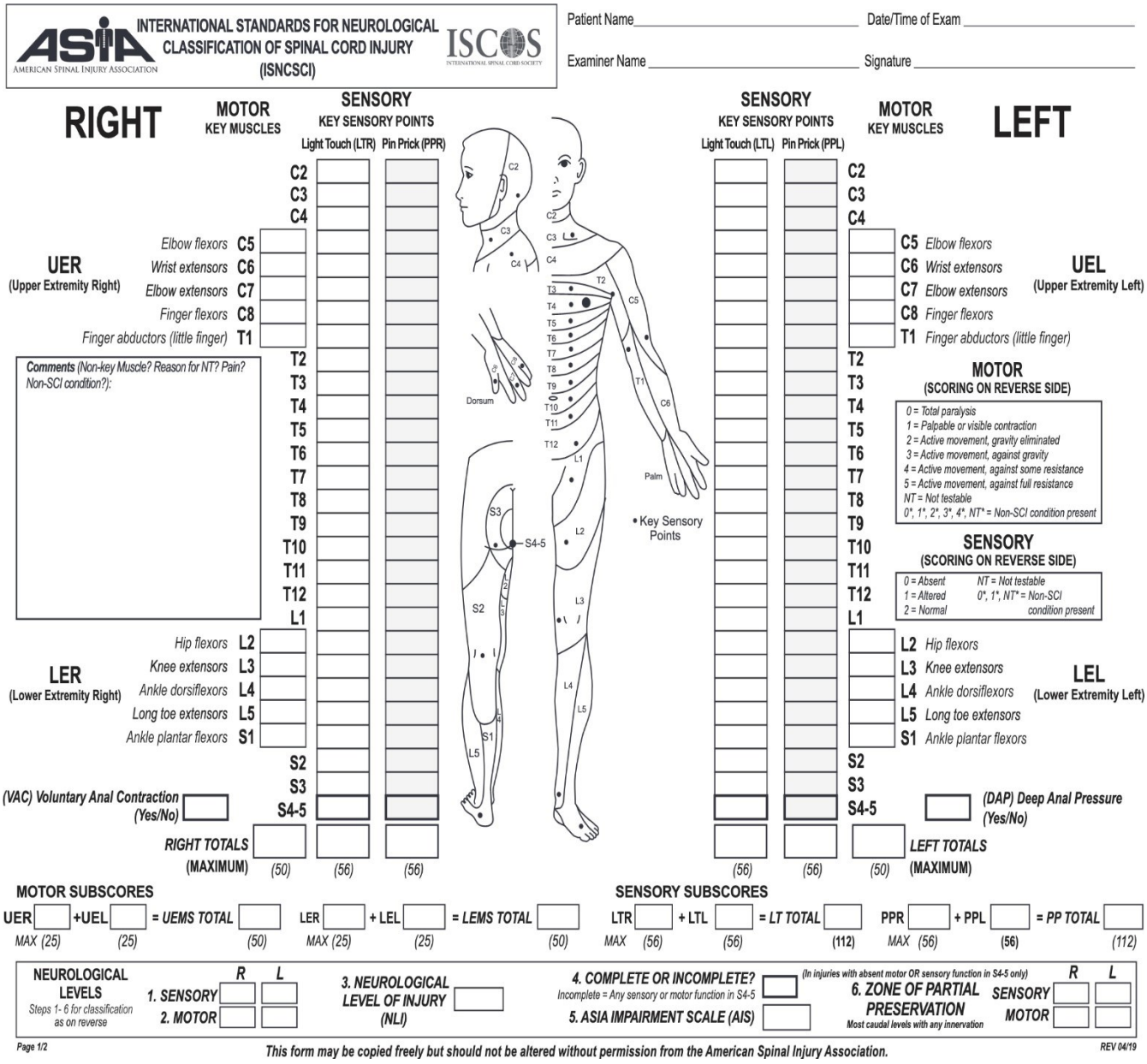
Hip flexors
Knee extensors
Ankle dorsiflexors
Long toe
Extensors
Ankle plantar flexors

Voluntary anal contraction (Yes/No)

MOTOR SCORE

Maximum	50	50	100

NEUROLOGICAL LEVELS		**R**	**L**	**COMPLETE OR INCOMPLETE?**
	SENSORY			*Incomplete = Any sensory or motor function in S4-S5*
The most caudal	**MOTOR**			
Segment with				**ASIA IMPAIRMENT SCALE**
Normal function				


INTERNATIONAL STANDARDS FOR NEUROLOGICAL CLASSIFICATION OF SPINAL CORD INJURY (ISNCSCI)
ASIA AMERICAN SPINAL INJURY ASSOCIATION
ISCOS INTERNATIONAL SPINAL CORD SOCIETY
Patient Name
Date/Time of Exam
Examiner Name
Signature
RIGHT
LEFT
MOTOR KEY MUSCLES
SENSORY KEY SENSORY POINTS
Light Touch (LTR)
Pin Prick (PPR)
Light Touch (LTL)
Pin Prick (PPL)
UER (Upper Extremity Right)
UEL (Upper Extremity Left)
Elbow flexors C5
Wrist extensors C6
Elbow extensors C7
Finger flexors C8
Finger abductors (little finger) T1
Comments (Non-key Muscle? Reason for NT? Pain? Non-SCI condition?):
LER (Lower Extremity Right)
LEL (Lower Extremity Left)
Hip flexors L2
Knee extensors L3
Ankle dorsiflexors L4
Long toe extensors L5
Ankle plantar flexors S1
(VAC) Voluntary Anal Contraction (Yes/No)
(DAP) Deep Anal Pressure (Yes/No)
RIGHT TOTALS (MAXIMUM)
LEFT TOTALS (MAXIMUM)
(50) (56) (56)
(56) (56) (50)
Dorsum
Palm
• Key Sensory Points
MOTOR (SCORING ON REVERSE SIDE)
0 = Total paralysis
1 = Palpable or visible contraction
2 = Active movement, gravity eliminated
3 = Active movement, against gravity
4 = Active movement, against some resistance
5 = Active movement, against full resistance
NT = Not testable
0*, 1*, 2*, 3*, 4*, NT* = Non-SCI condition present
SENSORY (SCORING ON REVERSE SIDE)
0 = Absent
1 = Altered
2 = Normal
NT = Not testable
0*, 1*, NT* = Non-SCI condition present
MOTOR SUBSCORES
UER +UEL = UEMS TOTAL
MAX (25) (25) (50)
LER + LEL = LEMS TOTAL
MAX (25) (25) (50)
SENSORY SUBSCORES
LTR + LTL = LT TOTAL
MAX (56) (56) (112)
PPR + PPL = PP TOTAL
MAX (56) (56) (112)
NEUROLOGICAL LEVELS
Steps 1- 6 for classification as on reverse
1. SENSORY
2. MOTOR
R L
3. NEUROLOGICAL LEVEL OF INJURY (NLI)
4. COMPLETE OR INCOMPLETE?
Incomplete = Any sensory or motor function in S4-5
5. ASIA IMPAIRMENT SCALE (AIS)
(In injuries with absent motor OR sensory function in S4-5 only)
6. ZONE OF PARTIAL PRESERVATION
Most caudal levels with any innervation
SENSORY
MOTOR
Page 1/2
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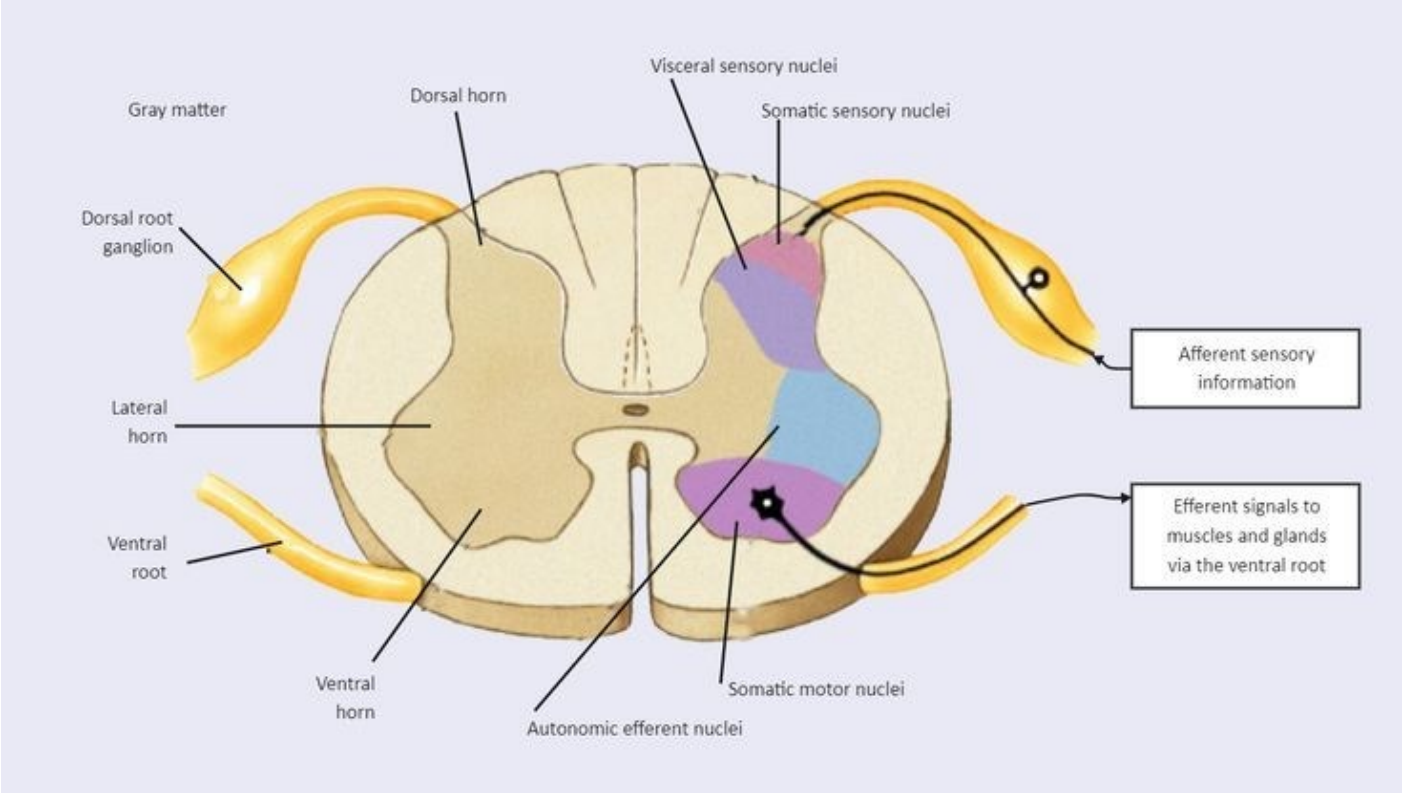
REV 04/19


Visceral sensory nuclei
Gray matter
Dorsal horn
Somatic sensory nuclei
Dorsal root ganglion
Afferent sensory information
Lateral horn
Efferent signals to muscles and glands via the ventral root
Ventral root
Ventral horn
Somatic motor nuclei
Autonomic efferent nuclei

Penetrating Neck Trauma

The optimal management of penetrating neck injury has been debated for the past 40 years. Early reports, influenced by military experience, recommended a policy of mandatory neck exploration. Given the anatomical proximity of critical structures in the neck and the disastrous potential of innocuous appearing injuries, many surgeons adopted this approach. On the other hand, the policy was questioned in civilian practice, driven by economic considerations and resistance to "unnecessary surgery" in 40-60% of patients. Selective management protocols have become widely accepted. Current debate focuses on the role of ancillary diagnostic tests in selective management protocols as the vast majority (>95%) of significant injuries are symptomatic. [1–4] The debate continues because there has not been a definitive study proving that one approach is superior or more cost effective compared with another. The goal of this management guideline is to encourage timely exploration in symptomatic patients and to obtain appropriate diagnostic studies in asymptomatic patients. The critical maneuver in the management of these patients is the physical examination, as all decisions are made based on physical findings. There are several principles to bear in mind.

1. Trauma surgeon presence is required for GSWs to the neck.
2. Immediate trauma surgeon notification is required for SWs to the neck.
3. Penetrating neck wounds should not be probed.
4. An adequate surgical exploration involves visualizing the wound tract, exploring the carotid sheath, and fully mobilizing the trachea and esophagus if there are signs of aerodigestive injury or if the trajectory of the wound is proximity of these structures.
5. The neck is divided into three anatomic zones: Zone I (between the clavicle and the cricoid cartilage), Zone II (between the cricoid cartilage and angle of the mandible), and Zone III (above the angle of the mandible).

PHYSICAL EXAMINATION – "Positive" Findings

Vascular Exam:	**Aerodigestive Exam:**
Active Bleeding	Hemoptysis/Hematemesis
Hypotension	Air Bubbling
Large or expanding Hematoma	Subcutaneous Emphysema Pulse Deficits-Carotid,
Brachial/Radial	Hoarseness
Bruit	Dysphagia

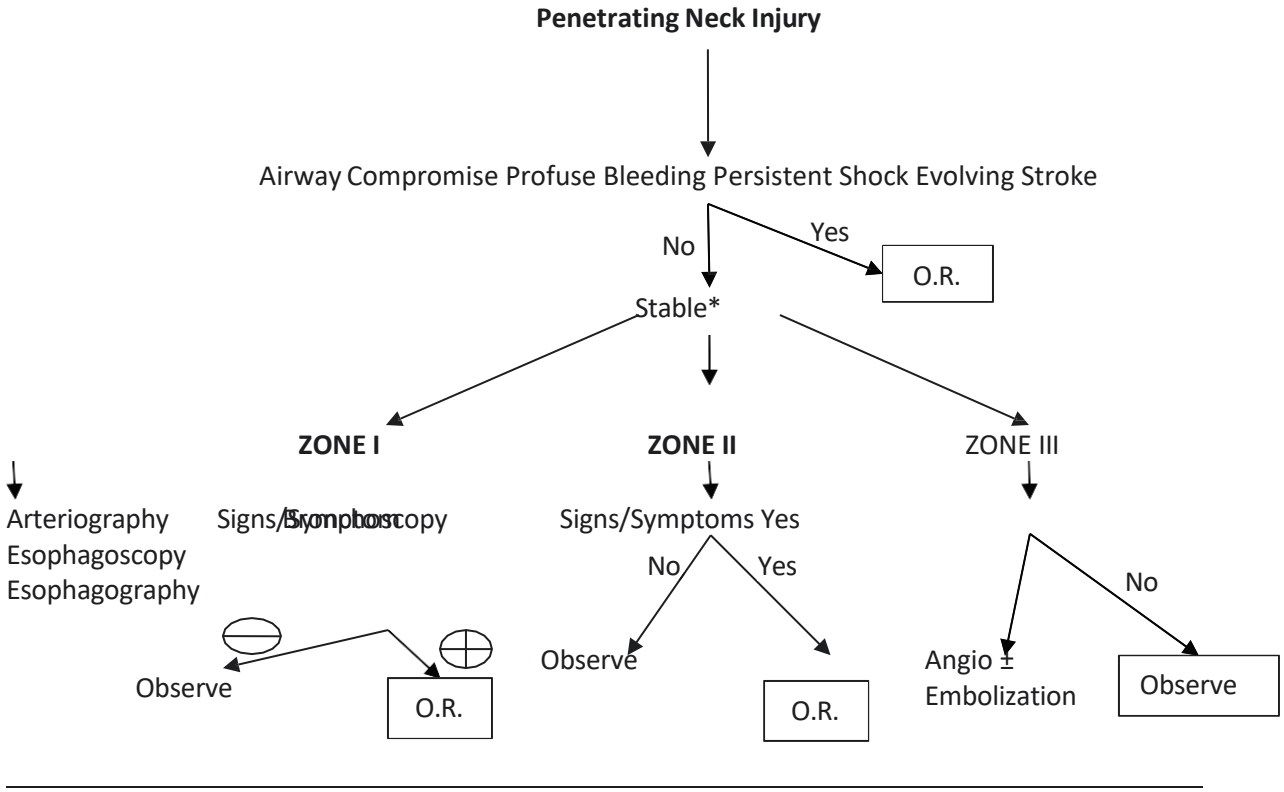
Neurologic Exam:

Localizing Signs: Pupils, Limbs, CN's

CN's: Facial
Glossopharyngeal – midline position of soft palate
Recurrent Laryngeal – hoarseness, ineffective cough
Accessory – shoulder lift
Hypoglossal – midline position of tongue

Horner's Syndrome – myosis, ptosis

Brachial Plexus:
- Median – fist
- Radial – wrist extension
- Ulnar – abduction/adduction of fingers
- Musculocutaneous – forearm flexion
- Axillary – arm abduction



* If GSW, transcervical or high-risk trajectory, get arteriography/bronchoscopy/esophagoscopy/esophagography

1. Biffl WL, Moore EE, Rehse DH, et al. Selective Management of Penetrating Neck Trauma Based on Cervical Level of Injury, Am J Surg 1997;174:678-682.
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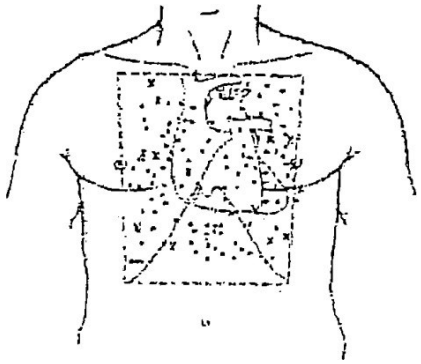
Penetrating Injuries to the Heart

Clinical signs of pericardial tamponade in penetrating cardiac injuries are the exception, rather than the rule.[1] Paradoxically, pericardial tamponade itself may act protectively, as patients with cardiac injuries *and* tamponade had a higher survival rate than those presenting without tamponade.[2] Thus, patient who survive the acute stage after penetrating cardiac trauma (i.e. those who make it to the ED alive) are more likely to have tamponade. It is critical to identify patients with cardiac injury (and tamponade) early on, before the "protective" effect is lost.

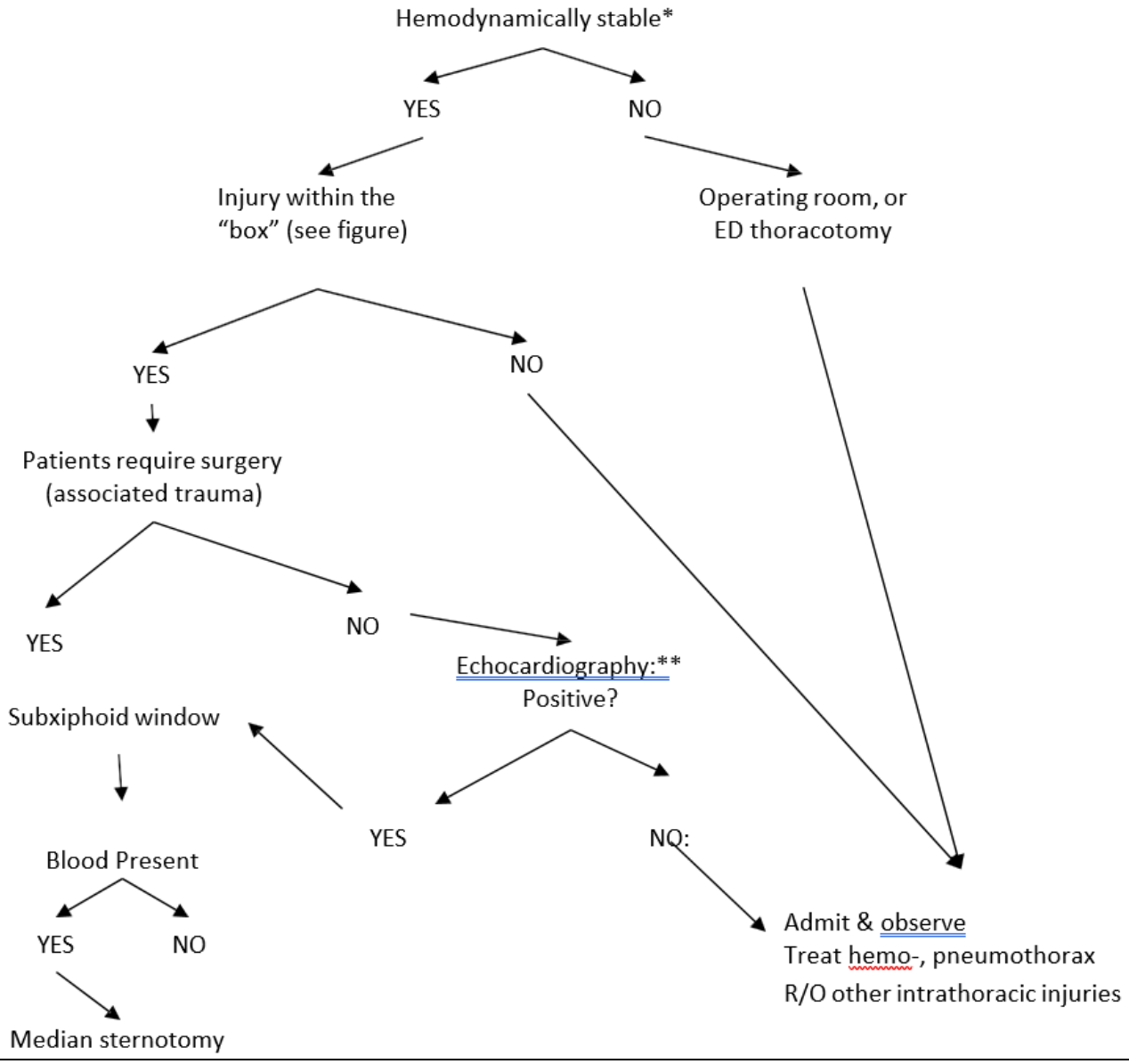
Pericardiocentesis is unreliable in the acute setting of trauma with a 20% false (+) and false (-) rate. The most sensitive test for post-traumatic tamponade is (subxiphoid) pericardial window. This requires general anesthesia for surgery following penetrating trauma, the best non-invasive test for cardiac or pericardial injury is two-dimensional echocardiography. This test is both sensitive and specific in the patients without hemothorax (100%/90%) yet is less accurate in the setting of hemothorax (56%/93%).[4,5]

Penetrating cardiac injuries can occur without entrance or exit wounds in the 'box"-injuries to the heart can occur from a transmediastinal gunshot wound. A small retrospective study on gunshot wounds reveal that 40% of these patients present in extremis with decreased blood pressure and require emergency operative, with 1/3 of these patients having cardiac injury. Approximately 60% of these patients present in stable condition, but anywhere from 20-50% of these patients have injuries to the heart, mediastinal vessels, bronchus or esophagus that will present in a delayed fashion. Evaluation of these injuries requires workup to include echo/pericardial window, angiogram, bronchoscopy and esophagoscopy / barium swallow.[6]



"The box:" definition of proximity to the heart for penetrating injuries. X = wounds that produced cardiac injuries (Nagy KK, J Trauma 1995)

Penetrating chest trauma



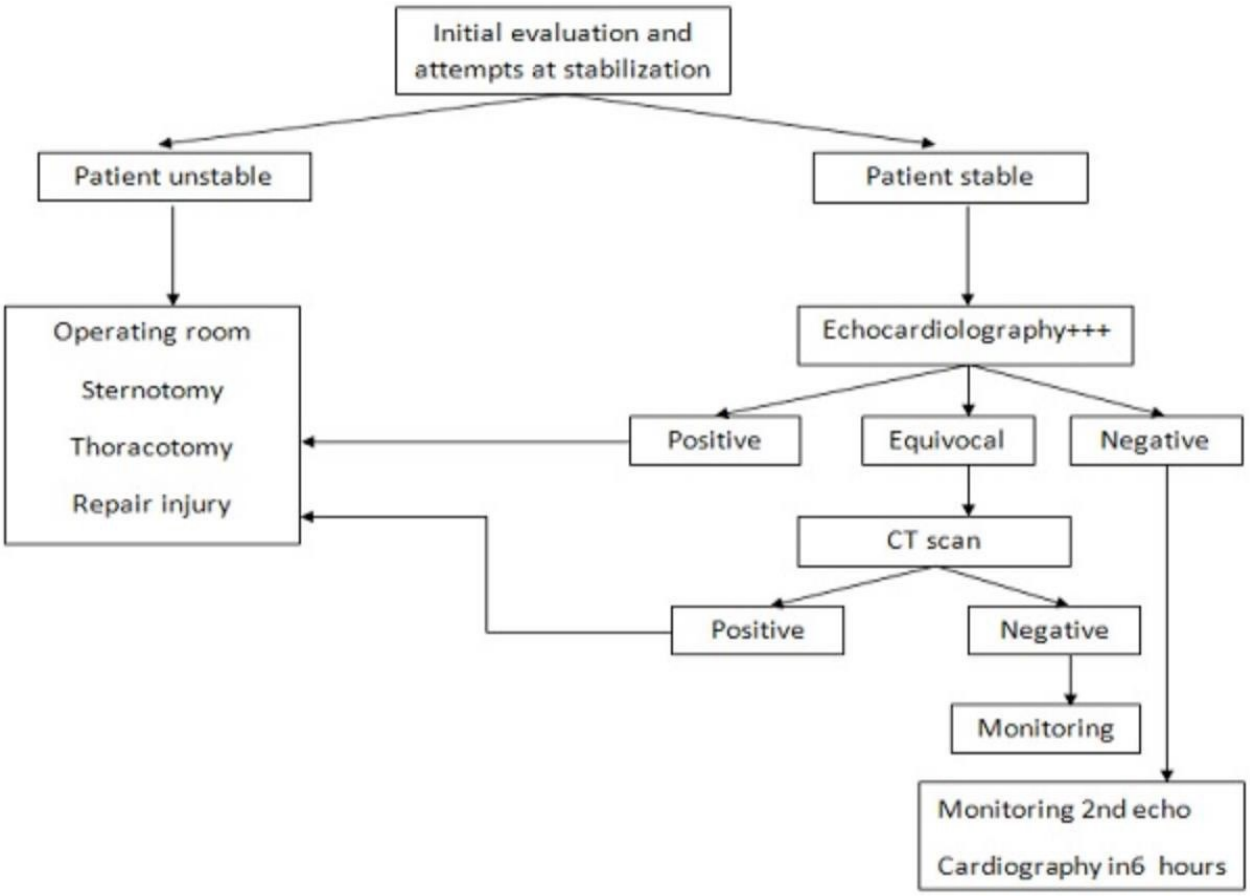
*SBP > 90 in adults (should be adjusted for age)

**Non-availability of 2-D echo warrants consideration of pericardial window.

: A negative 2-D is only 60% sensitive in the presence of a pneumo/hemothorax.
Clinical suspicion of cardiac injury despite initially (-) echo should prompt a repeat echo or pericardial window.

1. Asensio JA, Stewart BM, Murray J, et al. Penetrating cardiac injuries. Surg Clin N Am 1996;76:685.
2. Moreno C, Moore EE, Majune JA, et al. Pericardial tamponade. A critical determinant for survival following penetrating cardiac wounds. J Trauma 1994;36:229.
3. Trinkle JK, Toon R, Franz JL, et al. Affairs of the wounded heart: Penetrating cardiac wounds. J Trauma 1979;19:467.
4. Meyer D, Jessen M, Grayburn P. Use of echocardiography to detect occult cardiac injury after penetrating thoracic trauma: A prospective study. J Trauma 1995;39:902.
5. Nagy KK, Lohmann C, Kim DO, et al. Role of echocardiography in the diagnosis of occult penetrating cardiac injury. J Trauma 1995;38:859.
6. Richardson JD, Flint LM, Small MJ, Gray LA, Trinkle JK. Management of transmediastinal gunshot wounds. Surgery 1981;90:671-676.

For Consideration



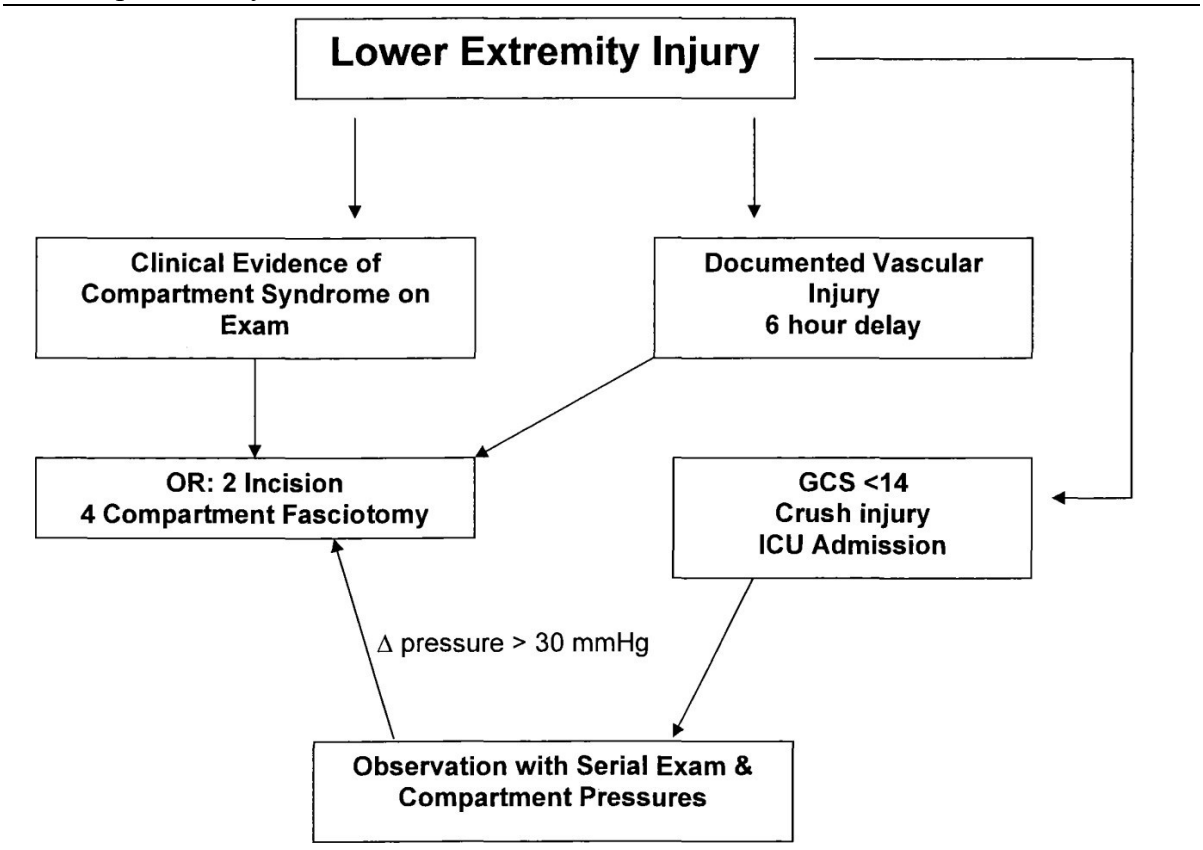
Lower Extremity Compartment Syndrome

Patients presenting to the Emergency Department with evidence of low extremity injury may lead to suspicion of compartment syndrome. In general, compartment syndrome is a clinical diagnosis based upon the 5 P's:

- Pain
- Pallor
- Paresthesia
- Poikilothermy
- Pulselessness

Measurement of compartment pressure should be performed in the acute setting if there is ample clinical suspicion of compartment syndrome. Orthopedic evaluation within 30 minutes should be sought. The patient should be referred to the operating room for decompressive fasciotomy. In general, there is a critical timeframe of approximately 6-8 hours from time of injury to accomplish fasciotomy.

It is essential that the presence or absence of pulses be carefully documented on all patients with suspicion compartment syndrome.



1. Kashuk JL, Moore EE, Pinski S, et al. Lower Extremity Compartment Syndrome in the Acute Care Surgery Paradigm: Safety Lessons Learned. Patient Safety in Surgery 2009, 3:11.

GSW to Chest: Trans-Mediastinal Gunshot Wound

Transmediastinal trajectory of a bullet should be considered in the following situations:

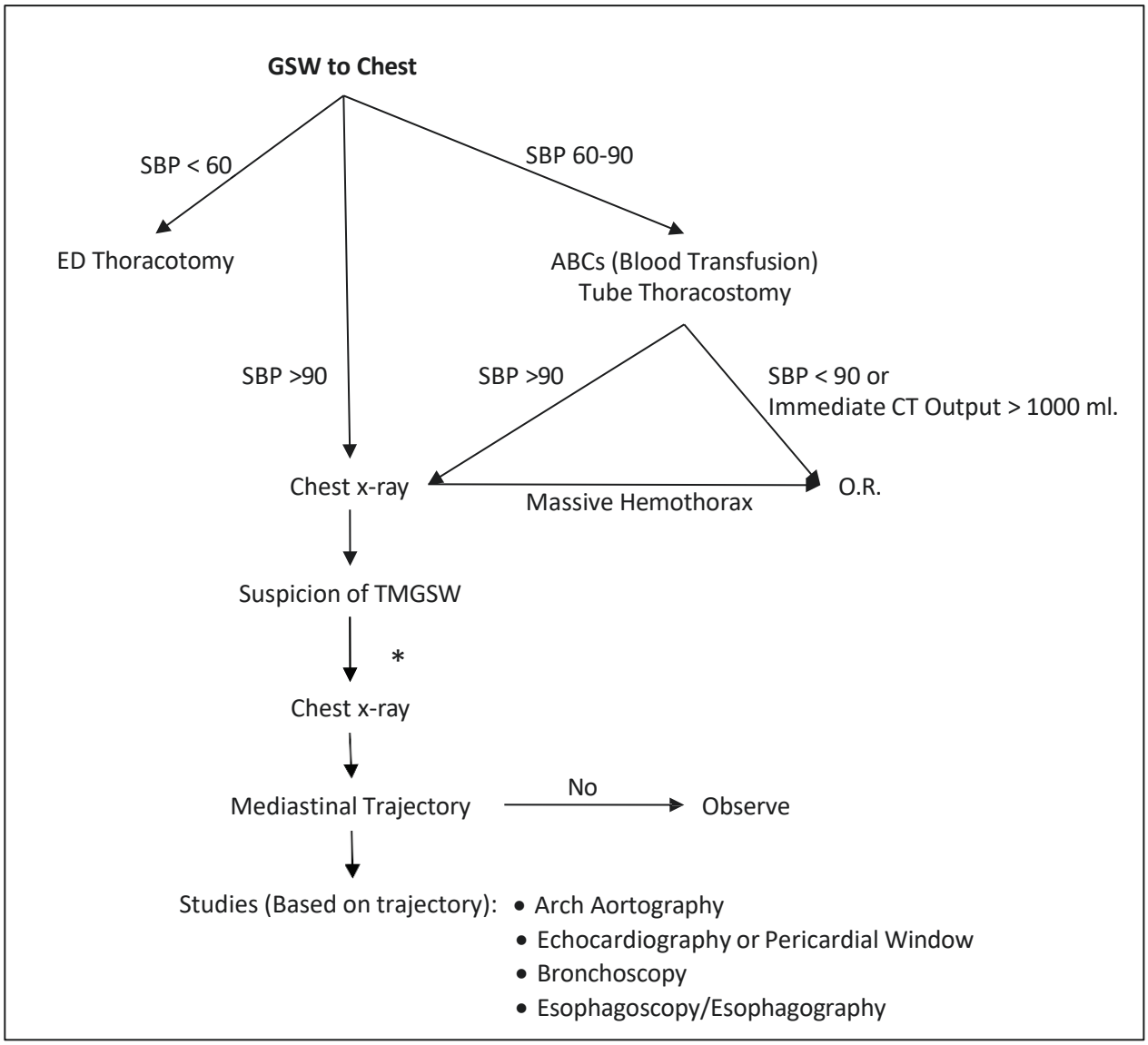
1. Entry and exit wounds on opposite sides of the thorax.
2. Single wound with x-ray demonstrating a missile on opposite side of the thoracic cavity or in close proximity to the mediastinum.
3. Multiple gunshot wounds to the thorax.

The mediastinum contains the heart, great vessels, trachea and esophagus as well as major venous and neural plexuses. Significant injury – especially to heart or great vessels- often result in pre-hospital death or hemodynamic instability. There is little controversy regarding the management of unstable patients – they should have emergent thoracotomy. However, stable patients could harbor occult injuries to critical mediastinal structures (heart, great vessels, trachea, esophagus). Consequently, patients have routinely been submitted to a battery of invasive diagnostic test: echocardiography or subxiphoid pericardial window, arch aortography, bronchoscopy, esophagoscopy and/or esophagography.[1] The latter two have been employed together in order to improve upon the sensitivity or each individual test. This array of tests can be expensive and time consuming. Furthermore, only a small percentage of hemodynamically stable, asymptomatic patients have clinically significant injuries.[2]

Helical CT of the chest has proven useful in demonstrating the trajectory of missiles in the thorax.[3,4] in the setting of a potential TMGSW, a CT scan may confirm a trajectory remote from the mediastinum, obviating further testing. On the other hand, proven transmediastinal trajectory mandates further evaluation. However, rather than performing all the aforementioned tests, the investigations may be tailored to the specific clinical scenario.

Trajectory near the pericardium warrants echocardiography or pericardial window. If CT suggests aortic injury, or if the trajectory is superior to the arch, arteriography remains the gold standard (TEE cannot be considered reliable enough). Bronchoscopy is indicated for pneumomediastinum, respiratory distress or bronchopleural fistula/massive air leak.

Esophagoscopy has been reported to have 100% sensitivity for thoracic esophageal injuries.[5,6] In an awake, asymptomatic patient, barium esophagography is easier to obtain and may be adequate by itself. The cervical esophagus most difficult to reliably evaluate, and so both studies are warranted.



*If evidence of mediastinal injury (pneumomediastinum, widened mediastinum) consider proceeding directly to invasive diagnostic testing.

Note: Additional studies may be ordered at the discretion of the Trauma Attending.

Injured vessel	Incision
Uncertain injury (hemodynamically unstable)	Left anterolateral thoracotomy Transverse sternotomy ± Right anterolateral thoracotomy (clamshell)
Ascending aorta	Median sternotomy
Transverse aortic arch	Median sternotomy ± Cervical extension
Descending thoracic aorta	Left posterolateral thoracotomy (fourth intercostal space)
Innominate artery	Median sternotomy with right cervical extension
Right subclavian artery or vein	Median sternotomy with right cervical extension
Left common carotid artery	Median sternotomy with left cervical extension
Left subclavian artery or vein	Left anterolateral thoracotomy (third or fourth intercostal space) with separate left supraclavicular incision Endovascular balloon occlusion may eliminate need for thoracotomy for proximal control
Pulmonary artery	
Main/intrapericardial	Median sternotomy
Right or left hilar	Ipsilateral thoracotomy
Pulmonary vein	Ipsilateral thoracotomy
Innominate vein	Median sternotomy
Intrathoracic vena cava	Median sternotomy
Azygos vein	Ipsilateral thoracotomy

1. Richard JD, et al. Management of transmediastinal gunshot wounds. *Surgery* 1981;90-671.
2. Renz BM, et al. Transmediastinal gunshot wounds: A prospective study. *J Trauma* 2000;48:416.
3. Grossman MD. Determining anatomic injury with computed tomography in selected torso gunshot wounds. *J Trauma* 1998;45:446.
4. Stassen NA, Reevaluation of diagnostic procedures for transmediastinal gunshot wounds. *J Trauma* 2002;53:635.
5. White RK, et al. Diagnosis and management of esophageal perforations. *Ann Surg* 1992;58:112.
6. Flowers JL, et al. Flexible endoscopy for the diagnosis of esophageal trauma. JT Trauma 1996;40:261.

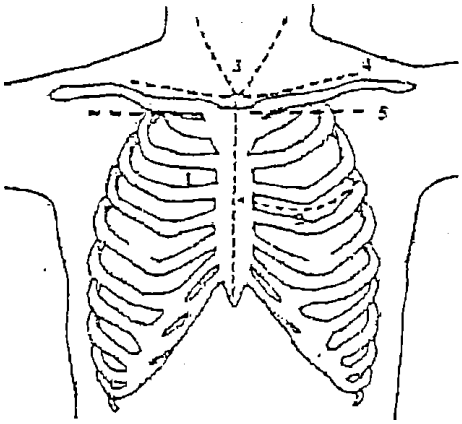
Vascular Exposures

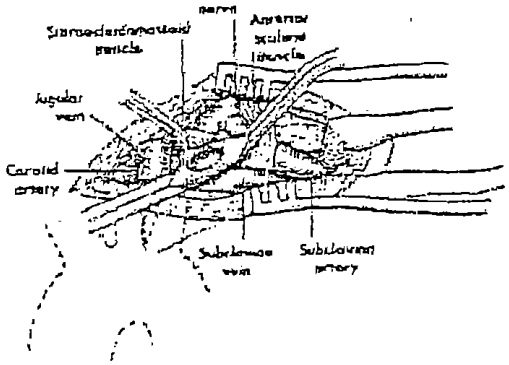
Vascular exposures can prove especially challenging in the trauma setting, where proximal and distal control must be rapidly achieved in the face of active hemorrhage. Fundamental ATLS concepts should be followed, with the caution that normotensive resuscitation may not be attainable and in fact may increase hemorrhage, if a vascular injury is uncontrolled.

Thoracic Vascular Injuries

Resuscitative (left anterolateral) thoracotomy is indicated in patients in extremis. Transsternal extension with a right anterolateral thoracotomy ("clam shell" incision) is needed to control cardiac or right sided injuries. In unstable patients, incisions are chosen based on the presumed injury. In stable patients, the incision is based on either the presumed (clinical exam) or the proven (angiogram) location of the injury. Unstable patients should be kept in a supine position to allow quick access to other body cavities.

Injured Artery	**Incision (Depiction)**
Ascending Aorta/Arch	Sternotomy (1)
Descending Aorta	L 5th Interspace Thoracotomy (2)
Imnominate	Sternotomy + R Cervical Extension (1+3)
Left Common Carotid	Sternotomy + L Cervical Extension (1+3)
Subclavian First Portion (Left) (Right) Second Portion Third Portion	L 3rd Interspace Thoracotomy (2) or "Trap Door" (Partial Sternotomy + L Supraclavicular + L 3rd Interspace Anterolateral Thoracotomy + Division of Clavicle) (I + 2 + 4) Sternotomy + R Supraclavicular (1+3) Supraclavicular + Infraclavicular (4+5) Infraclavicular + Supraclavicular (5+4)
Axillary	Infraclavicular + Supraclavicular (5+4) + Deltopectoral Groove Extension

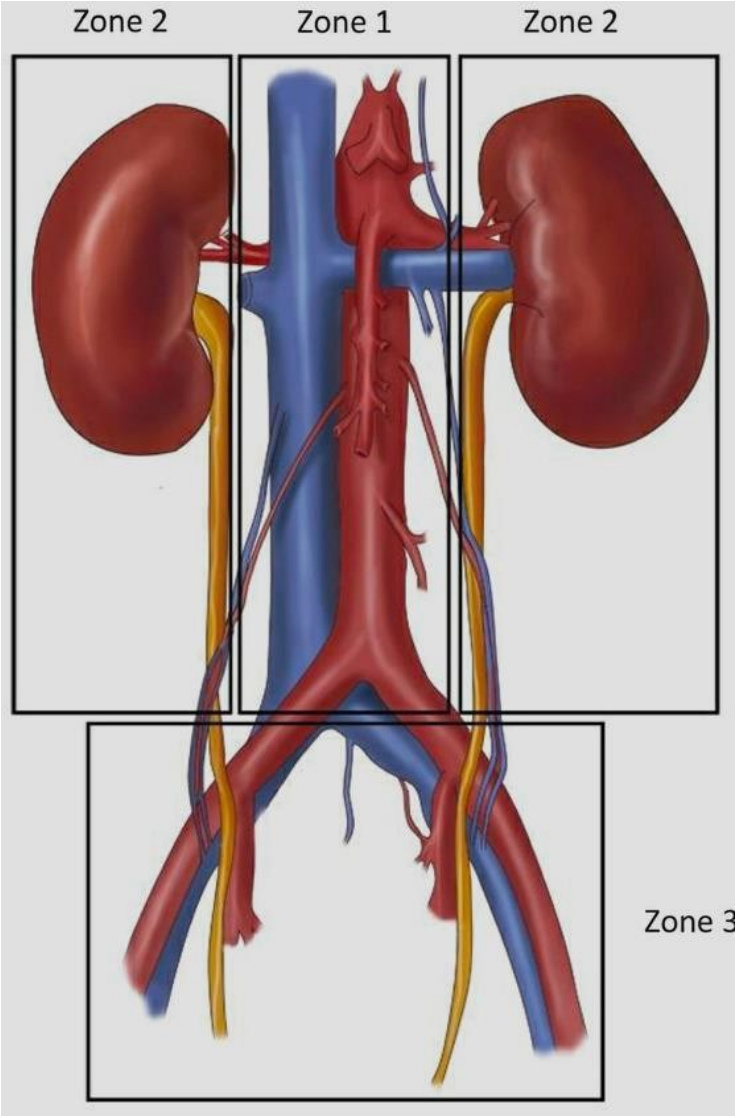




The subclavian artery exposure needs special attention because it depends on the location of the injury. The artery has three segments, each defined by its relationship to the anterior scalene muscle. The first lies medial, the second posterior, and the third lateral to this muscle. On angiogram, the first portion is proximal to the vertebral artery, the second is between the vertebral and transverse scapular arteries and the third is distal to the transverse scapular artery. The clavicle may be divided and removed if necessary.

Abdominal Vascular Injuries

Inspect the retroperitoneum and act according to the guidelines in the Table and Figures below. If, at any point, patient's SBP < 60 mm Hg, either compress the aorta or clamp it at the diaphragmatic hiatus (retract stomach laterally, divide lesser omentum, dissect hiatus, apply clamp).



BLUNT abdominal trauma/hematoma

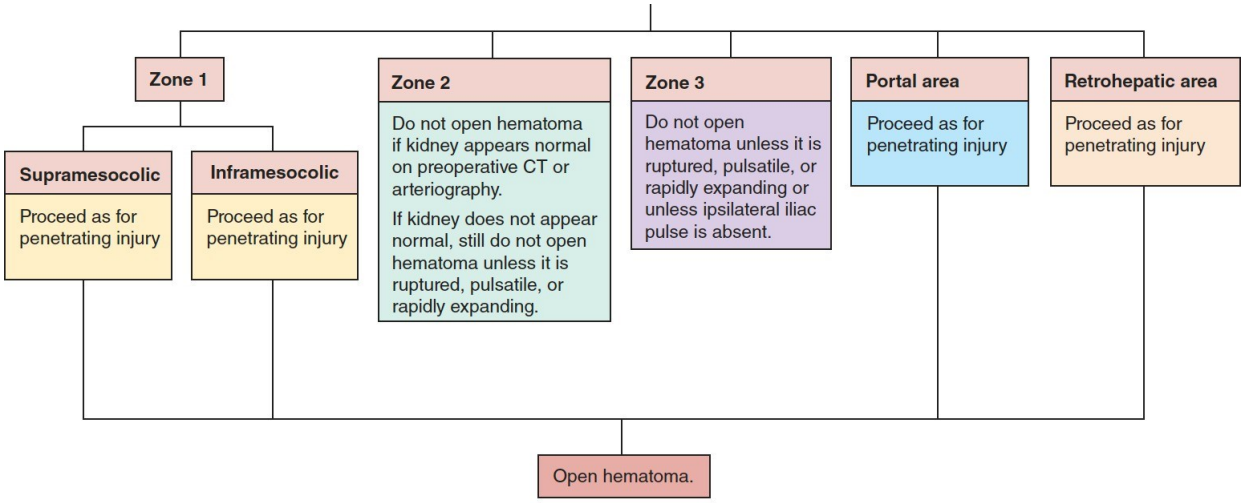


FIGURE 38-8 Blunt abdominal vascular injury algorithm. CT, computed tomography.

PENETRATING abdominal vascular trauma/hematoma

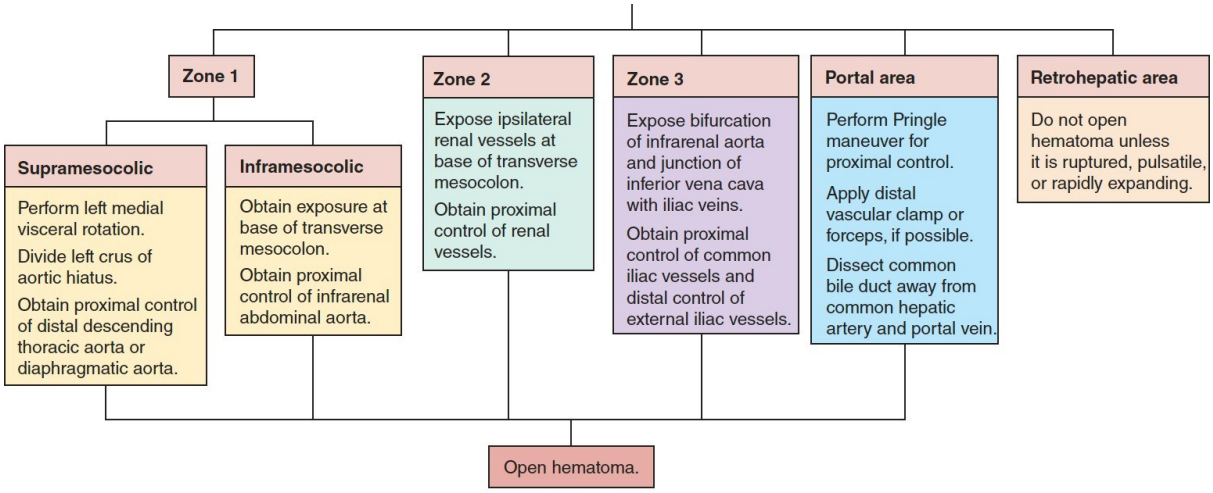


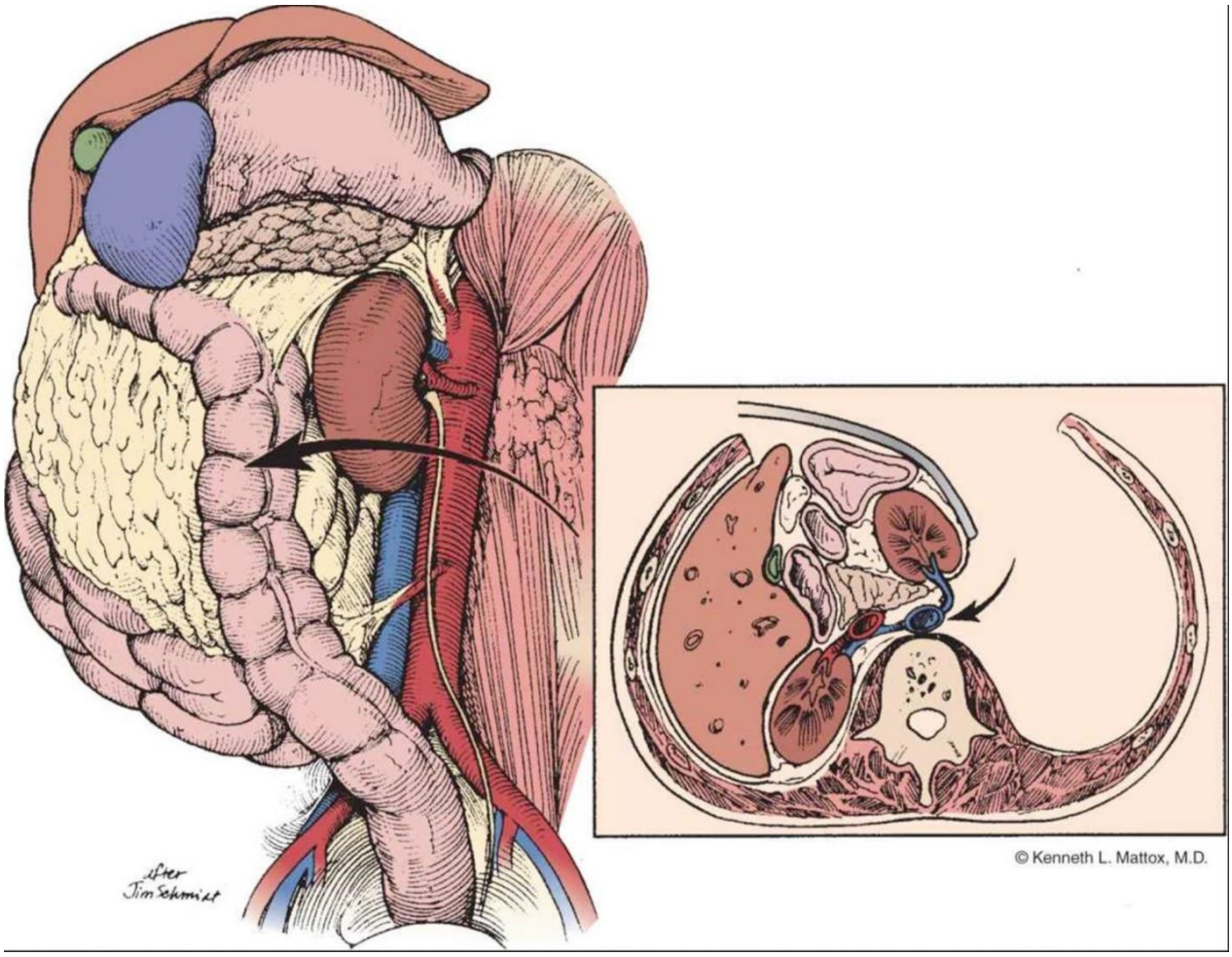
FIGURE 38-9 Penetrating abdominal vascular injury algorithm.

TABLE 38-1: Classification of Abdominal Vessel Injury

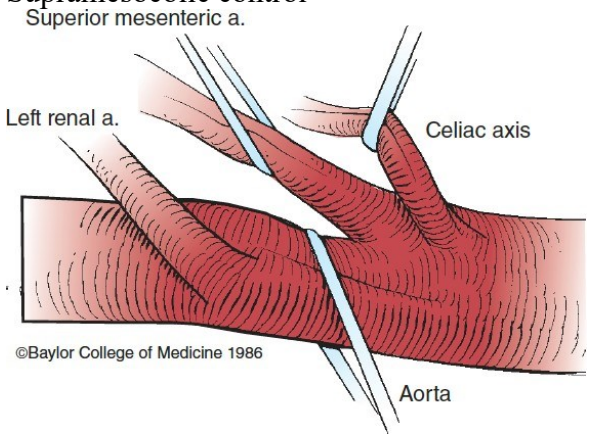
Zone	Major arterial branches	Major venous branches	Operative maneuvers[a]
1 (Supramesocolic)	Suprarenal aorta Celiac axis Superior mesenteric artery Proximal renal artery	Superior mesenteric vein	Left medial visceral rotation Midline suprarenal aortic exposure
1 (Inframesocolic)	Infrarenal aorta	Infrahepatic inferior vena cava	Midline infrarenal aortic exposure Right medial visceral rotation
2	Renal artery	Renal vein	Midline control of the renal hilum Lateral control of the renal hilum
3	Common, external, and internal iliac arteries	Common, external, and internal iliac veins	Midline control of iliac arteries and veins Isolation and control of common iliac vein/vena caval confluence Total pelvic isolation
4	Hepatic artery	Portal vein Retrohepatic vena cava	Portal exposure Exposure and control of retrohepatic inferior vena cava

[a]Discussed in sections titled "Exposure and Vascular Control."

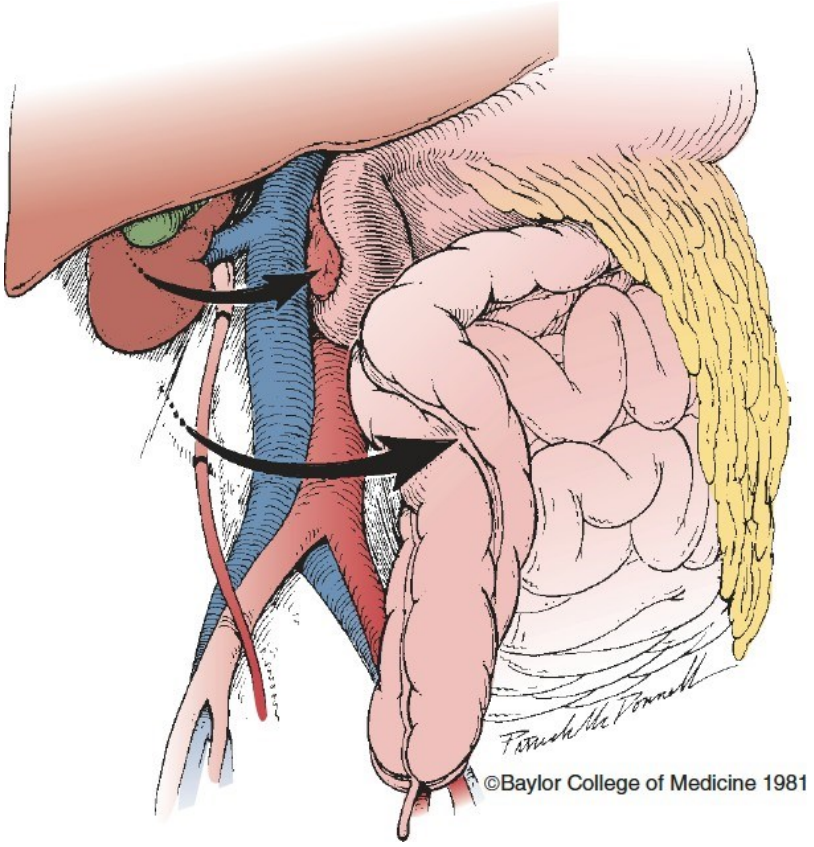
Left medial visceral rotation



Supramesocolic control



Right medial visceral rotation



Truncal Stab Wounds

The purpose of this algorithm is to guide the management of patients with stab wounds to the anterior abdomen, thoracoabdominal area, back and flank.

Back/Flank stab wounds are defined as those between the tips of the scapulae and posterior iliac crests, posterior to the mid-axillary line. Physical examination alone is unreliable in this group, and eFAST is unable to evaluate the retroperitoneum. Triple contrast (oral, rectal, and intravenous) CT has a sensitivity of 89-100% and a specificity of 98-100% in diagnosing intra-abdominal and retroperitoneal injuries. [1–4]

Thoracoabdominal stab wounds are defined as those between a circumferential line connecting the nipples and tips of the scapulae superiorly, and the costal margins inferiorly. Occult diaphragmatic injury is problematic in this patient group. [5] eFAST can exclude diaphragmatic injury, with a RBC cutoff of 5000/mm³ chosen to balance sensitivity and specificity.[6] Alternatively, laparoscopy may be utilized to diagnose and repair these injuries.

Anterior abdominal stab wounds are defined as those anterior to the mid-axillary line, from the xiphoid process to the pubic symphysis. Although optimal management of stable patients with AASW is debated, imaging and serial clinical assessment or anterior wound exploration are reasonable options to determine the need for laparotomy. In carefully selected patients, observation and documented serial abdominal exams will suffice.

Local wound exploration to assess fascial penetration can assist in triage of these patients.

1. East DW, Shackford SR, Mattrey RF, et al.: A prospective, randomized comparison of computed tomography with conventional diagnostic methods in the evaluation of penetrating injuries to the back and flank. Arch Surg 1991;126:1115-9.
2. Himmelman RG, Martin M, Giikey S, et al.: Triple-contrast CT scans in penetrating back and flank trauma. J Trauma 1991;31:852- 5.
3. Kirton OC, Wint D, Thrasher B, et al. Stab wounds to the bank and flank in the hemodynamically stable patient. A decision algorithm based on contrast-enhanced computed tomography with colonic opacification. Am J Surg 1997;173:189-93.
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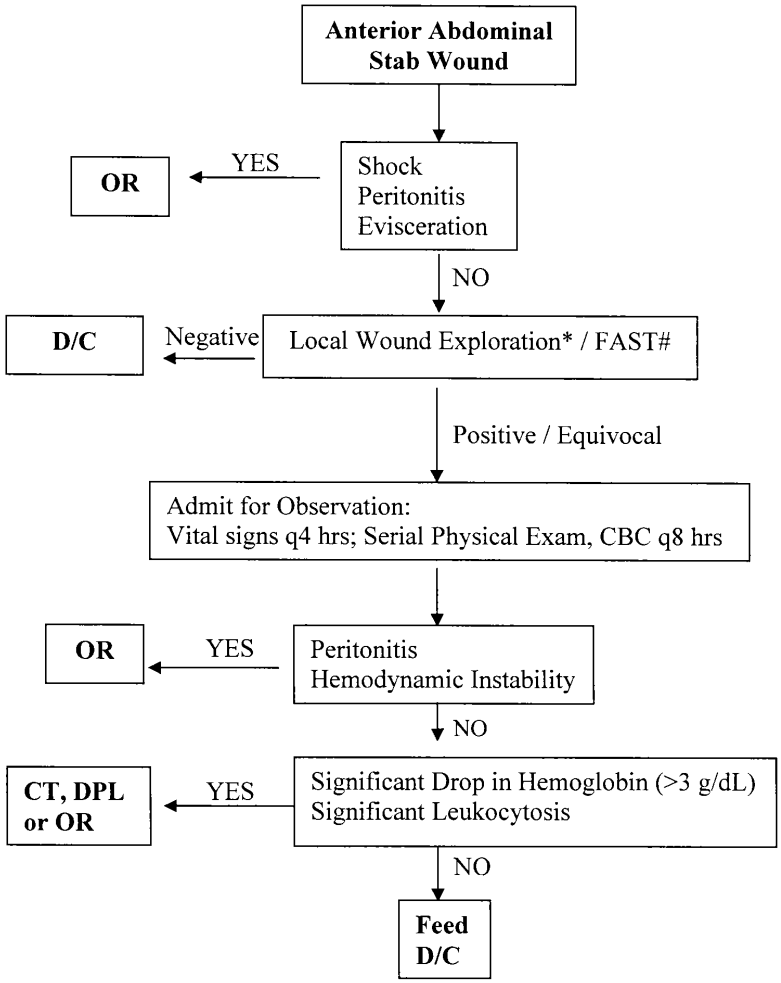
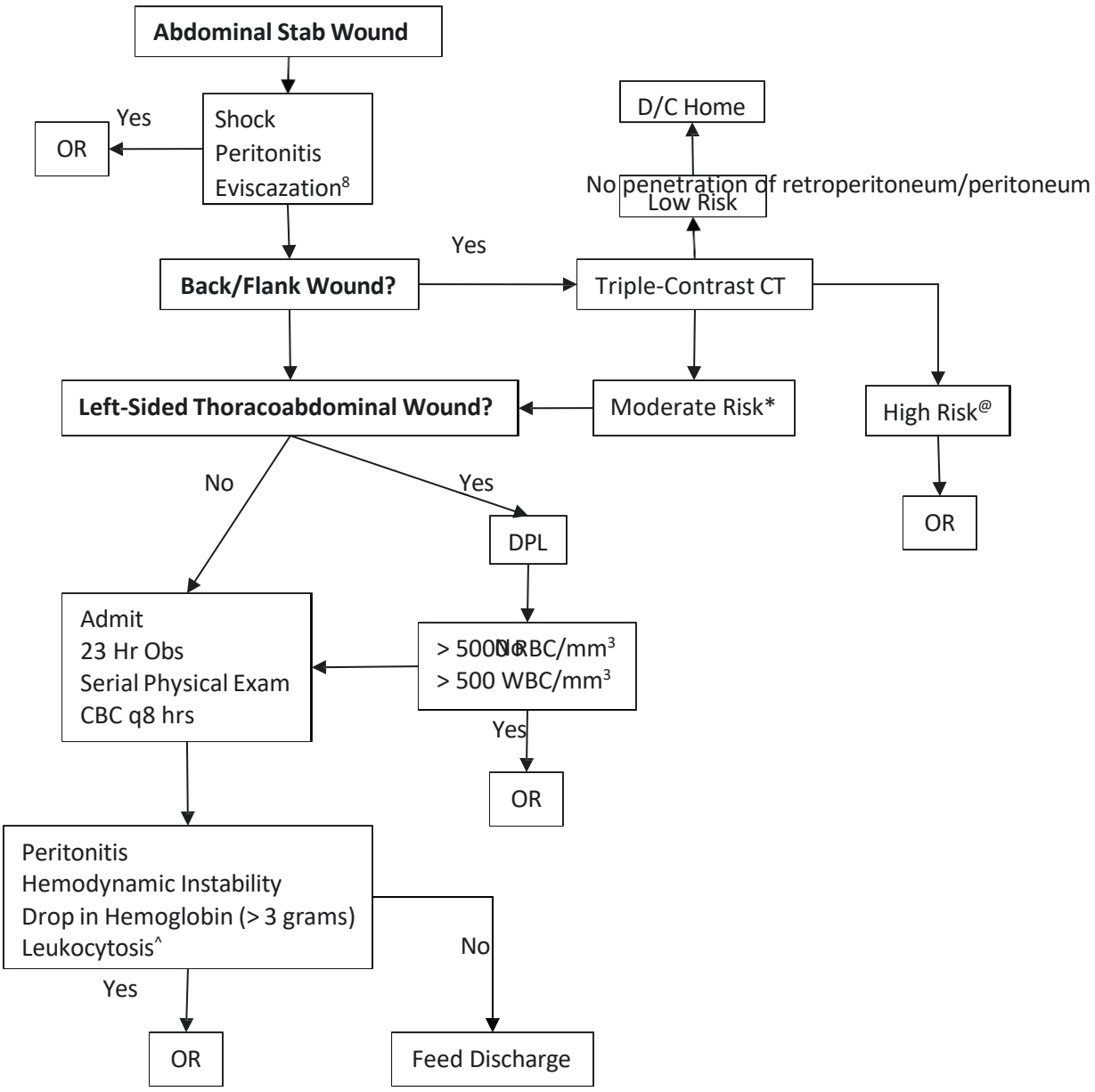
Clinical pathway for management of patients with anterior abdominal stab wounds



* Consider CT scan if patient is morbidly obese (BMI>30) or wound tract is long and tangential
# FAST demonstrating hemoperitoneum may be used as evidence of peritoneal penetration, obviating the need for local wound exploration

OR, Operating room; D/C, Discharge; CBC, Complete Blood Count; CT, Computed tomography scan; DPL, Diagnostic peritoneal lavage; FAST, Focused abdominal sonographic examination for trauma

- Only 50% of stab wounds to the anterior abdominal wall enter the abdominal cavity.
- Stab wounds to the anterior abdomen should be taken directly to the OR if there is shock, peritoneal signs or evisceration.
- If immediate laparotomy is not required, local wound exploration should be carried out.
- If wound exploration reveals that the peritoneum has been violated, admit and do repeated physical examinations.
- The use of CT scan, ultrasound, diagnostic peritoneal lavage or laparoscopy is of minimal benefit in these patients.



^ Consider eFAST or CT scan

* Penetration of muscle; retroperitoneal hematoma not near critical structure (e.g. IVC).

@ Extravasation of contrast from colon or major extravasation from the kidney, hematoma adjacent to a major retroperitoneal vessel, free air in the retroperitoneal space, fluid in the peritoneal cavity without prior eFAST

Blunt Cerebrovascular Injuries

Blunt cerebrovascular injuries (BCVI) have historically been considered rare, yet potentially devastating, events. Early series reported mortality rates of 28%, with 58% of survivors suffering permanent severe neurologic sequelae.[1] Given the dearth of experience with BCVI, there is essentially no Class I literature to guide management.

The fundamental mechanism of internal carotid artery (ICA) injury include: a) cervical hyperextension/hyperflexion with rotation, stretching the ICA over the lateral articular processes of CI-C3; b) direct cervical trauma; c) intraoral trauma; and d) basilar skull fracture involving the carotid canal.[1] The vertebral artery is most commonly injured from C-spine subluxation and fracture, especially of the foramen transversarium and CI-C3.[2] Regardless of the mechanism, the final common pathway of BCVI is intimal disruption. This provokes platelet aggregation with subsequent embolization or thrombosis; it also allows egress of blood with dissection or pseudoaneurysm formation. Injured patients should undergo emergent 4-vessel cerebral arteriography for any of the following signs or symptoms suggestive of cerebrovascular injury:

a) hemorrhage – from mouth, nose, ears- of potential arterial origin;
b) large or expanding cervical hematoma (consider surgery);
c) cervical bruit in a patient<50 years old.
d) evidence of cerebral infarction on computed tomography CT scan;
e) unexplained or CT incongruous central or lateralizing neurologic deficit, transient ischemic attack, or Horner's syndrome.

A latent period between the time of injury and the appearance of cerebral ischemia is characteristic of BCVI and relates to the pathophysiology (i.e. platelet plug formation and subsequent embolization or occlusion). 23-50% of patients first develop signs or symptoms > 12 hours after the traumatic event.[1] This has led to the adoption of screening protocols in many institutions, to allow the diagnosis and treatment of injuries prior to the occurrence of stroke. Screening has dramatically increased the recognized incidence of BCVI (from 0.1% in multicenter reviews to >1%) but benefit in terms of stroke reduction has not been proven. [4–] This would require a prospective, multicenter, placebo-controlled trial, which is unlikely to occur. On the other hand, existing data indicate that anticoagulation improve neurologic outcomes among symptomatic patients and may prevent stroke in asymptomatic patients. [5], Arteriography is the gold standard for diagnosis. Duplex ultrasonography is unreliable near the base of the skull (where most injuries occur) and has not been promoted for screening.

Grade	Description
I	Luminal irregularity or dissection with <25% luminal narrowing
II	Dissection or intramural hematoma with >25% luminal narrowing, intraluminal thrombus, or raised intimal flap
III	Pseudoaneurysm
IV	Occlusion
V	Transection with free extravasation

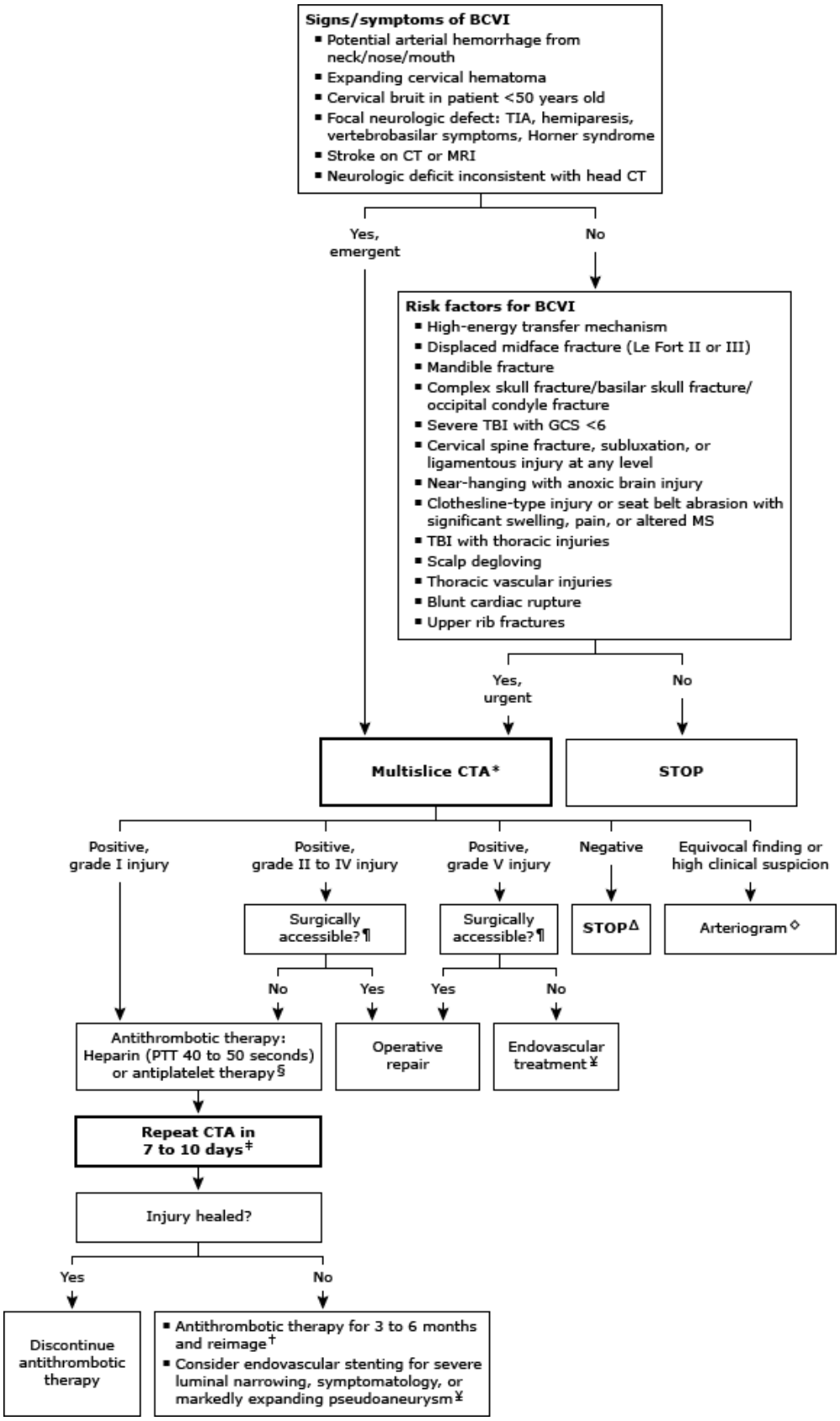

Signs/symptoms of BCVI
Potential arterial hemorrhage from neck/nose/mouth
Expanding cervical hematoma
Cervical bruit in patient <50 years old
Focal neurologic defect: TIA, hemiparesis, vertebrobasilar symptoms, Horner syndrome
Stroke on CT or MRI
Neurologic deficit inconsistent with head CT
Yes, emergent
No
Risk factors for BCVI
High-energy transfer mechanism
Displaced midface fracture (Le Fort II or III)
Mandible fracture
Complex skull fracture/basilar skull fracture/ occipital condyle fracture
Severe TBI with GCS <6
Cervical spine fracture, subluxation, or ligamentous injury at any level
Near-hanging with anoxic brain injury
Clothesline-type injury or seat belt abrasion with significant swelling, pain, or altered MS
TBI with thoracic injuries
Scalp degloving
Thoracic vascular injuries
Blunt cardiac rupture
Upper rib fractures
Yes, urgent
No
Multislice CTA*
STOP
Positive, grade I injury
Positive, grade II to IV injury
Positive, grade V injury
Negative
Equivocal finding or high clinical suspicion
Surgically accessible?¶
Surgically accessible?¶
STOPΔ
Arteriogram◇
No
Yes
Yes
No
Antithrombotic therapy: Heparin (PTT 40 to 50 seconds) or antiplatelet therapy§
Operative repair
Endovascular treatment¥
Repeat CTA in 7 to 10 days‡
Injury healed?
Yes
No
Discontinue antithrombotic therapy
Antithrombotic therapy for 3 to 6 months and reimage†
Consider endovascular stenting for severe luminal narrowing, symptomatology, or markedly expanding pseudoaneurysm¥

TABLE 1. Screening Criteria for BCVI[5,8]

Denver Criteria	Memphis Criteria
Signs/symptoms of BCVI	Unexplained neurologic deficit
Potential arterial hemorrhage from neck/nose/mouth	Horner's syndrome
Cervical bruit in patient <50 y old	LeFort II or III (unilateral or bilateral)
Expanding cervical hematoma	Cervical spine injury
Focal neurologic defect: TIA, hemiparesis, vertebrobasilar symptoms, Horner's syndrome	Skull base fractures involving the foramen lacerum
Neurologic deficit inconsistent with head CT	Neck soft tissue injury (e.g., seatbelt injury or hanging)
Stroke on CT or MRI	
Risk factors for BCVI	
High-energy transfer mechanism	
Displaced midface fracture (LeFort II or III)	
Mandible fracture	
Complex skull fracture/basilar skull fracture/occipital condyle fracture	
Severe TBI with GCS <6	
Cervical spine fracture, subluxation, or ligamentous injury at any level	
Near hanging with anoxic brain injury	
Clothesline type injury or seat belt abrasion with significant swelling, pain, or altered mental status	
TBI with thoracic injuries	
Scalp degloving	
Thoracic vascular injuries	
Blunt cardiac rupture	
Upper rib fractures	

MRI, magnetic resonance imaging; TIA, transient ischemic attack; GCS, Glasgow Coma Scale.

"High risk" associated injuries have been identified: GCS <6, petrous bone fracture, diffuse axonal brain injury. LeFort II or III fracture, and cervical spine injury. However, at least 20% of patients with BCVI have none of these injuries.[3]

Treatment strategies and treatment-related outcomes by injury grade are as follows.[5]

Grade I – Intimal Irregularity; Dissection/Hematoma with < 25% Stenosis: 7% stroke rate. 57% heal, 8% program on follow-up arteriogram. No significant differences in healing or progression whether treated with heparin, antiplatelet therapy, or untreated. Heparin or antiplatelet therapy recommended.

Grade II – Intraluminal Thrombus: Intimal Flap: Dissection/Hematoma with> 25% Stenosis: 26% stroke rate. 8% heal, 43% progress on follow-up arteriogram. Consider repair, may be complicated by extension to base of skull. Anticoagulation recommended. Consider stenting for dissections that threaten to occlude lumen.

Grade III – Pseudoaneurysm: 26% stroke rate. Rare healing with anticoagulation, although it may prevent strokes. Repair if surgically accessible. Consider endovascular therapy for inaccessible lesions but wait several days for injury stabilize.

Grade IV – Occlusion: 35% stroke rate (50% in ICA). Rare recanalization with anticoagulation, but it may prevent stroke (all strokes were in untreated patients). Consider repair, but it may be complicated y extension to base of skull.

Grade V – Transection: 100% stroke rate, mortality. Endovascular therapy may be the only useful intervention.

Therapy should be in individualized. Anticoagulation should be held until there is no presumed risk of intracranial or other life-threatening hemorrhage. Small, uncontrolled case series suggest that antiplatelet therapy may be a reasonable alternative to systemic heparin.[11] Drugs of choice are heparin (no bolus; 15 U/kg/hr to target PTT 40-50 sec) or antiplatelet therapy (clopidogrel 75 mg qd or aspirin 325 mg qd). Anticoagulation should be administered following stenting. Follow-up arteriography is performed within 7-10 days, to evaluate efficacy of the initial therapy and plan further intervention.

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Blunt Aortic Injury (BAI)

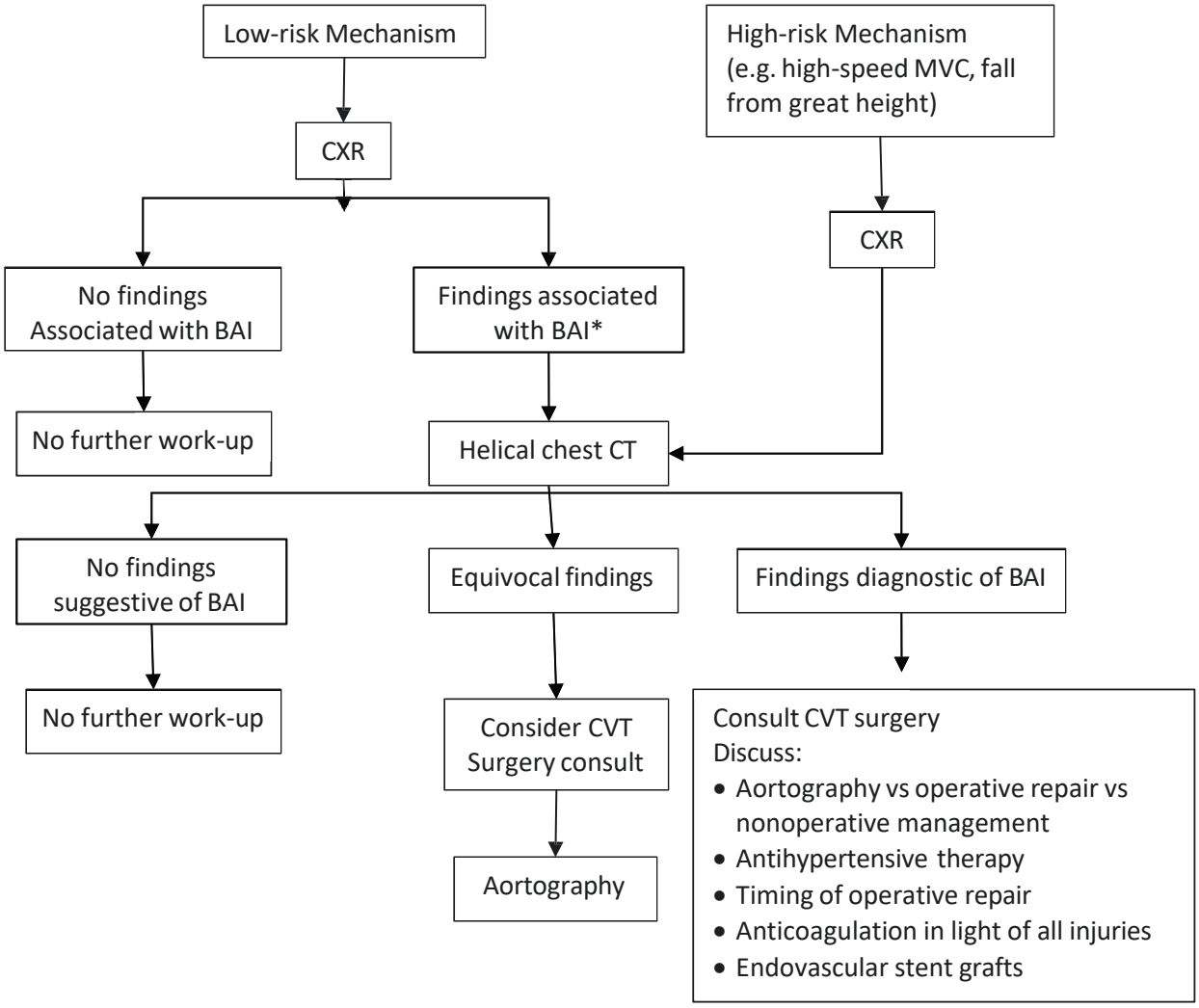
BAI is the second most common cause of death in blunt trauma, following head injury. Deceleration forces (e.g. high speed MVCs, falls from heights) cause tearing of the aorta at points of fixation: ligamentum arteriosum (80-85%), diaphragmatic hiatus (10-15%), and ascending aorta (5-10%). 85% of fatalities occur at the accident scene. Of the remainder, 25% occur within 24 hours and another 25% within one week.

Findings suggestive of BAI (including widened mediastinum, indistinct aortic knob, depression of left main stem bronchus, deviation of NG tube, opacification of aortopulmonary window, widening of paratracheal/paraspinous stripes, apical capping, scapular fracture of $1^{st}/2^{nd}$ rib fracture) should prompt chest CT. However, if suspicion of BAI is high, as in situations where there has been severe deceleration mechanism, chest CT is indicated regardless of CXR findings as the initial CXR may be interpreted as "normal" in up to 7% of patients with BAI. Helical chest CT is a sensitive test for BAI, and its specificity approaches 100%. Suspicious findings warrant arteriography (the gold standard). If CT is diagnostic of BAI, the decision to proceed to aortography vs thoracotomy is the thoracic surgeon's preference.

Once BAI is diagnosed or strongly suspected, antihypertensive therapy should be instituted with the goal of SBP<110 and HR <100, to prevent aortic rupture. Esmolol is preferred initially. A loading close of 0.5 µg/kg over 30 sec is followed by infusion of 50 µg/kg/min (increasing up to 300 µg/kg/min as needed). If necessary, nitroprusside (2-5 µg/kg/min) may be added.

The optimal means of minimizing perioperative morbidity – spinal cord ischemia, mesenteric and renal insufficiency – is debated. "Clamp-and-sew" techniques can be relatively safe with cross clamp times<30 minutes. However, as the cross-clamp time is not always predictable, and paraplegia rates increase markedly after 30 minutes, many authors recommend some form of bypass. Partial cardiopulmonary bypass with either left atrial- femoral or femoral-femoral cannulation to maintain distal arterial perfusion, allows for prolonged cross clamping times without significant untoward effects.

Multisystem injuries (90%) and brain injury (50%) are commonly associated with BAI, and management must be prioritized. Severe brain injury, blunt cardiac injury, or pulmonary injury may be prohibitive risks to early repair. Nonoperative management (i.e. antihypertensive and other supportive therapy) should be considered, with potential delayed repair. Low-grade blunt solid organ injuries may still be managed nonoperatively, but higher-grade injuries represent a bleeding risk with heparinized bypass circuits. Endovascular stent-grafts are rapidly becoming the technique of choice for most injuries, although long-term data is lacking.



*Consider upright CXR to evaluate isolated widened mediastinum

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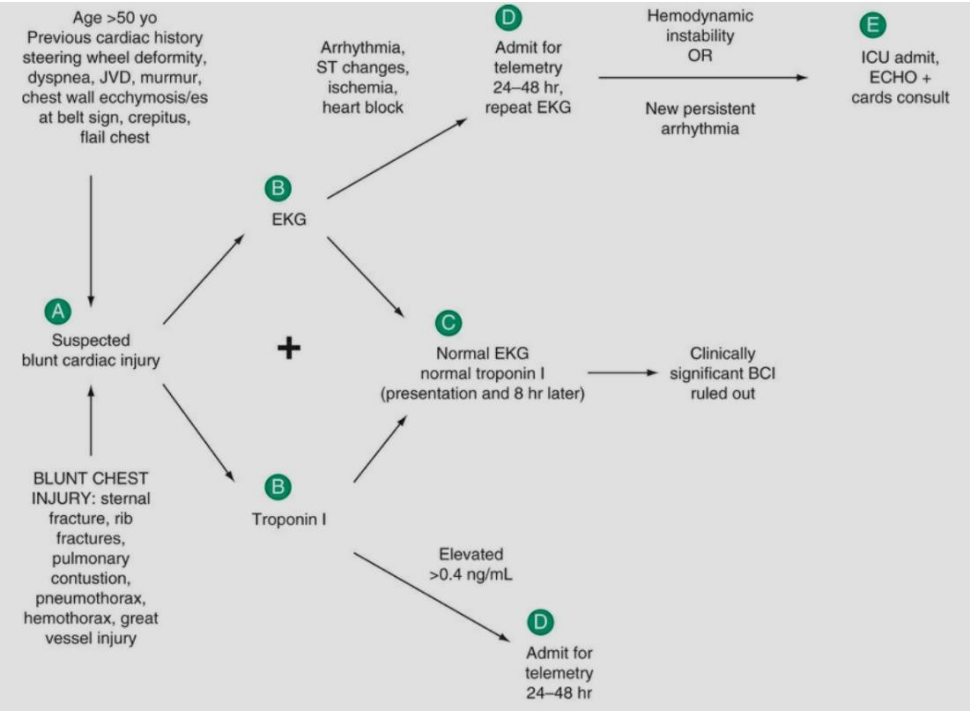
Blunt Cardiac Injury

Blunt cardiac injury (BCI) is a common cause of scene death. Of those who present to the hospital, the injury can be minor and inconsequential, or may be the cause of in-hospital mortality. The term "blunt cardiac injury" is preferable to older terms such as "myocardial/cardiac contusion or concussion." Modifiers such as "with ECG or enzyme changes, -with complex arrhythmia, -with cardiac failure, -with coronary thrombosis, -with septal/free wall rupture" may be added.

The goal of this algorithm is not to identify all patients with a BCI: the diagnosis itself is of secondary importance. Rather, the goal is to identify the patients at risk for complications (dysrhythmia, cardiogenic shock, or structural injury) which may require treatment. Of note, most current literature does not associate sternal facture with an increased risk of BCI.

BCI should be suspected in individuals who sustain major chest trauma. The initial evaluation should include an ECG as part of the secondary survey. Patents with shock from any cause, ischemic changes on ECG or significant dysrhythmia* are admitted to the ICU. If angina or ischemic ECG changes are noted, the routine r/o MI protocol should be followed. Nonspecific ECG findings are rarely associated with significant BCI; patients may be discharged after 24 hours of cardiac monitoring if no new symptoms occur. Patients with significant blunt chest trauma who are being admitted for associated injuries should have cardiac monitoring for 24 hours. While many patients will require admission for associated injuries, a subset of patients may not require admission.



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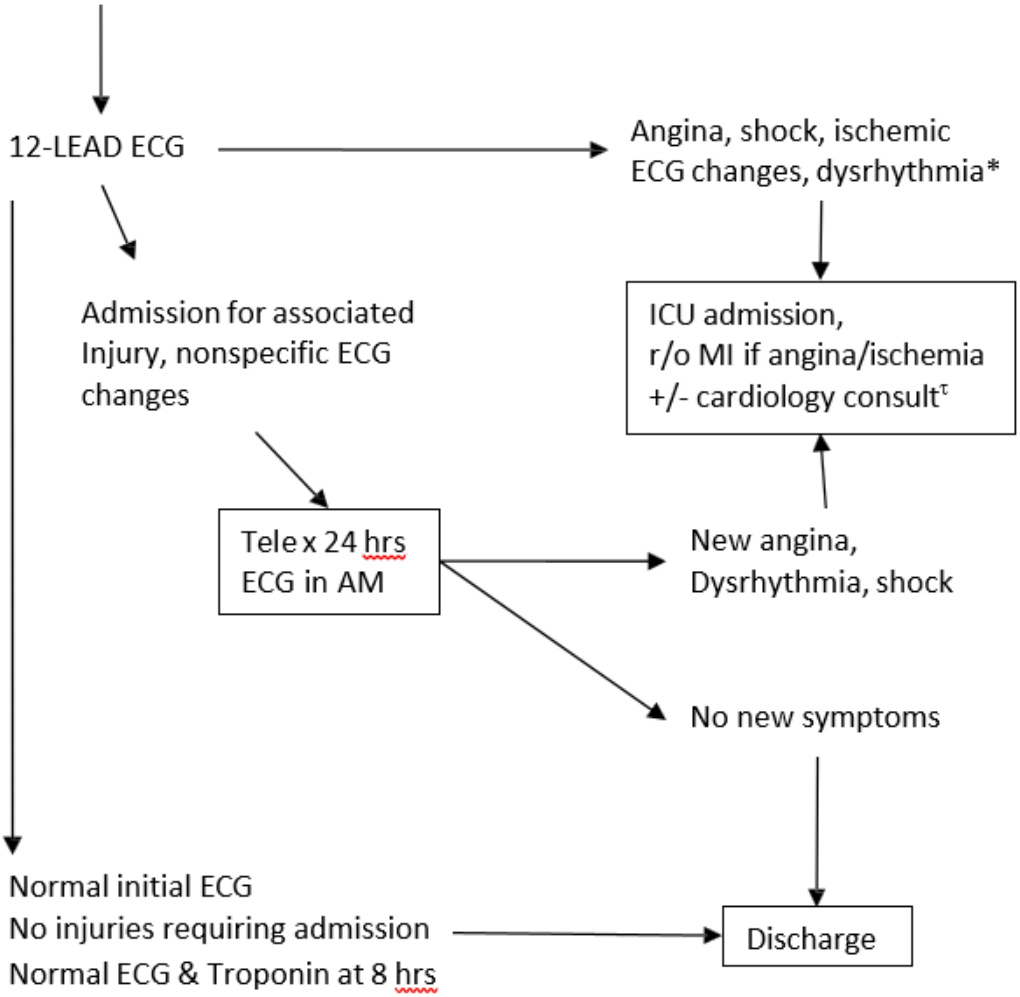
Blunt Chest Trauma: R/O Cardiac Contusion

Substernal chest pain, dysrhythmia on ECG monitor[τ], sternal/multiple rib fractures, pulmonary contusion, thoracic seat belt sign.



* Ischemic changes: ST elevation, depression, or T wave inversion in ≥2 leads dysrhythmia: new atrial fib, new LBBB/RBBB, request PVC's/PAC's, heart block

[τ] Echocardiogram may be obtained in selected patients in this group with refractory shock, new murmur, clinical suspicion of pericardial effusion/tamponade

[τ] Anything other than normal sinus rhythm

Blunt Chest Trauma: Multiple Rib Fractures

The pain associated with rib fractures, along with underlying pulmonary pathology, contributes to impaired gas exchange, and increased risks of pneumonia and respiratory failure. Although the overall mortality in adult patients with rib fractures is approximately 10%, deaths in young adults are generally attributed to associated injuries. In contrast, elderly patients with rib fractures have at least a 20% mortality that is often directly related to progressive.

In patients with underlying pulmonary dysfunction, or those who are frail, consideration should be given to using a lower age threshold regardless of signs of respiratory compromise at the time of admission. Similarly, for those older than 65 who have no underlying comorbidities, minimal pain, and are in good overall health, a non-monitored setting may be appropriate.

An alternative method of identifying patients at risk for respiratory decompensation is to use some measure of respiratory compromise. Hypoxemia (oxygen saturation <92% on room air), inability to perform incentive spirometry greater than 1,000 cc or greater than 15 cc/kg, and a vital capacity of less than 1.4 or less than 55% of predicted have all been used to identify patients likely to develop complications respiratory failure and pneumonia.

ICU admission
Patients with more than two significant rib fractures who are older than 65 years be admitted to a monitored unit with ICU-level staffing.

Incentive spirometry should be performed on all conscious patients and documented

Multimodal Pain Therapy
- Tylenol 650mg q6h scheduled
- Gabapentin 300mg q8h scheduled, increase as needed
- Flexeril or Skelaxin q8h scheduled
- Ketorolac scheduled or Celecoxib scheduled
- PO opioids — oxycodone 5 or 10mg q4h prn
- IV Dilaudid prn if breakthrough is needed
- PCA dilaudid preferred if unable to control with above
- IV ketamine infusions if still in pain
- Continuous IV infusions are usually started at 0.1-0.2 mg/kg/h.
- Epidural versus paravertebral block in select patients as available per institution.

Rib fixation
- Computed tomography of the chest with three-dimensional reconstruction is necessary to adequately assess anatomic severity if rib fixation is being considered.
- When deciding whether rib fixation is a good option, there are a few things to consider other than the severity of the rib fractures.
  - The patient should be free of other injuries that would prolong intubation or immobility, such as a severe head injury or pelvic fracture. In these cases, rib fixation is not likely to alter the patient's

overall clinical course, as the benefits that have been most clearly shown are related to decreasing ventilator days.

- Second, the fixation should occur early, ideally within 72 hours of admission, to maximize the likelihood of avoiding ventilator-associated complications that would independently increase ventilator days.
- Lastly, if the patient needs either a video-assisted thoracoscopy or thoracotomy at any point, the ribs can be fixed during either of these procedures.

EAST recommendations:

- Based on the aforementioned analyses, in adult patients with flail chest after blunt trauma, we conditionally recommend operative rib ORIF compared to nonoperative management, to decrease mortality; shorten DMV (duration of mechanical ventilation, ICU LOS, and hospital LOS; incidence of pneumonia, and need for tracheostomy. This level of recommendation is given based on the low quality of evidence.
- In adult patients with non-flail pattern rib fractures, we cannot offer a recommendation regarding rib ORIF, compared to conservative management, to decrease mortality; DMV, ICU LOS, and hospital LOS; incidence of pneumonia and need for tracheostomy; and improve pain control, with currently available evidence.

WEST Algorithm

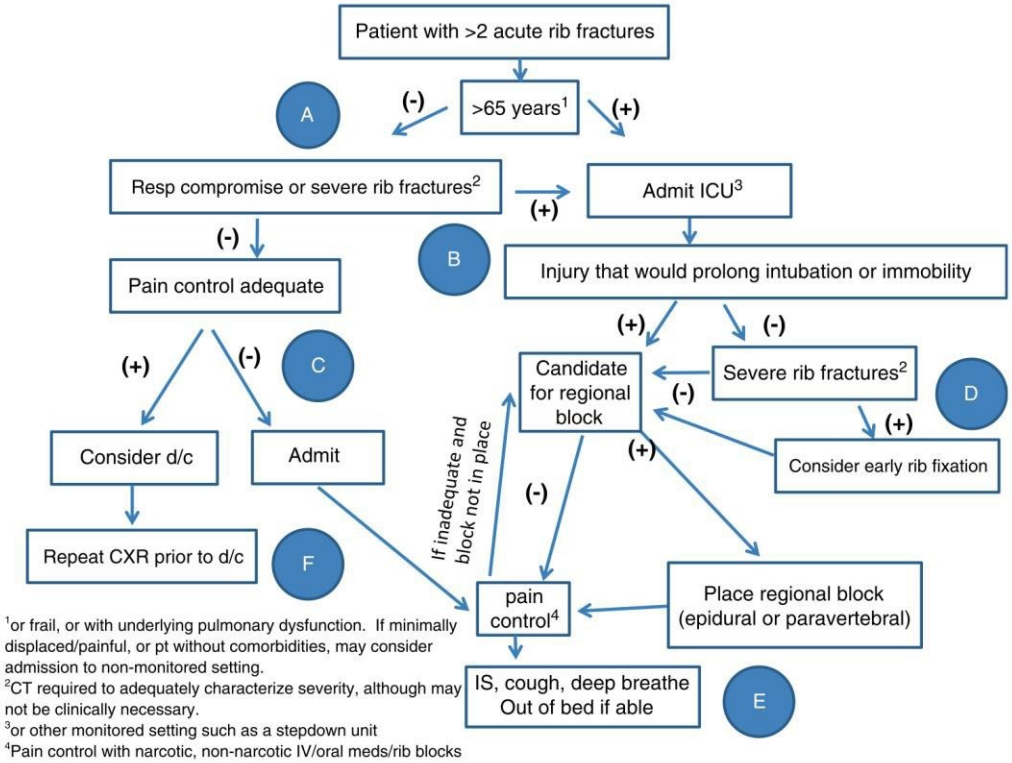


Figure 1. Western Trauma Association rib fracture algorithm. *Circled letters* refer to corresponding areas within the text.

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Blunt Abdominal Trauma: Adult

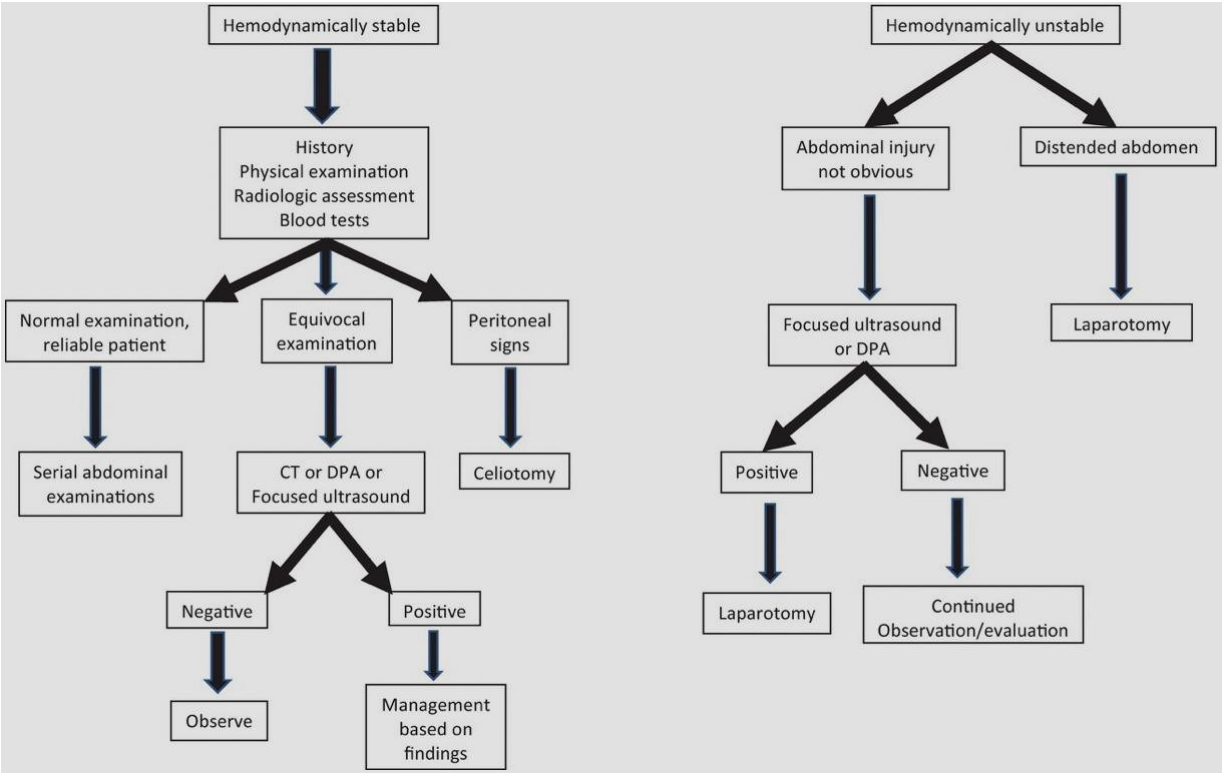
Only 5-10% of patients admitted to trauma centers with suspected abdominal injury (motor vehicle crashes, sever crush injuries, falls from heights>10 feet, or patient with abdominal tenderness) will have abdominal injury. The rate of abdominal injury is twice as high in patients with hypotension, severe head injury, or spinal cord injuries. Approximately half of these abdominal injuries can be managed nonoperatively. The diagnostic challenge is to identify abdominal injuries efficiently and accurately. Physical examination alone may result in a significant number of missed abdominal injuries, with 10% of patients with no abdominal tenderness or abdominal wall bruising having an abdominal injury on CT scan.

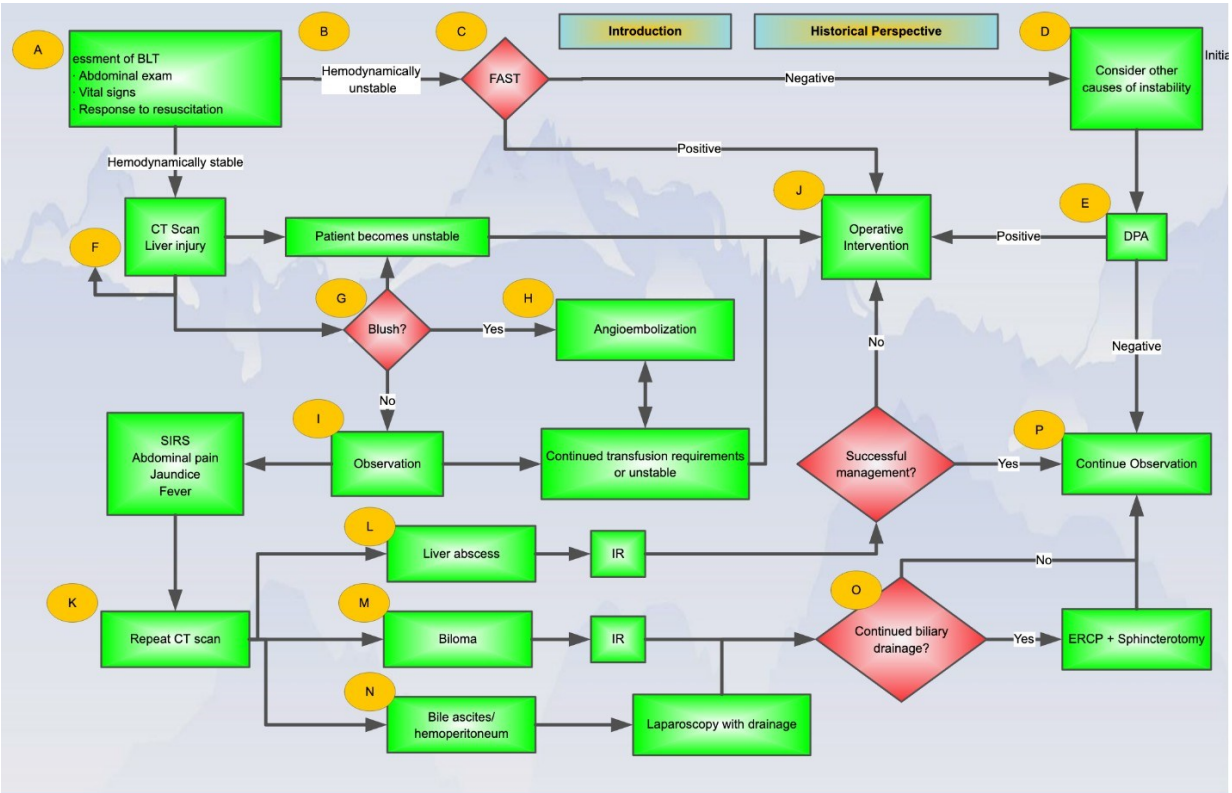
Complicating the evaluation of patients with blunt abdominal trauma is the presence of EtOH. However, one large study has found that the presence of EtOH (levels equivalent to legal intoxication) does not appear to affect the reliability of an abdominal exam until the EtOH causes obtundation (GCS<11). There are surrogate markers for abdominal injury in the absence of physical findings, such as chest injury and hematuria. The absence of abdominal tenderness and these two injuries has a negative predictive value for abdominal injury of >99%.

***u.b.* – Ultrasonography is user-dependent. If trauma and emergency medicine attendings do not agree on the interpretation of scan, pursue alternative diagnostic maneuvers (e.g., DPL). Serial FAST scans may be indicated for unexplained tachycardia/hypotension.**

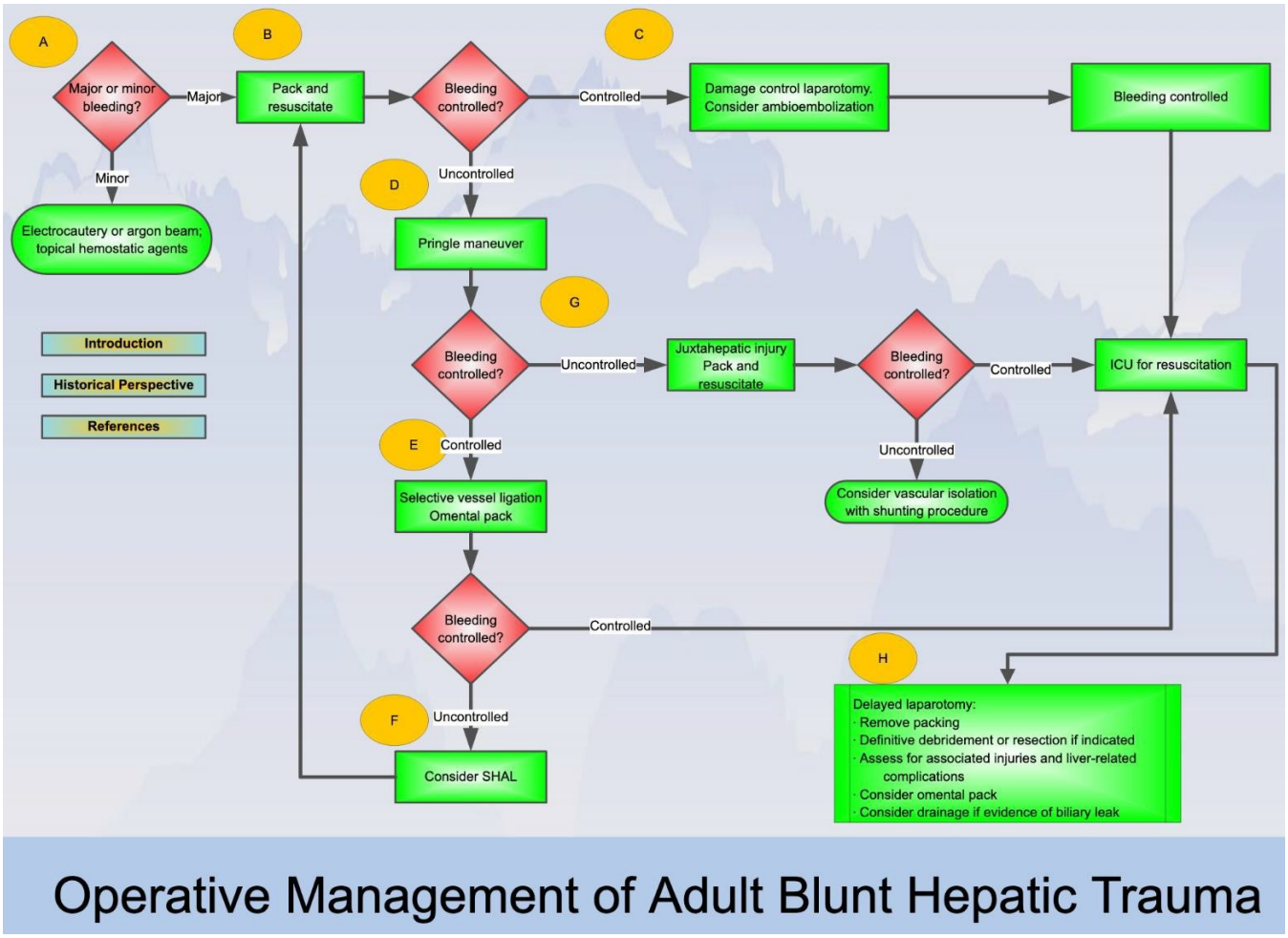
CT Indications	Ultrasound Indications
• Spinal cord injury, GCS<9	Hypotension
• Significant abdominal pain or tenderness	
• Gross hematuria	
• Pelvic fracture	
• Significant chest trauma**	
• Unexplained tachycardia and/or transient	
• Hypotension (with normal ultrasound exams/ DPL)	

**Significant chest trauma: The presence of any of the following: myocardial or pulmonary contusion, multiple (>2) unilateral rib fractures, left lower (8-12) rib fracture, first or second rib fracture, scapular fracture, mediastinal hematoma.

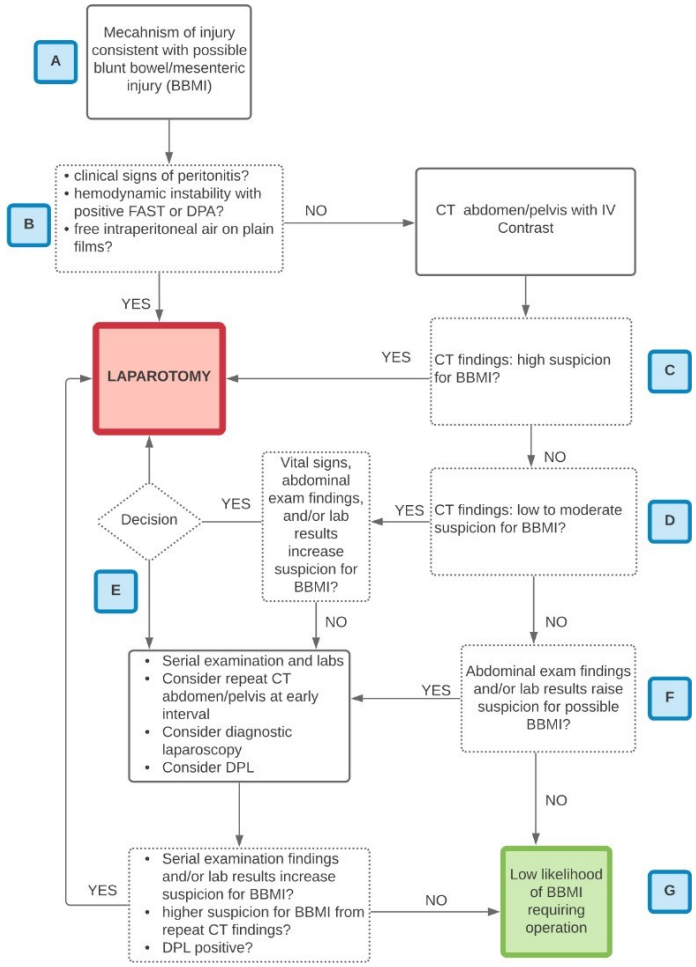




Nonoperative Management of Adult Blunt Hepatic Trauma



Operative Management of Adult Blunt Hepatic Trauma



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Blunt Splenic Trauma: Adult

Consistent with the management guidance of EAST, the following principles will be observed:

1. Patients who have diffuse peritonitis or who are hemodynamically unstable after blunt abdominal trauma with splenic injury will be taken urgently for laparotomy.

2. Routine laparotomy is not indicated in the hemodynamically stable patient without peritonitis presenting with an isolated splenic injury.

3. The severity of splenic injury (as suggested by CT grade or degree of hemoperitoneum), neurologic status, age >55 and/or the presence of associated injuries are not contraindications to a trial of nonoperative management in a hemodynamically stable patient.

4. In the hemodynamically normal blunt abdominal trauma patient without peritonitis, an abdominal CT scan with intravenous contrast should be performed to identify and assess the severity of injury to the spleen.

5. Angiography should be considered for patients with American Association for the Surgery of Trauma (AAST) grade of greater than III injuries, presence of a contrast blush, moderate hemoperitoneum, or evidence of ongoing splenic bleeding.

6. After blunt splenic injury, clinical factors such as a persistent systemic inflammatory response, increasing/persistent abdominal pain, or an otherwise unexplained drop in hemoglobin should dictate the frequency of and need for follow- up imaging for a patient with blunt splenic injury.

7. Contrast blush on CT scan alone is not an absolute indication for an operation or angiographic intervention. Factors such as patient age, grade of injury, and presence of hypotension need to be considered in the clinical management of these patients.

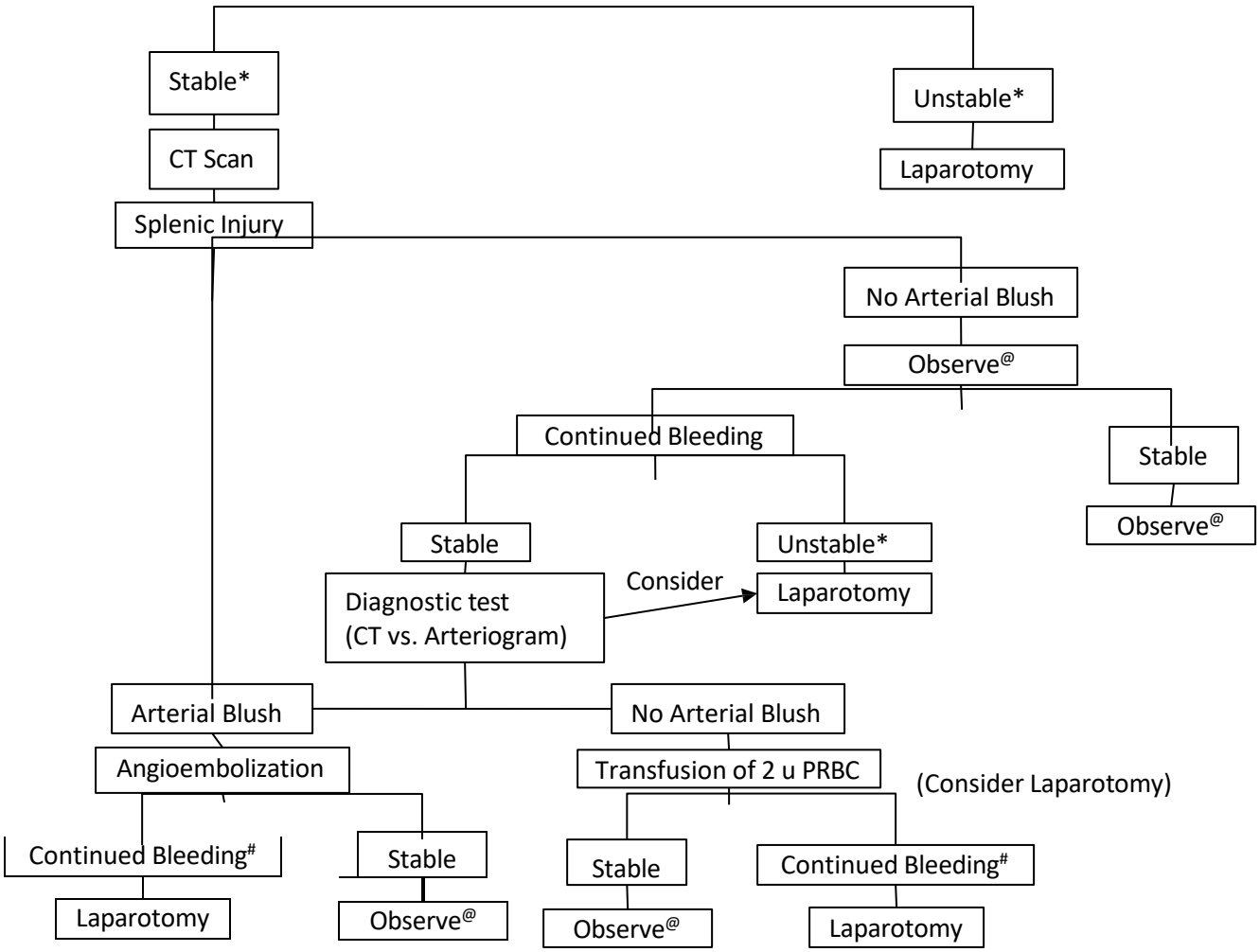
8. Angiography may be used either as an adjunct to nonoperative management for patients who are thought to be at high risk for delayed bleeding or as an investigative tool to identify vascular abnormalities such as pseudoaneurysms that pose a risk for delayed hemorrhage.

9. Pharmacologic prophylaxis to prevent venous thromboembolism can be used for patients with isolated blunt splenic injuries without increasing the failure rate of nonoperative management, although the optimal timing of safe initiation has not been determined. In the absence of contraindications DVT prophylaxis will be started within 48 hrs.

Important Points:

- Consider early operative intervention in patients with severe brain injury, multisystem injuries, or multiple solid organ injuries.
- There is risk of transfusion reactions, disease transmission and infectious morbidity with blood transfusion.
- Splenectomized patients should undergo meningococcal, pneumococcal, and Hib vaccines. Although the optimal timing may be 14 days post-splenectomy, trauma patients should be vaccinated prior to discharge as there is a significant lack of follow up with these patients. There is no convincing data evaluating the immunologic function of the embolized spleen or the need for vaccination after splenic angioembolization and currently it is not required for trauma patients.
- In patients with higher grade injuries in whom non-intervention is chosen, there should be a follow up CTA of the spleen to rule out the development of a splenic artery pseudoaneurysm which can cause delayed hemorrhage

Blunt Abdominal Trauma



Definitions:

- Hemodynamic instability: Hypotension (SBP<90 mm/Hg)
- Continued bleeding: Continued drop in Hgb attributable to the splenic injury.
- Observation: serial hemoglobin and gradual resumption of activity. There is no solid evidence dictating the level of activity
- Avoidance of contact sports for three months is recommended but data on this is lacking

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Renal Trauma

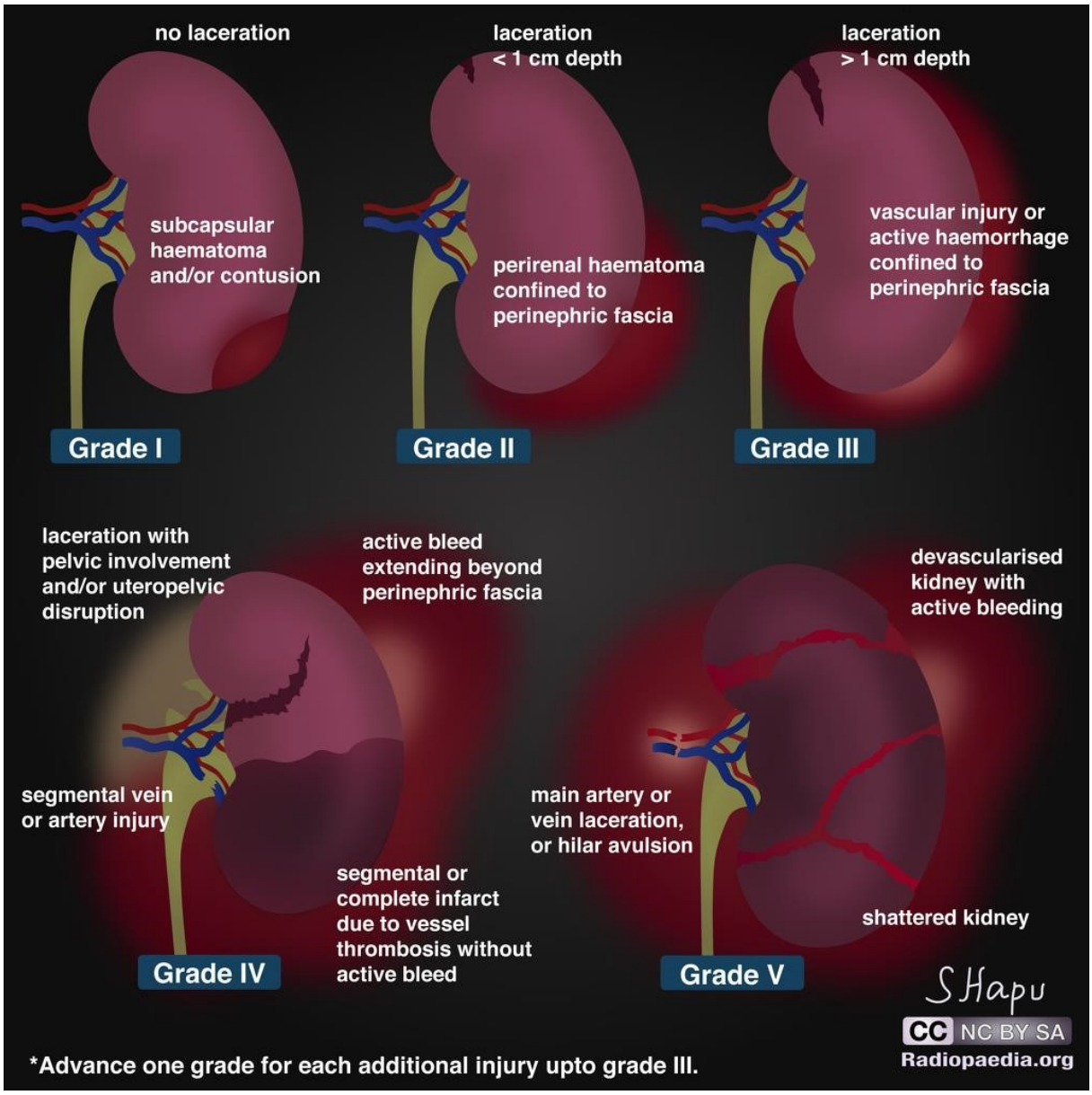
Ten percent of patients with blunt abdominal trauma are found to have a urogenital injury. Renal parenchymal injuries are the most common. Of these injuries, 75-90% may be classified as minor (Grade I-III) and require no intervention. Work up and treatment of the remaining "major" renal injuries has been controversial but there has been increasing interest in non-operative management because of associated decreased transfusion requirements, shorter ICU stay, and increase salvage rate of the kidney. CT scan of the abdomen/pelvis is the test of choice for staging renal injury.

Evaluation:
Urine from the first post injury void should be evaluated on all patients with blunt abdominal trauma. Most patients with major renal trauma present with gross hematuria or hypotension, only 0.8 – 1.2 % of major renal injuries have neither.

Microscopic hematuria: (Greater than 5 RBC/HPF): Rarely associated with significant renal system injury unless shock (SBP <90 documented, including on EMS transport) or associated with penetrating mechanism. Patients require observation and repeat UA later in the ER or hospital to demonstrate resolution, in order to rule out other sources of hematuria such as malignancy. Children with significant microscopic hematuria (Greater than 50 RBC/HPF) should undergo abdominal/pelvic CT with Cystogram as their risk for significant renal injury is higher than in adults.

Gross hematuria: Patients require abdominal/pelvic CT with cystogram if hemodynamically stable. A retrograde urethrogram should be performed if there is blood at the meatus.

Blunt vs. penetrating: Blunt injury and stab wounds may be worked up in a similar fashion. Gunshot injuries often skip CT scan staging and require exploration because of hypotension, massive injury and delayed complications secondary to blast effect.


no laceration
subcapsular haematoma and/or contusion
Grade I
laceration < 1 cm depth
perirenal haematoma confined to perinephric fascia
Grade II
laceration > 1 cm depth
vascular injury or active haemorrhage confined to perinephric fascia
Grade III
laceration with pelvic involvement and/or uteropelvic disruption
segmental vein or artery injury
segmental or complete infarct due to vessel thrombosis without active bleed
Grade IV
active bleed extending beyond perinephric fascia
main artery or vein laceration, or hilar avulsion
devascularised kidney with active bleeding
shattered kidney
Grade V
*Advance one grade for each additional injury upto grade III.
S Hapu
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Grade[a]		Injury description[b]
Renal injury scale		
I	Contusion	Microscopic or gross hematuria; urologic studies normal
	Hematoma	Subcapsular, nonexpanding without parenchymal laceration
II	Hematoma	Nonexpanding perirenal hematoma confined to the renal retroperitoneum
	Laceration	<1 cm parenchymal depth of renal cortex without urinary extravasation
III	Laceration	>1 cm parenchymal depth of renal cortex without collecting system rupture or urinary extravasation
IV	Laceration	Parenchymal laceration extending through the renal cortex, medulla, and collecting system
	Vascular	Main renal artery or vein injury with contained hemorrhage
V	Laceration	Completely shattered kidney
	Vascular	Avulsion of renal hilum that devascularizes kidney
Ureter injury scale		
I	Hematoma	Contusion of hematoma without devascularization
II	Laceration	≤50% transection
III	Laceration	>50% transection
IV	Laceration	Complete transection with 2 cm devascularization
V	Laceration	Avulsion of renal hilum that devascularizes kidney
Bladder injury scale		
I	Hematoma	Contusion, intramural hematoma
	Laceration	Partial thickness
II	Laceration	Extraperitoneal bladder wall laceration ≤2 cm
III	Laceration	Extraperitoneal (>2 cm) or intraperitoneal (≤2 cm) bladder wall lacerations
IV	Laceration	Intraperitoneal bladder wall laceration >2 cm
V	Laceration	Intraperitoneal or extraperitoneal bladder wall laceration extending into the bladder neck or ureteral orifice (trigone)
Urethral injury scale		
I	Contusion	Blood at urethral meatus; urethrography normal
II	Stretch injury	Elongation of urethra without extravasation on urethrography
III	Partial disruption	Extravasation of urethrographic contrast medium at injury site, with contrast visualized in the bladder
IV	Complete disruption	Extravasation of urethrographic contrast medium at injury site without visualization in the bladder; <2 cm of urethral separation
V	Complete disruption	Complete transection with >2 cm urethral separation, or extension into the prostate or vagina

[a]Advance one grade for multiple injuries to the same organ.
[b]Based on most accurate assessment at autopsy, laparotomy, or radiologic study.

Management:
Notify Urology Service. Patients with a major renal injury may be candidates for non-operative management under these conditions: Stable hemodynamics, urine extravasation contained within Gerota's fascia, and no ongoing bleeding. Patients should be monitored in the TICU for the first 24-48 hours.

Bedrest should continue for 24 hours after the cessation of hematuria. Other therapeutic interventions are:

Angio-embolization: Consider with arterial blush visualized on CT abdomen/pelvis done with IV contrast or with significant hematoma.

Double J Stent: Patients with evidence of urinary extravasation on initial CT scan may warrant stenting. Plan re-evaluation with CT scan 48 hours post injury. Any patient with persistent urinary extravasation on repeat CT scan requires stenting. Less than 10% of patients require surgery for failure of stents to control urine extravasation.

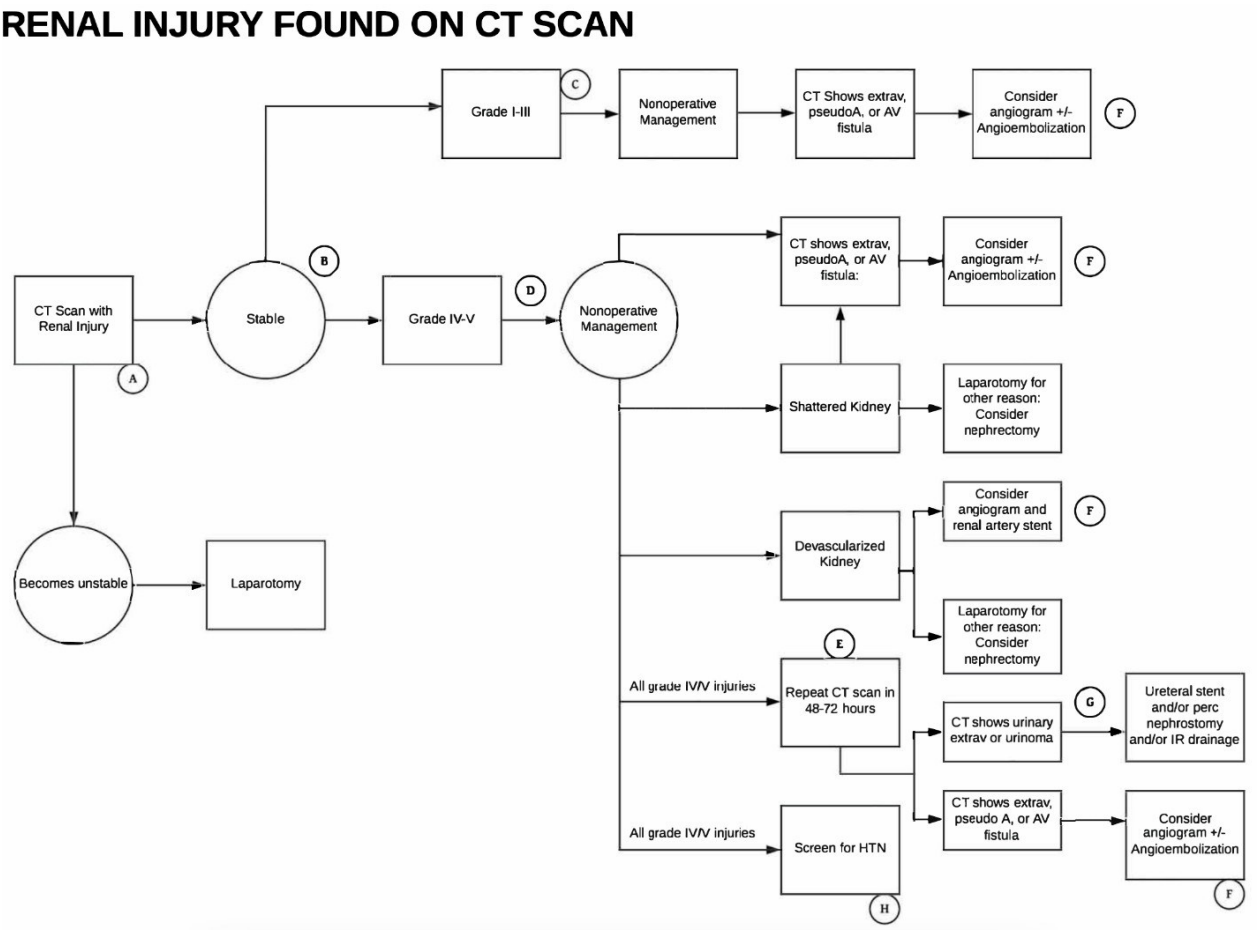
Percutaneous drainage: Urinoma and abscess may be a complication of non0operative management. Both may be treated with percutaneous drainage.

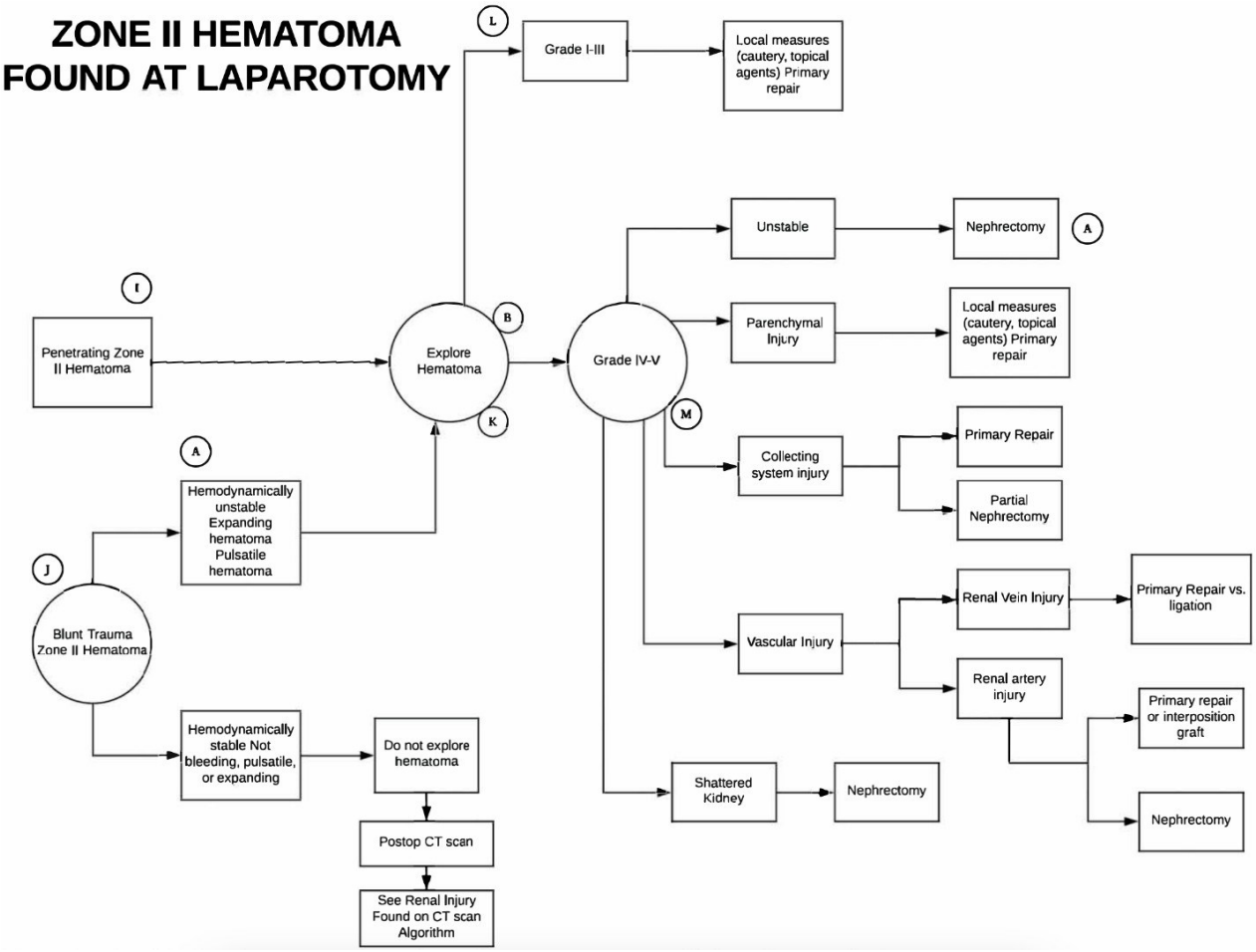
Operative salvage: Patients taken to the operating room for hypotension before adequate staging of potential renal injuries may warrant exploration if there is a strong suspicion for renal injury. Otherwise, postoperative staging CT is recommended. Intra-op IVP has been used to assess contralateral kidney function yet less than 1% of patients with a palpable contralateral kidney have a non-functioning kidney. The "one-shot IVP" is not warranted.

Intra-op considerations: Assess urinary extravasation by injection of methylene blue. Goals are debridement, homeostasis, watertight closure of the collecting system, re-approximation of the parenchyma, and drainage of the retroperitoneum. Often omentum is used to wrap the kidney after repair.

Revascularization: Revascularization has been employed for traumatic renal artery occlusion. Salvage in this situation is rarely successful and should not be undertaken in the acutely injured patient. Fewer complications are seen if non-operative management is undertaken. However, the patient must be monitored for the development of renovascular hypertension.

RENAL INJURY FOUND ON CT SCAN





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Diagnosis of Blunt Bowel and Mesenteric Injury

Blunt injury to the bowel or mesentery (BBM) is uncommon and can be difficult to diagnose. While some studies claim that diagnostic delay does not cause morbidity or mortality,[1] a large multicenter series has reported an increased mortality when the diagnosis is delayed by as little as 8 hours.[2] Therefore, it is important to identify those at risk and make the diagnosis early.

CT scanning is the best noninvasive test for diagnosing BBMI. [3,4] Oral contrast does not need to be routinely administered as it delays the evaluation and does not add to specificity of sensitivity of the test.[5] CT findings that suggest BBMI include free fluid in the absence of solid organ injury, bowel wall thickening, mesenteric fat streaking, mesenteric hematoma, pneumoperitoneum, and extravasation of IV or oral contrast.

The findings of pneumoperitoneum or contrast extravasation mandate laparotomy. The other findings are suggestive but not specific for BBMI. Malhotra and colleagues[3] found that in a patient with a single CT finding 35% had BBMI. Two findings were associated with BBMI in 80%. If more than two findings were present the rate was 100%. Thus, two or more of these findings mandate laparotomy. A single finding should prompt further evaluation.

Options for further evaluation include serial physical exams, DPL, and repeat CT scan. Physical exam has been shown to have variable results in predicting a need for operation[1]. Thus, it should supplement by serial WBC and delayed CT scan. DPL has a high sensitivity and negative predictive value but a positive predictive value of only 35%. In addition, it is invasive and carries a risk of complications. [6] A positive DPL is defined as RBC>100,000/mm3, WBC>500/mm3 or the presence of bile, bacteria or particulate matter. Amylase >20 and Alkaline phosphatase >3 are useful adjuncts in equivocal tests.[7] A low threshold for exploration should be used when the clinical picture is not improving.

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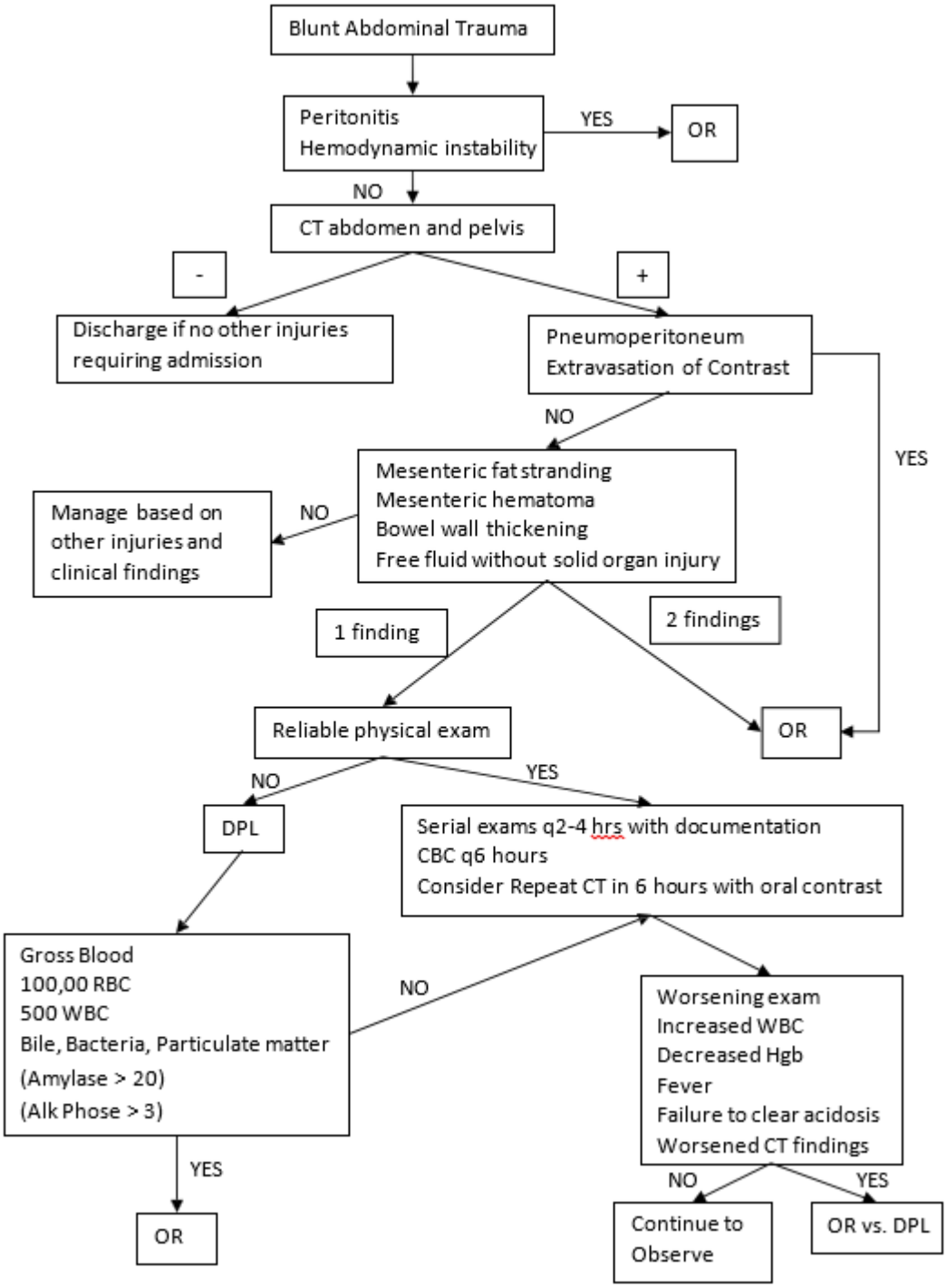
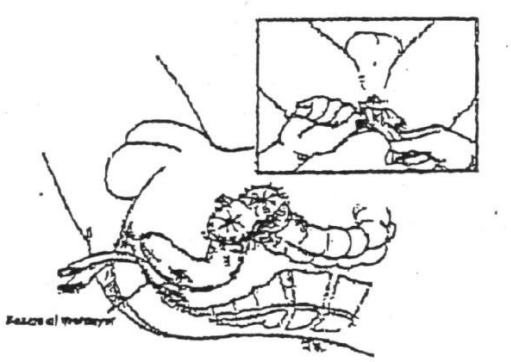

Blunt Abdominal Trauma
Peritonitis
Hemodynamic instability
YES
OR
NO
CT abdomen and pelvis
-
+
Discharge if no other injuries requiring admission
Pneumoperitoneum
Extravasation of Contrast
NO
YES
Mesenteric fat stranding
Mesenteric hematoma
Bowel wall thickening
Free fluid without solid organ injury
Manage based on other injuries and clinical findings
NO
1 finding
2 findings
Reliable physical exam
OR
NO
YES
DPL
Serial exams q2-4 hrs with documentation
CBC q6 hours
Consider Repeat CT in 6 hours with oral contrast
Gross Blood
100,00 RBC
500 WBC
Bile, Bacteria, Particulate matter
(Amylase > 20)
(Alk Phose > 3)
NO
Worsening exam
Increased WBC
Decreased Hgb
Fever
Failure to clear acidosis
Worsened CT findings
YES
NO
YES
OR
NO
YES
Continue to Observe
OR vs. DPL

Rectal Injury

Intraperitoneal rectal injuries should be managed similar to colonic injuries, and thus primary repair without diversion is acceptable.[2–5] However, diversion is expected for all extraperitoneal rectal injuries based on expert consensus in the light of relatively sparse data. The ones easily visualized with minimal dissection should be primarily repaired as well. [2,4,6,7]

Although it may be helpful in visualizing the rectal injury, distal rectal washout has not shown any advantage in the management of rectal injury and may be omitted, particularly in non-destructive lesions.[2–11, 15]

Presacral drainage is controversial. Several series suggest it does not significantly decrease morbidity. [8,9,11] On the other hand, a large series suggested reduced pelvic sepsis, [2] and most textbooks treat it as the standard of care-particularly in the setting of blunt rectal injury.[10] Presacral drainage involves a curvilinear incision 3-5 cm in length between the coccyx and the posterior margin of the anal sphincter and extended through the endopelvic fascia of Waldeyer's. Dissection is carried towards the region of the rectal injury and drains are secured to the perianal skin.



Healing of rectal wounds may occur in up to 75% of patients 10 days after injury. Same admission colostomy closure may be considered in patients with low-grade or penetrating injuries.[12] Healing should be demonstrated with a contrast enema. Current recommendations are for fecal stream diversion in "destructive" rectal injuries involving >25% of the rectal wall circumference.[14]

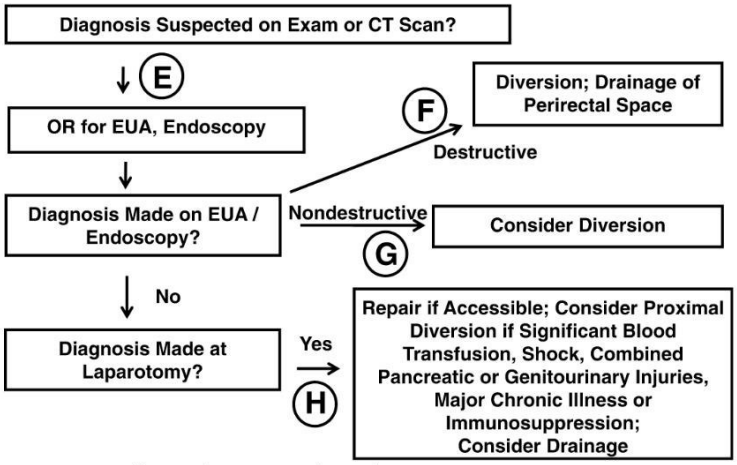


Figure 2. Algorithm for management of wounds to extraperitoneal rectum.

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Orthopedic Trauma Consultation Response / Physician Management Guideline

RESPONSIBILITY

A. The orthopedic trauma surgeon on-call is dedicated to the Washington Hospital Healthcare System
B. When requested, the on-call orthopedic surgeon, fellow, PA, or NP must be available in the resuscitation area within 30 minutes.
C. The on-call Orthopedic Surgeon will be available for consultation 24 hours a day.

GUIDELINE

A. Emergent Orthopedic Surgery Consultation ["ACS Requirement 5.21 Orthopaedic Surgeon Response"]: For trauma patients, an orthopedic surgeon must be at bedside within 30 minutes of request for the following:

a. Hemodynamically unstable patients secondary to pelvic fracture
b. Suspected extremity compartment syndrome
c. Fractures/dislocations with risk of avascular necrosis (e.g., femoral head or talus)
d. Vascular compromise related to a fracture or dislocation
e. Trauma surgeon discretion.1

B. Urgent Orthopedic Surgery Consultation

The attending trauma surgeon and orthopedic surgeon on-call will institute appropriate diagnostic evaluation and treatment according to the clinical situation which may include:

a. Unstable pelvic fractures
b. Isolated hip fractures
c. Bilateral lower extremity long-bone fractures
d. Any open fracture
e. Femur fractures
f. Other fractures, dislocations, or soft tissue injuries with vascular compromise or continued bleeding
g. Other fractures with associated compartment syndrome

Outside of the predetermined 30-minute orthopedic response criteria, the timing of orthopedic bedside evaluation will be agreed upon by the involved surgeons. Time **at bedside** will be documented in the medical record by the orthopedic surgeon, PA, or NP on the orthopaedic trauma service.

C. Non-Urgent Orthopedic Surgery Consultation

1. Orthopedic surgical consultation is available for non-urgent trauma cases at the discretion of the attending trauma surgeon
2. Non-displaced fractures, without neurovascular compromise or evidence of compartment syndrome may be treated with immobilization and orthopedic follow-up.

DOCUMENTATION

Response times will be documented in the orthopedic surgeon, PA, or NP consultation note or dictation, on the trauma resuscitation flow sheet by the Primary trauma RN and/or on the ED consult log. The orthopedic surgeon, PA, or NP will also document the time at bedside in the consultation note and plan of care. Documentation will be tracked by Trauma Services during the performance improvement process. Opportunities for improvement will be communicated promptly in order to enhance future process improvement and patient

outcomes.

BACKUP/CONTINGENCY PLAN

The following process will be implemented when the on-call orthopedic surgeon is encumbered in the operating room or otherwise unable to immediately respond to a trauma consultation request.

A. If unable to reach the orthopedic surgeon on-call at any time, the ED or Trauma physician will check with the operating room to inquire whether the on-call surgeon is in surgery.
B. If the orthopedic surgeon is unavailable or encumbered, the backup orthopaedic surgeon will be contacted, if the backup orthopaedic surgeon is encumbered, consider transferring the patient to another facility.
C. The Orthopedic Medical Director may also be contacted for further assistance.

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Unstable Pelvic Fractures

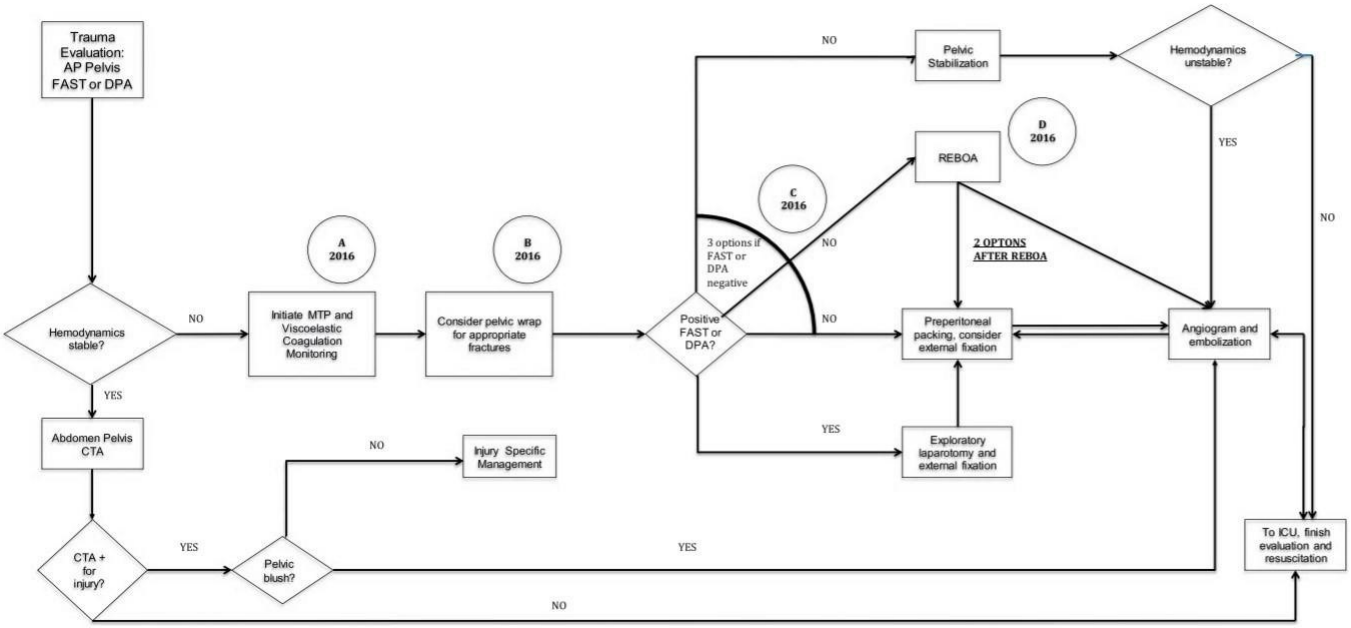
Hemodynamically compromised patients with pelvic fractures present a complex challenge to trauma surgeons. Fractured pelvic bones bleed briskly and can lacerate surrounding soft tissues and disrupt their extensive arterial and venous networks. The resultant hemorrhage and secondary coagulopathy can be lethal; to confound matters, the considerable force required to fracture the pelvis typically results in significant associated extrapelvic injuries. Collectively, these factors account for high rates of death and complications. The concept of a multispecialty approach to patients with pelvic fractures and significant hemorrhage has been reinforced by several groups. Although the fundamental objectives – control of hemorrhage, restoration of hemodynamics, and prompt diagnosis and treatment of associated injuries – have not changed, the means of achieving these goals have evolved significantly. [1'2] Maneuvers such as early mechanical pelvic stablilization[3] and arterial hemorrhage control by means of interventional radiologic techniques[4] are now recognized as pivotal components of the management scheme.

Hemodynamically stable patients should undergo CT scanning of the abdomen and pelvis to detect occult injuries or contrast extravasation.[5] The findings of contrast extravasation in the pelvis is highly suggestive of significant arterial bleeding that may require angiography and embolization.[6,7] Ongoing transfusion requirements also constitute an indication for arteriography.

The initial approach to hemodynamically compromised patients must be aggressive. Crystalloid resuscitation and transfusion of packed red blood cells should be instituted immediately; empiric administration of fresh frozen plasma (1:1) and platelets (5:5) may help prevent coagulopathy. Viscoelestic testing should be initiated. Reduction of the pelvic volume is critical, and is achieved by prompt wrapping of the pelvis, and taping of the knees and ankles The orthopedics surgery attending is instrumental in determining whether application of an external fixation device – and what device – is appropriate.[8,9]. Finally patients with hemodynamically unstable pelvic fractures warrant emergency consultation to orthopedics with an expected 30 min response time

Identification of alternative sites of bleeding is central to the triage of these patients. Physical examination, chest x-ray, and ultrasonography will identify significant extrapelvic hemorrhage, allowing timely intervention. If ultrasonography is equivocal, supraumbilical DPL should be performed, and the patient taken to the OR if the aspirate is grossly positive.

Patients who do not recover with mechanical pelvic stabilization, transfusion, and treatment of associated injuries have a high likelihood of harboring pelvic arterial hemorrhage. They should undergo prompt arteriography either in the operating room or the radiography suite. Preperitoneal pelvic packing and REBOA techniques may be used at the discretion of the attending trauma surgeon, especially REBOA which is currently subject to the experience and availability of this technique and may not be immediately available. For this reason, vascular/interventional radiology should be altered early in the course of these patients.



Pelvic Fracture Clinical Pathway

Hemodynamically Unstable Patient with Biomechanically Unstable Pelvis Fracture

↓

Immediate Notification Attending Trauma and Orthopedic Surgeon, Blood Bank, Interventional Radiology Resuscitate with 2 Liters Crystalloid

Wrap Pelvis with Sheet, T-Pod, Tape Knees and Ankles, Consider External Fixation Device

Ensure adequate IV access. Consider Massive Transfusion Protocol for unstable pelvic fracture patients

Transfuse PRBCs and FFP 1:1; 5 U PLTs for each 5 U PRBCs

Rule Out Thoracic Source (Portable Chest X-Ray)

---

*DPL, may be warranted in the setting of refractory shock

CVP, Central Venous Pressure, PRBCs, Packed Red Blood Cells, FFP, Fresh Frozen Plasma; PLTs, Platelets; DPL, Diagnostic Peritoneal Lavage; TICU, Trauma Intensive Care Unit

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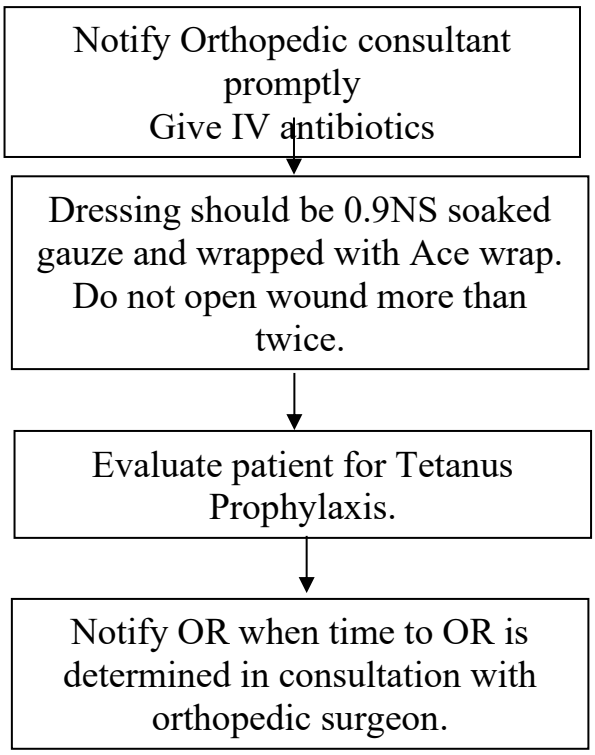
Open Extremity Fracture: Adult

The Open Fracture Algorithm is as follows:



Open fracture grade	Characteristics of Gustilo Grade Open Fracture	Infection Rate	Amputation Rate
Grade I	Clean wound smaller than 1 cm in diameter, simple fracture pattern, no skin crushing.	0-2%	0%
Grade II	A laceration larger than 1 cm but without significant soft tissue crushing, including no flaps, degloving, or contusion. Fracture pattern may be more complex.	2-7%	0%
Grade III	An open segmental fracture or a single fracture with extensive soft tissue injury. Type III injuries are divided into three subtypes:		
Grade III A	Adequate soft tissue coverage of the fracture despite high energy trauma or extensive laceration or skin flaps.	5-10%	2.5%
Grade III B	Inadequate soft tissue coverage with periosteal stripping. Soft tissue reconstruction is necessary.	10-50%	5.6%
Grade III C	Any open fracture that is associated with an arterial injury that requires repair.	25-50%	25%

Grade of Open Fx	Recommended Antibiotic	Alternate if PCN Allergy
I or II	Kefzol 1-2 g load then 1g IV q8h for 48 hrs	Clindamycin 900 mg IV q8h for 48 hrs
III	Ceftriaxone 1g IV then repeat q24h for 48 hrs	Clindamycin 900 mg IV q8h and Aztrenonam 1g IV q8h for 48hrs

Open fractures will receive IV antibiotics within one (1) hour of presentation to the trauma bay.

Gustilo grade 1 or 2 will receive a first generation cephalosporin.
Gram negative coverage will be considered for grade 3 fractures.
Anaerobic coverage will be considered for injuries with severe contamination or vascular occlusion.

Tetanus vaccination will be provided for

- Incomplete primary immunization
- Greater than 10 years since last booster dose
- Unknown primary immunization or most recent booster

Antibiotics will be administered for no longer than 24 hours after surgical procedure for grade one and two injuries or those with mild or moderate contamination, but may be continued for as long as 72 hours after surgical procedure for severe contamination

Antibiotics will be administered for no longer than 24 hours after surgical procedure for grade one and two injuries or those with mild or moderate contamination, but may be continued for as long as 72 hours after surgical procedure for severe contamination.

Patients with open fractures will go to the operating room for irrigation and debridement within 24 hours.

Damage control: Patients in extremis will be placed in skeletal traction or temporarily stabilized by other appropriate means until stable for operative fixation. Once patients are stable from concurrent injuries, formal stabilization with external or definitive fixations will be performed.

Patients with femoral shaft fractures will undergo fracture stabilization within 24 hours of presentation.

References:

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Fractures with Vascular Injury Treatment Guideline

BACKGROUND

Prompt and accurate diagnosis of vascular compromise is imperative because delays in diagnosis are associated with a high rate of extremity amputation. Damage to vascular structures may occur because of direct or indirect trauma. Direct trauma includes puncture wounds or lacerations of a vessel caused by a stabbing mechanism of injury, projectile, or sharp fracture fragment. Indirect trauma causes stretching or shear forces that act on a vessel, which may lead to intimal tear.

Soft Signs of Vascular Injury:

- History of bleeding in transit
- Proximity-related injury
- Neurologic finding from a nerve adjacent to a named artery
- Hematoma over named artery

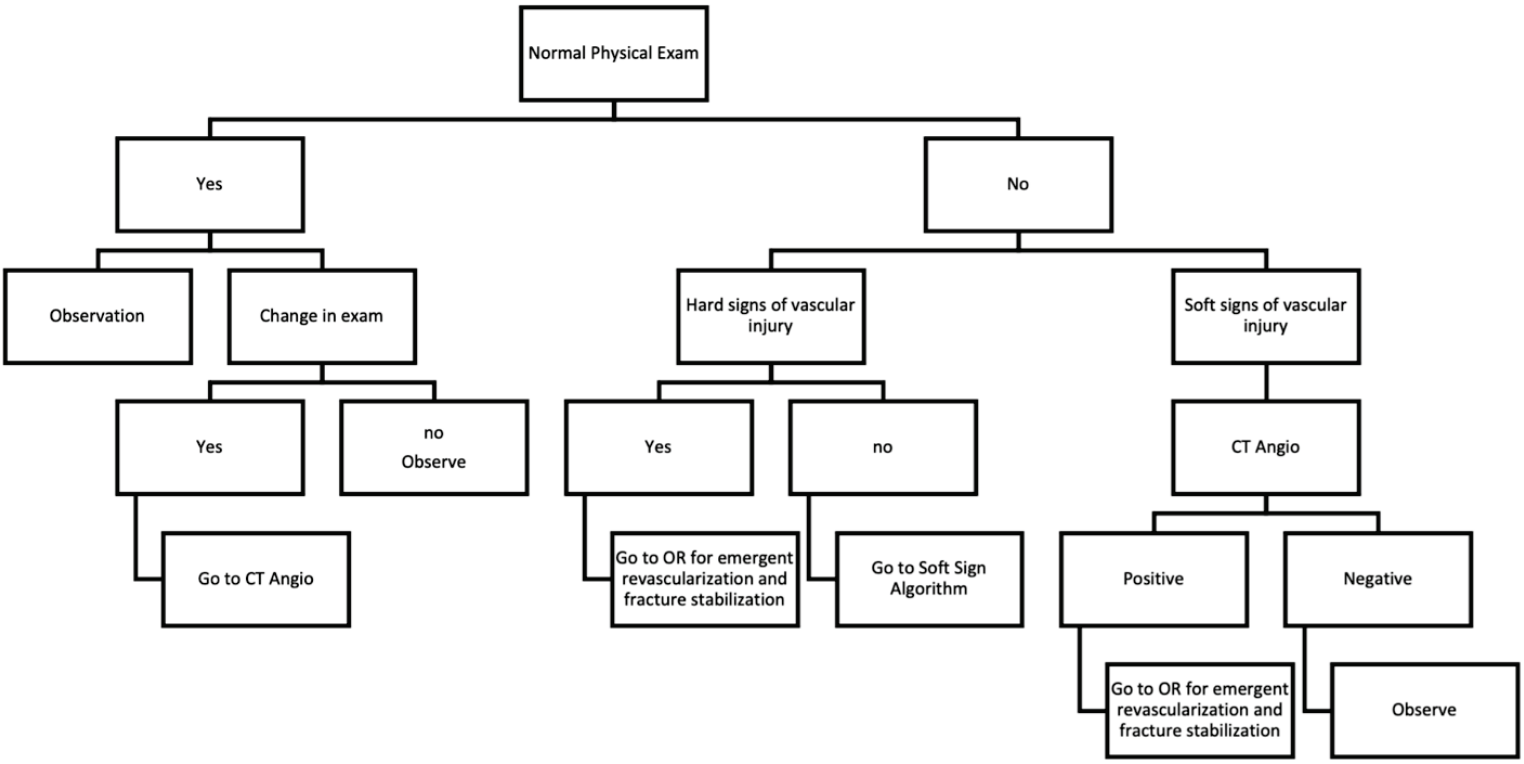
Hard Signs of Vascular Injury

- Pulselessness
- Pallor
- Paresthesia
- Pain
- Paralysis
- Rapidly expanding hematoma
- Massive bleeding
- Palpable or audible bruit

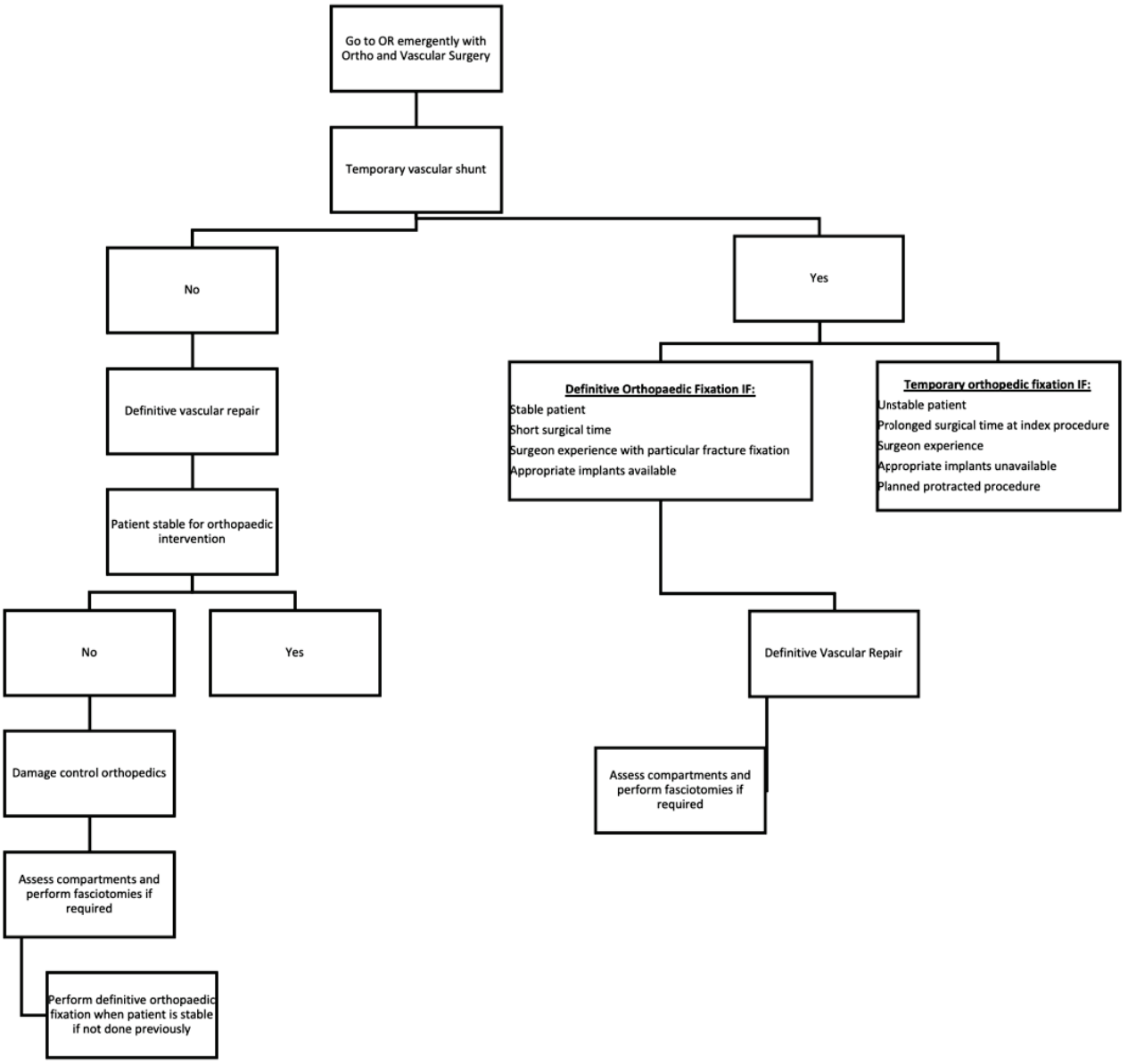
GUIDELINE

Communication between ED/Trauma/Ortho/Vascular/Anesthesia/OR

- Discussion should include:
    i. Patient factors (mechanism of injury; associated injury treatment)
    ii. Treatment plan and algorithm (sequence, timing, and temporary and definitive vascular repair and fracture fixation procedures)
    iii. Other factors (equipment, need for radiolucent table, surgical approaches, and positioning)


Normal Physical Exam
Yes
No
Observation
Change in exam
Hard signs of vascular injury
Soft signs of vascular injury
Yes
no
Observe
Yes
no
CT Angio
Go to CT Angio
Go to OR for emergent revascularization and fracture stabilization
Go to Soft Sign Algorithm
Positive
Negative
Go to OR for emergent revascularization and fracture stabilization
Observe

Treatment of Diagnosed Vascular Injury with Concomitant Fracture/Dislocation



Mangled Extremity

Severe extremity injuries with significant damage to more than one tissue component (integument = Skin + subcutaneous tissue, muscles, bone, nerves and vasculature) are often called ***mangled extremities***. They typically require arterial repair to restore limb viability. Unlike a pure vascular injury, however (such as knife or gunshot wound), the prognosis for restoration of function is poor. Particularly for mangled lower extremities, amputation must be seriously considered as a better alternative to attempted limb salvage, especially when risk of systemic complications is high or when the salvaged limb will be less functional than a prosthesis.

The prediction of successful limb salvage in terms of patient morbidity and eventual acceptable limb function has been limited by the lack of class I data (well powered, randomized, prospective trial).

Additionally, all the scoring systems currently used are based on data from lower extremity injuries only. The NISSSA scoring system is a tool which emphasizes the important factors which impact limb salvage for mangled extremities: nerve injury, ischemia, soft tissue/contamination, skeletal trauma, presence of shock, and patient age. Using this scoring system, several retrospective studies have shown that limb salvage is nearly always possible with acceptable functional results when the NISSSA is < 7 and that few limbs can be or should be salved with the NISSSA >10.

Several surgical services must become involved immediately in the care of a patient with a mangled extremity. Attending surgeons from the Trauma Service, the Orthopaedic Service and, as required on an individual basis, Vascular and Plastic Surgery are essential during evaluation, decision making, and treatment. If the mangled extremity is ischemic, every effort must be made to expedite immediate operative intervention – nonviable limbs rarely benefit from arteriography in the Radiology Department, although an OR arteriogram may be valuable. It is essential that the trauma attending be directly involved in the care of these patients, to have a direct dialogue with attending surgeons of other disciplines and to main the perspective of the entire patient.

Other Important Principles

If a patient has inadequate physiologic reserve due to other associated injuries, limb salvage should not be considered.

- If the mangled extremity is contributing to significant physiologic derangement threatening loss of life, limb salvage will not be considered.
- Limb salvage will only be attempted when there is a reasonable expectation that a functional limb is salvageable and with discussion of appropriate services and/or patient or family.
- Prompt orthopedic evaluation (within 30 minutes) will be performed for
    - Mangled extremities with loss of pulses, not restored with reduction of displacement
    - Open extremity fracture with hemorrhage and hemodynamic instability
    - Fractures with associated compartment syndrome
    - Upon request of the trauma attending for uncontrolled life or limb-threatening injury

Time is of the essence!! Unless adequately perfused, nerve and muscle become progressively unsalvageable after 4 to 6 hours. Prompt response is essential and fractures/dislocations with risk of avascular necrosis (e.g., femoral head or talus) as well as vascular compromise related to a fracture or dislocation mandate prompt orthopedic consultation with the expectation of 30 minute response time

NISSSA Rating Criteria

Type of Injury	Degree of Injury	Points	Description
N-Nerve injury	Sensate	0	No major nerve injury
	Dorsal	1	Peroneal (deep or superficial), femoral nerve injury[a]
	Plantar partial	2	Tibial nerve injury[a]
	Plantar complete	3	Sciatic serve injury[a]
I-Ischemia	None	0	Good to fair pulses, no ischemia
	Mild	1[b]	Reduced pulses, perfusion normal
	Moderate	2[b]	No pulse(s), ↓ cap refill, Doppler signals present
	Severe	3[b]	Pulseless, cool, ischemic, no Doppler pulses
S-Soft Tissue (ST)/ Contamination (CON)	Low	0	Minimal to no ST contusion, no CON
	Medium	1	Moderate ST injury, low velocity GSW, moderate CON, minimal crush
	High	2	Moderate crush, deglove, high velocity GSW, moderate ST injury, considerable CON
	Severe	3	Massive crush, farm injury, severe deglove, severe CON, requires soft-tissue flap
S-Skeletal	Low energy	0	Spiral, oblique fx, no/minimal displacement
	Medium energy	1	Transverse fx, minimal comminution, Small caliber GSW
	High energy	2	Moderate displacement, moderate comminution, high velocity GSW, butterfly fragment(s)
	Severe energy	3	Segmental, severe comminution, bony loss
S-Shock	Normotensive	0	BP normal, SBP always >90mm Hg
	Transient↓BP	1	Transient SBP <90 in field or ED
	Persistent↓BP	2	Persistent SBP <90 despite fluids
A-Age	Young	0	< 30 years
	Middle	1	30-50 years
	Old	2	>50 years

TOTAL SCORE (N+I+S+S+S+A) _____

*Nerve injury as assessed primarily in emergency room.[b] Score doubles with ischemia >6 h.

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2. Lin CH, Wei FC, Levin L, Su JI, Yeh WL. The functional outcome of lower-extremity fractures with vascular injury. J Trauma 1997;43:480-485.
3. McNamara MG, Heckman JD, Corley FG. Severe open fractures of the lower extremity: A retrospective evaluation of the Mangles Extremity Severity Score. J Orthop Trauma 1194;8:81-87.

To Ligate or Not to Ligate

Injury	Best Mode of	
Infrarenal vena cava	Repair	Can ligate
Suprarenal vena cava	Repair	Cannot ligate – (at least 50% mortality)
Internal jugular vein	Repair	Can ligate unilaterally
Brachiocephalic vein	Repair	Can ligate unilaterally
Subclavian vein and artery	Repair	Can ligate
Superior vena cava	Repair	Can ligate in life-threatening situations
Carotid artery	Repair	Can ligate in life-threatening situations
Mesenteric veins	Ligate	Can ligate if isolated injury, but at least 50% mortality rate secondary to massive fluid
Portal vein	Repair	Sequestration in splanchnic vascular bed and bowel necrosis
Right renal vein	Repair	Cannot ligate – fewer collateral than left renal vein
Popliteal vein	Repair	Cannot ligate
Femoral vein	Repair	Can ligate
Lobar bile duct	Ligate	
Celiac artery	Ligate	
Left gastric artery	Ligate	
Common/proper hepatic arteries	Ligate	Especially if proximal to gastroduodenal branch
Right/left hepatic arteries	Ligate	Especially if portal vein is intact
Splenic artery	Ligate	Short gastric a. from left gastroepiploic
Iliac vein – comm/ext	Ligate	
Iliac artery – comm/ext	Repair	
Tibial arteries	Repair	Can ligate but need to ensure patency of other leg arteries
Brachial artery	Repair	Can ligate if distal profunda brachi branch since the elbow has a rich collateral of blood flow
Radial/ulnar arteries	Repair	Can ligate but need to ensure patency of other artery

Trauma Surgeons should be aware of the option of shunting named arteries in the presence of damage control or if further expertise required and not immediately available.

Reversal of Anticoagulation in Patients with Intracranial or Spinal Bleeding

In an effort to streamline emergency care of patients with neurotrauma who are on anticoagulant and antiplatelet agents, the following guidelines should be followed in the Emergency Department.

Neither the initial GCS nor coagulation laboratory measures in anticoagulated patients reliably identify patients with ICH (intra-cranial hemorrhage). Accordingly, rapid confirmation of ICH with expedited head CT along with prompt reversal of anticoagulation and antiplatelet agents is essential to reduce ICH progression and mortality.

1. Neurosurgery should be informed immediately of all CT scans demonstrating intracranial or spinal trauma in patients taking anticoagulation or antiplatelet agents.
2. A STAT CBC, type and screen, and coagulation profile should be obtained.
3. IMMEDIATELY initiate rapid reversal of anti-coagulation or anti-platelet agents in patients with an acute head injury after consultation with Neurosurgery. For patients with DELAYED PRESENTATION it is recommended to initiate reversal within 72 hours of injury utilizing the same procedure. Clinical judgement should be employed while weighing risk-benefit of reversing anticoagulation in these patients.
4. Please refer to the following GUIDELINE as well as hospital acute reversal protocol for recommendations of reversal of anticoagulation and antiplatelet agents.

Pharmacology of Antiplatelet Agents				
Drug	**Mechanism**	**Time to Antiplatelet Effect**	**Serum Half-Life**	**Irreversible Inhibition of Platelet?**
Aspirin	COX 1-inhibitor	<60 minutes	0.5 – 3 hours	Irreversible
NSAIDs	COX 1-inhibitor	Varies with specific agent		Reversible
Clopidogrel	P2Y12 inhibitor	<2 hours	6-8 hours	Irreversible
Prasugrel	P2Y12 inhibitor	<30 minutes	4-7 hours	Irreversible
Ticagrelor	P2Y12 inhibitor	<30 minutes	7-9 hours	Reversible
Cangrelor	P2Y12 inhibitor	<5 minutes	3-6 minutes	Reversible
Vorapaxar	PRAR-1 antagonist	Several days	8 days	Reversible
Abciximab	GP IIb/IIIa inhibitor	<10 minutes	10-30 minutes	Irreversible
Eptifibatide	GP IIb/IIIa inhibitor	<5 minutes	2.5 hours	Reversible
Tirofiban	GP IIb/IIIa inhibitor	<5 minutes	2 hours	Reversible
Dipyridamole	PDE inhibitor	< 60 minutes	12 hours	Reversible
Cilostazole	PDE inhibitor	<6 hours	12 hours	Reversible

Pharmacology of Direct Thrombin Inhibitors & Xa-Inhibitors								
Drug	**Mechanism**	**Route**	**Half-Life**	**Renal Excretion (%)**	**Removal by Dialysis**	**Crude Lab Measurement**	**Preferred Lab Measurement**	**Antidote**
Bivalrudin	Direct thrombin inhibitor	IV infusion	25 min	20%	~25%	PTT		PCC can be attempted (but dubious efficacy)
Argatroban	Direct thrombin inhibitor	IV infusion	40 min	20%	~20%	PTT		
Dabigatran (Pradaxa)	Direct thrombin inhibitor	Oral	12-17 hours (doubles if GFR < 30 ml/min)	80%	~ 65%	PTT	Thrombin time	Idarucizumab
Fondaparinux	Xa inhibitor	Subcutaneous	12-21 hours	80%	No	INR	Anti-Xa level*	Four-Factor PCC (possibly Adenexanet Alfa if available for oral agents)
Rivaroxaban (Xarelto)	Xa inhibitor	Oral	6-9 hours (11-13 in elderly)	66%	No	INR	Anti-Xa level*	
Apixaban (Eliquis)	Xa inhibitor	Oral	9-14 hours	25%	No	INR	Anti-Xa level*	
Edoxaban (Savaysa)	Xa inhibitor	Oral	10-14 hours	50%	~25%	INR	Anti-Xa level*	

*Any anti-Xa level can be used (e.g. those designed to measure the level of unfractionated heparin or low molecular-weight heparin). The most readily available assay will often be an anti-Xa level designed to measure unfractionated heparin (which may be available STAT in hospitals using this assay to titrate heparin infusions).

Condition	Description
INR above therapeutic range but < 5.0; no significant bleeding	Lower dose or omit dose, monitor more frequently, and resume at lower dose when INR therapeutic; if only minimally above therapeutic range, no dose reduction may be required.
INR $\geq$ 5.0 but $\leq$ 10.0, no significant bleeding	Omit next 1-2 doses, monitor more frequently, and resume at lower dose when INR in therapeutic range. Alternatively, omit dose and give Vitamin K1 (1-2.5 mg orally), particularly if at increased risk of bleeding. If more rapid reversal is required because the patient requires urgent surgery, Vitamin K1 (2-4 mg orally) can be given with the expectation that the INR will decrease in 24 hours. If the INR is still high, additional Vitamin K1 (1-2 mg orally) can be given.
INR > 10.0; no significant bleeding	Hold warfarin therapy and give higher dose of Vitamin K1 (5-10 mg orally) with the expectation that INR will be reduced substantially in 24-48 hours. Monitor more frequently, and use additional Vitamin K1 if necessary. Resume therapy at lower dose when INR therapeutic.
Serious or life-threatening bleeding at any elevation of INR	Hold warfarin therapy and give Vitamin K1 (10 mg by slow IV infusion), supplemented with 4-factor prothrombin complex concentrate or fresh frozen plasma. Vitamin k1 can be repeated every 12 hours.

References for Guideline

1. Campbell PG, Yadla S, Sen AN, Jallo J, Jabbour P. Emergency reversal of clopidogrel in the setting of spontaneous intracerebral hemorrhage. World Neurosurg. 2011 Jul-Aug;76(1-2):100-4.
2. Farkas J. Anticoagulant reversal. The Internet Book of Critical Care, 2021. https://emcrit.org/ibcc/reverse/.
3. Frontera JA, Lewin JJ, Rabinstein, et al. Guideline for reversal of antithrombotics in intracranial hemorrhage. *Neurocrit Care* 2016;24:6–46.
4. Levi M, Eerenberg E, Kamphuisen PW. Bleeding risk and reversal strategies for old and new anticoagulants and antiplatelet agents. J Thromb Haemost. 2011 Sep;9(9):1705-12.
5. Schulman S. Pharmacologic tools to reduce bleeding in surgery. Hematology Am Soc Hematol Educ Program. 2012;2012:517-21.
6. Thiele T, Sümnig A, Hron G, et al. Platelet transfusion for reversal of dual antiplatelet therapy in patients requiring urgent surgery: a pilot study. J Thromb Haemost. 2012 May;10(5):968-71.
7. Circulation. 2013;128:1234-1243.Integrated safety analysis of a 4-factor prothrombin complex concentrate versus plasma in Phase III clinical trials. PRESENTED AT Thrombosis and Hemostasis Summit of North America (THSNA) 2012.

BURNS

Initial Burn Resuscitation

Stop Further Injury

1. Maintain safety for self and victim
2. Extinguish or remove burning clothing
3. Chemical burns. See Chapter on Chemical Burns
   A. Avoid self-injury; wear gown, gloves and protective clothing
   B. Remove all contaminated clothing
   C. Remove contact lenses if present
   D. Copious irrigation with water
   E. Prolonged eye irrigation if exposure to eyes

Maintain Ventilation

1. Place 100% oxygen on patient (humidified if possible)
2. Examine airway for signs of inhalation injury
   A. Singed facial or nasal hairs
   B. Carbonaceous material present in mouth, nose or throat
   C. Swelling of upper airway
   D. Hoarseness, brassy cough
   E. Consider carbon monoxide poisoning (enclosed spaces?)
3. Maintain Airway
   A. Raise head of bed if no spinal injury present
   B. Monitor for airway compromise for possible early intubation when indicated
      1. Stridor, hoarseness, raspy cry
      2. Associated neck injury
      3. Associated chest wall injury (rib fractures, burns)
      4. Acute airway edema/severe inhalation injury
   C. Mechanical ventilation when intubated

Circulation (CPR when indicated)

1. Two large bore IV's (16g or larger) through non-burned skin (if possible) or IO's, for burns > 20% Total Body Surface Area (TBSA)
2. Start IV fluids with Lactated Ringer's (LR)

≤ 5 years	125 cc/hr
6-13 years	250 cc/hr
≥ 14 years	500 cc/hr

3. Monitor EKG with electrical injury for 24 hours
4. Hourly assessments of peripheral pulses
5. Place urinary catheter if patient with >20% TBSA burn

History

A: Allergies

M: Medications

P: Past history/injuries: Pregnancy

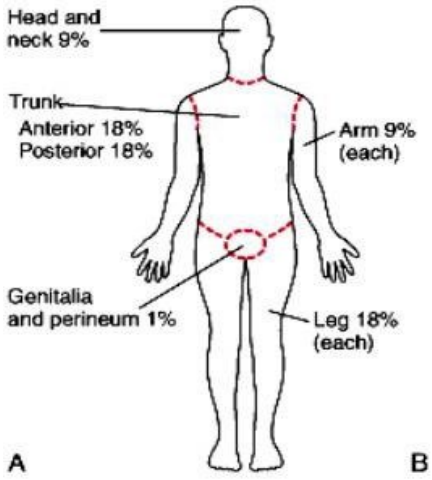
L: Last oral intake

E: Events (circumstances of injury, possible abuse, history or enclosed space, drug/alcohol use)

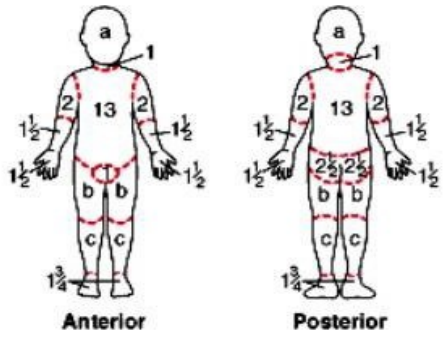
T: Tetanus and immunization status (give tetanus if indicated)

Examine

1. Remove all clothing and jewelry (rings and bracelets, etc.)
2. Check for associated injuries
3. Calculate extent and depth of burn injury % TBSA
   A. Using Rule of Nines
   B. Scattered burns; use the Patient's hand = 1%
   C. Only include 2nd degree (partial thickness) and 3rd degree (full thickness) burn area
   D. Obtain weight (kg)



(A) Rule of nines (for adults) and (B) Lund-Browder chart (for children) for estimating extent of burns.



Relative percentage of body surface area (% BSA) affected by growth

	Age				
Body Part	**0 yr**	**1 yr**	**5 yr**	**10 yr**	**15 yr**
a = 1/2 of head	9 1/2	8 1/2	6 1/2	5 1/2	4 1/2
b = 1/2 of 1 thigh	2 3/4	3 1/4	4	4 1/4	4 1/2
c = 1/2 of 1 lower leg	2 1/2	2 1/2	2 3/4	3	3 1/4

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Intravenous Fluid Therapy (Resuscitation)

1. Required for all burn injures > 20% TBSA:
   A. Estimate fluid needs for first 24 hours post burn
   B. Adults > 30 kg Lactated Ringers (LR)
      1. 2-4cc X kg X % TBSA
   C. Children < 30kg LR
      1. 3cc X kg X % TBSA
   D. Infants < 10kg D5 LR
      1. 3cc X kg X % TBSA
   E. Fluid total divided by 2. Give half within the first 8 hours of injury and remaining half over the next 16 hours
   F. In addition to resuscitation fluid, children need MAINTENANCE fluid using D5 LR (do NOT titrate)
      1. 4cc/kg/hr for 1st 10kg of weight
      2. 2cc/kg/hr for 2nd 10kg of weight
      3. 1cc/kg/hr for remaining kg of weight
   G. Electrical injury should start with 4cc X kg X % TBSA
   H. Insert urinary catheter to monitor urine output
      1. Adults: 0.5cc/kg/hr
      2. Children: 1cc/kg/hr
      3. Electrical Injury: >100cc/hr
   I. Increase and decrease resuscitation fluid as needed according to urine output

Peripheral Circulation with Circumferential Extremity Burns

1. Hourly (or more frequently as needed) for peripheral pulses
   A. Use Doppler if necessary
2. Monitor for clinical signs of impaired circulation
   A. Pain
   B. Pallor
   C. Paresthesia
   D. Paralysis
   E. Pulselessness
3. Need for escharotomy or fasciotomy (consult Burn Center)

Gastric Tube

1. Place gastric tube and attach to suction if:
   A. >20% TBSA
   B. Nausea, vomiting or abdominal distention
   C. Intubated patient
   D. As indicated, related to associated Trauma

Pain Management

1. IV or I/O pain administration preferred route during the initial phase of injury.
   A. May give small, frequent doses.

Initial Burn Wound Care

1. If transferring the patient to another facility, cover wounds with clean, dry sheet
2. If transfer is delayed > 24 hours:
   A. Initiate wound care
   B. Debride wound and wash with mild soap and water
   C. Begin topical therapy (contact Burn Center for guidance if needed)

Criteria for Referral to Burn Center

1. Partial thickness burns > 10% TBSA
2. Full thickness burns
3. Burns involving: Face, Hands, Feet, Major Joints, Genitalia or Perineum
4. Electrical injury (including lightening injury)
5. Chemical burns
6. Inhalation injury
7. Burns with pre-existing conditions that could complicate condition
8. Burns with associated trauma in which the burn injury poses the greatest risk
9. Burned children at hospitals without qualified personnel to care for children
10. Burn patients requiring special social, emotional or rehab intervention

Other Considerations: patients with complex frostbite injuries, extensive debridements from severe necrotizing fasciitis or Toxic epidermal Necrolysis/Stevens Johnson syndrome may also require transfer to a burn center. Decision to be made by the attending trauma surgeon and ED physician

Burn Mass Casualty Incident

1. During a Burn Mass Casualty Incident, hospitals may care for burn patients longer than during normal operations.

A. Hospitals should contact their Regional Trauma Coordination Center (RMCC) who will coordinate with state agencies to determine if activation of the Alameda County Plan will be necessary to assist with response.

Burn Referral Facilities:

1. Santa Clara Valley Medical Center, San Jose
2. UC Davis, Sacramento

References:

Advanced Burn Life Support Course provider manual 2021 update. American Burn Association311 South Wacker Drive, Suite 4150 Chicago, IL www.ameriburn.org

Burn Resuscitation

Burn resuscitation is characterized by the formation of tissue edema and intravascular hypovolemia. Hydrostatic and oncotic forces play a significant role in the formation of edema during the first 24 hours, most notably in the first 8 hours. Widening of the basement membrane gap junctions at 6-12 hours post-burn results in increased permeability, which further drives fluid losses. Due to the release of circulating cytokines and other inflammatory products, the effects of burn injury are both local and systemic. During the period of increased edema formation (the first 24 hours after burn), maintenance of normovolemia with aggressive fluid resuscitation and fluid boluses only exacerbates the severity of edema formation. Maintenance of end organ perfusion – not the rapid achievement of normovolemia – is the goal of burn resuscitation. The end organ monitored during resuscitation is the kidney, with urine output guiding fluid rates. By 24 hours after burn, the endothelial leak has sealed, and albumin infusions can safely be started. Insensible fluid losses through the burn wound begin in the second 24 hours following burn and continue to be significant until the burn wound is closed.

Success of resuscitation depends on ability to meet the patient's physiologic demands. Identifying patient populations at risk for failure directs resuscitative measures and possibly affects outcome. Risk factors for failure include age + burn size > 100, thrombocytopenia, blood transfusions, and excessive fluid requirements (6 cc/kg/% burn, normal average 3.7 cc/kg/% burn). These patients may benefit from invasive monitoring and the attainment of supranormal physiologic resuscitation parameters. The use of Vitamin C and hypertonic saline, though not found to affect outcome in the general population, may have a role in populations predicted to fail therapy.

Due to difference in body surface area, children <30 kg require a maintenance IV fluid of D5 ½ NS in addition to a to resuscitation equation of 3 cc/kg/% burn. Other special thermal injury populations include the electrical injury patient who has sustained a current injury greater than 1,000 volts. The surface area burned often greatly underestimates edema formation and, therefore, volume needs due to underlying muscle and soft tissue injury. These patients should be closely measured by urine output and for the appearance of pigmenturia.

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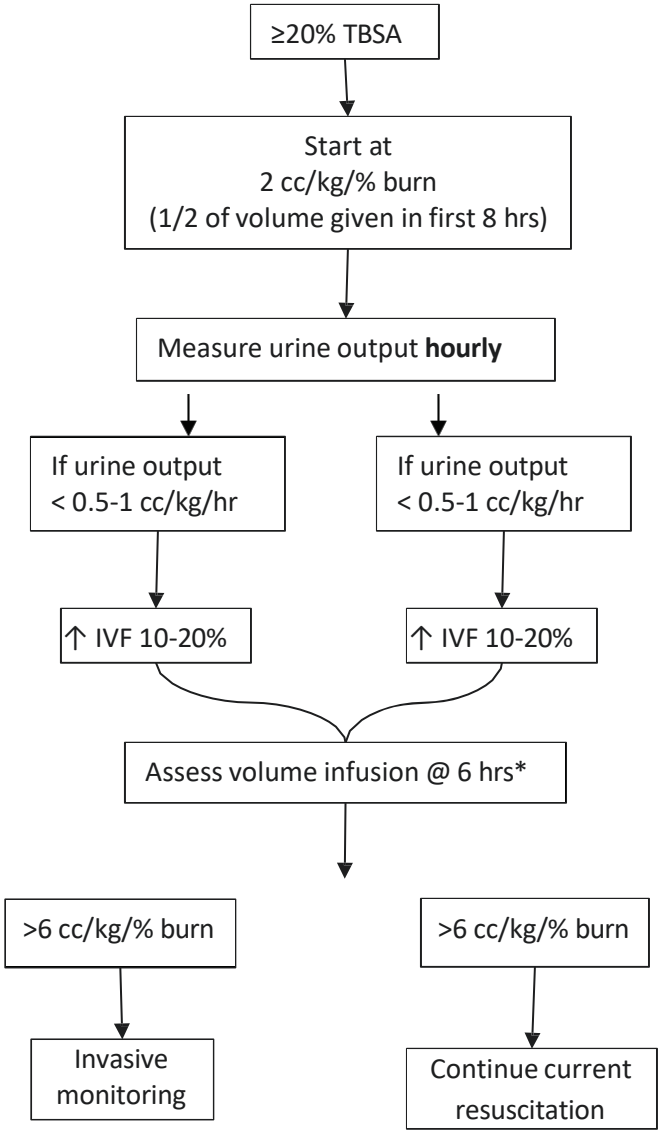
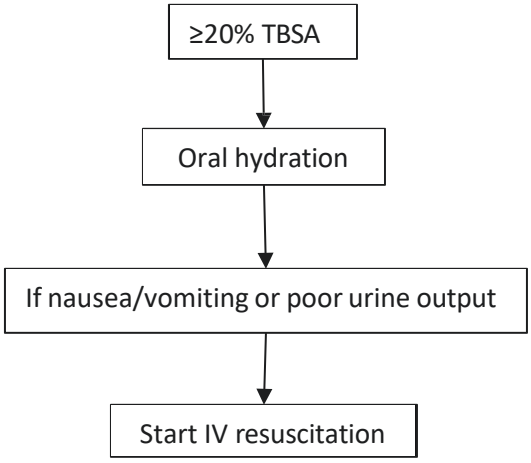




*IV rate at 9^0 post-burn – multiply by 24^0. Determine what this rate is equivalent to in terms of cc/kg/TBSA.

Burn – The Second 24 Hours

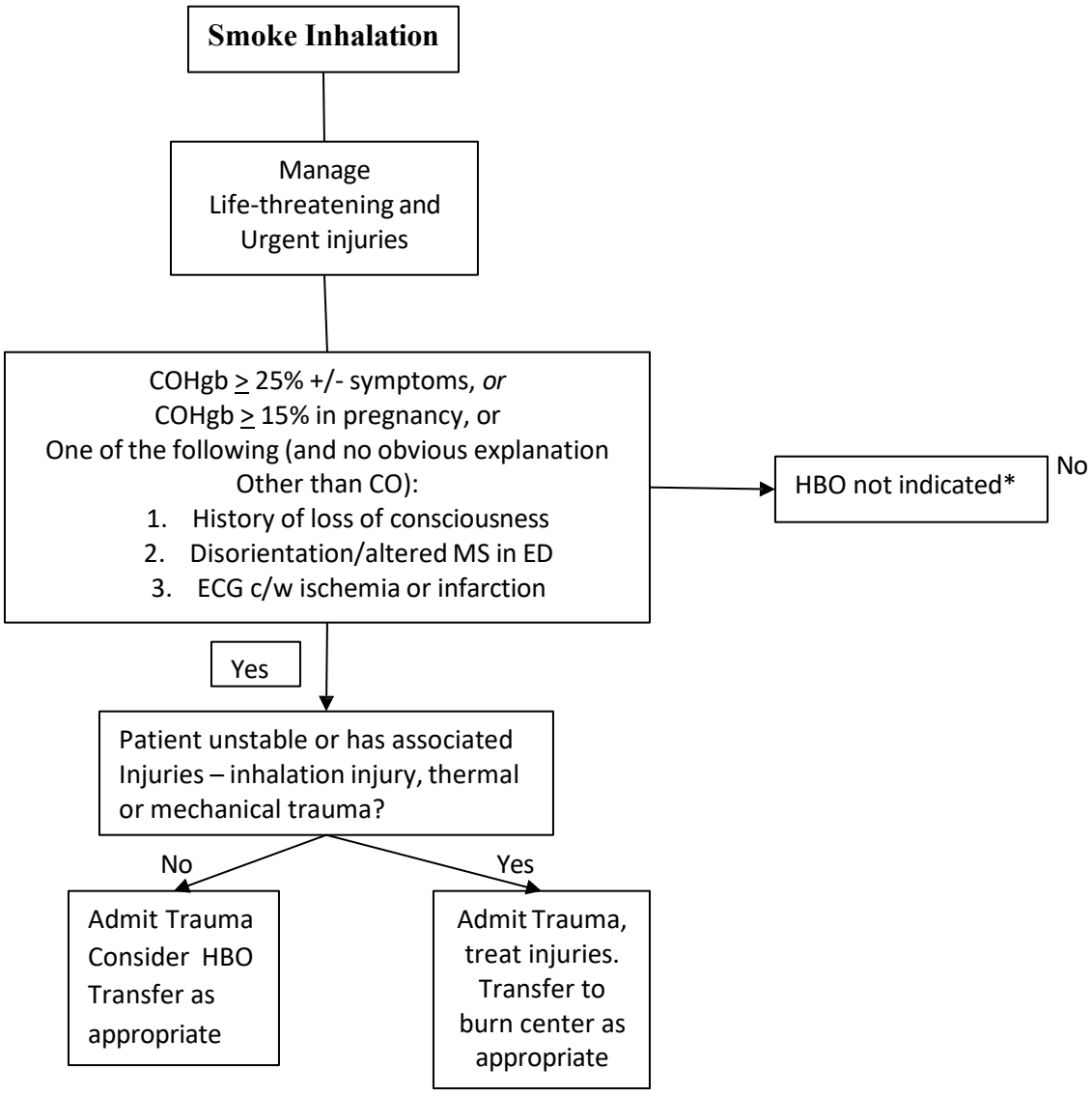
Start 5% albumin infusion for TBSA >30%:

For 30-50% burns 0.3 cc/kg/TBSA/24 = _____cc/hr
For 50-70% burns 0.4 cc/kg/TBSA/24 = _____cc/hr
For >70% burns 0.5 cc/kg/TBSA/24 = _____cc/hr

Continue to wean LR as dictated by the 1st 24 hours protocol. When LR rate <200 cc/hr, stop LR and start D5W at 1 cc/kg/TBSA/24 (to replace insensible water losses).

Smoke Inhalation and Carbon Monoxide Toxicity: Pediatric and Adult

All patients with suspected smoke inhalation injury should be evaluated by the Trauma Service.



Treatment of Inhalation Injury

In patients with suspected inhalation injury, initial assessment should be performed to identify the need for intubation followed by bronchoscopy to determine the severity of the inhalation injury. When injury is present, burn inhalation treatment including aerosolized heparin, N-acetylcysteine, and albuterol should be initiated and continued for 7 days post-inhalation injury.

RECOMMENDATIONS

- **Level 1**
  - **None**
- **Level 2**
  - **None**
- **Level 3**
  - **In patients with suspected inhalational injuries, bronchoscopy should be performed within 24 hours of admission.**
  - **The use of aerosolized heparin, N-acetylcysteine, and albuterol has been shown to significantly improve survival in burn inhalation injuries.**
  - **Hydroxycobalamin (Cyanokit®) should be considered in burn injuries sustained in an enclosed space with suspected cyanide toxicity and one or more of the following criteria:**
    - **Hypotension without clear etiology**
    - **Altered mental status or seizure**
    - **Cardiopulmonary arrest**
  - **If patients have received hydroxycobalamin, do not administer ascorbic acid therapy as patients are at a higher risk for calcium oxalate nephropathy.**

Electric Injury

The extent of electrical injury depends on the intensity of the electrical current. In terms of voltage, power lines are defined as either high (>1000V) or low voltage (<1000V). Long distance transmission (>300 miles) lines carry 155000V to 765,000V are normally huge steel towers. The standard neighborhood line voltage is 7,200V. A transformer outside of each house reduces the voltage to the normal household 240V service. This enters the home in the form of two insulated wires each carrying 240V service. This enters the home in the form of two insulated wires each carrying 120V. Homes use both 240V and 120V: 240V for high power appliances and 120V for general use. Lightning can provide a current of >200,000 amps and is associated with a very high mortality rate.

Four different modes of injury can be caused lightning strikes: direct, in which the lightning passes directly through the victim; side flash, in which the lightning strikes a nearby object and then the victim; stride potential, in which lightning hits the ground and then strikes the victim through the feet; and flashover phenomenon, in which the energy is discharged around the victim, causing a blast effect and vaporization of the surface water. Tympanic membrane rupture and cataract formation are common complications of lightning injuries.

In addition to the amount of current and voltage, the extent of injury depends on the location of contact and environmental factors. Thick calloused skin provides high resistance, whereas wet skin or moist mucus membranes provide no resistance, thus maximizing any current (e.g. children with oral burns after biting electrical wires). Although there has been considerable debate as to which tissues would be most affected after electrical injury, it appears that all internal structures act as conduits. Therefore, all tissues can be damaged.

In regard to specific organ injuries, electrical injury can injure:

1) The Cardiovascular System: direct myocardial necrosis, cardiac dysrhythmias (ventricular fibrillation, cardiac standstill, but more commonly include sinus tachycardia, non-specific ST and T-wave changes, heart block, bundle branch block and prolonged QT). Arrhythmia occur early, they rarely present in a delayed manner;
2) The Respiratory System: respiratory arrest attributable to damage to the respiratory control system or secondary to tetanic contractions of the respiratory muscles;
3) The Nervous System: disability can occur in up to 60% of electrical injuries, hemiplegia/quadriplegia, peripheral motor and sensory dysfunction and
4) Skin and musculoskeletal: unlike flame burns, the extent of skin damage in electrical burns will underestimate the degree of deeper internal injury and underestimate the needed resuscitation. With high-tension electrical injuries, the major complication encountered in deep muscle injury requiring fasciotomy, superficial muscles are often sparred.

The establishment of any airway may be difficult in patients with electrical burns of the face, mouth, or anterior neck, since extensive soft tissue swelling may progress rapidly. Endotracheal intubation should be considered early before signs of airway obstruction become severe. The administration of intravenous fluid is indicated to counteract hypovolemic shock and to correct ongoing fluid losses as well as to facilitate the excretion of myoglobin, potassium, and other by-products of tissue destruction.

Electric Injury

Cardiac dysrhythmia, abnormal EKG, electrical current pathway Through thorax, inhalation injury Or other respiratory distress	YES →	TICU admission -Telemetry monitoring -Serial physical exam* -monitor urine output -EKG
↓ NO		
Prolonged exposure, Lightning Strike, Pregnancy, Significant associated blunt injury	Yes →	TICU admission -As above -If pregnant, OB/GYN consult and fetal monitoring if viable pregnancy (>20 weeks)
↓ NO		
Abnormality found on physical exam, burns or tissue change, confusion or change in mental status, loss of consciousness	Yes →	-Telemetry admission -Serial examinations
↓ NO		
Asymptomatic, no loss of consciousness, Injury involves < 240 volts, normal Physical exam	Yes →	-EKG -Telemetry monitoring x4 hours -Repeat physical and EKG prior to Discharge

*Serial examination must include foley catheter, strict I & O, urine myoglobin, serial physical examinations q3-4 hours, examination of muscle compartments, neurovascular checks, ophthalmology consultation.

1. Casini, V: Overview of Electrical Hazards. In: workers death by electrocution: a summary of NIOSH surveillance and investigative findings. Washington, DC, Dept of Health and Human Services, May 1998, p 5-8. Publication No. 98-131.
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Chemical Burns

There are currently over 500,000 different chemicals in use in the United States, including more than 30,000 chemicals that have been designated as hazardous by one or more regulatory agencies. Approximately 60,000 people seek professional medical care annually as the result of chemical burns. Chemical burn injuries account for 3% of all burn center admissions (1999-2008). Most chemical burns are unintentional injuries, but chemicals can also be used as a form of assault, abuse or self-harm. There is also an increased risk of chemical exposure to first responders due to illicit drug manufacturing. Finally the Washington Hospital Healthcare System trauma center is located near several large manufacturing plants which use a variety of toxic chemicals in production

Toxic chemicals react with the skin, may not be easily removed, and thereby continue to cause injury for an extended time. The severity of a chemical burn is reduced by prompt recognition and reducing the duration of burning

The initial appearance of a chemical burn can be deceptively superficial and any patient with a serious chemical burn injury should be referred to a burn center for evaluation and definitive management after stabilization.

A: Treatment Principles: Personal Protection Equipment and Decontamination

Body Substance Isolation (BSI) must be observed in the treatment of all patients with a suspected chemical injury. All pre-hospital and in-hospital personnel should wear gloves, gown, and eye protection prior to contact with the patient. Remember that patient's clothing often contains remnants of the toxic agent and "off-gassing" may occur. Contaminated clothing can release toxic fumes, exposing first responders to inhalation injury. Failure to take simple precautions can lead to significant provider injury.

All chemical burns should be immediately decontaminated while using BSI protection. This will take place in a hospital determined decontamination area. For all chemical burns, immediate removal of the contaminated clothing (including underwear, gloves, shoes, jewelry and belongings) is critical. All contaminated clothing and belongings should be handled or disposed of according to Decontamination protocol

Brush any powdered chemical from the skin prior to beginning irrigation. Then, begin continuous irrigation of the involved areas with copious amounts of water. No substance has been proven to be superior to water for initial therapy. Irrigation should be continued from the pre-hospital scene through emergency evaluation in the hospital. Efforts to neutralize the chemical are contraindicated due to the potential generation of heat (an exothermic reaction), which could contribute to further tissue destruction. Irrigation in the hospital should be continued until the patient experiences a decrease in pain or burning in the wound or until the patient has been evaluated in a burn center. Skin pH can be checked by using pH test strips and should be performed before and after irrigation. It may take 30 minutes of irrigation or more, depending on initial skin pH, to achieve a normal skin pH level. .If the chemical exposure is to a large body surface area, caution must be taken to avoid hypothermia. Use warm water for irrigation and maintain a warm environment whenever possible.

Primary Survey: Support the "ABCs" (airway, breathing, circulation); volatile chemical agents like ammonia can have profound respiratory effects. It is important to continually evaluate the patient's airway status and to address promptly any evidence of airway compromise. Intravenous access should be

obtained for all significant chemical injuries. **Patients who are wearing contact lenses, with or without facial burns, should have the lenses removed prior to development of facial and periorbital edema**. Chemicals may also adhere to the lenses, prolonging exposure to the chemical and presenting further problems. Only after initial therapy has begun, it is helpful to try and identify the causative agent and any associated medical risks, including potential systemic toxicity. However, initial therapy should NOT be delayed while attempts are made to identify the agent involved.

It expected that patients with significant chemical burns will be referred to a burn center and their expertise will be requested

SPECIFIC CHEMICAL BURNS

Cement Burns: The active ingredient calcium oxide (quicklime) can combine with water to form calcium hydroxide with a pH >12. For instance, cement powder exposure at a construction site can lead to severe alkali burns. Often, the unsuspecting worker is exposed to cement powder in their socks, or around the knees while kneeling at work. Sweat will activate the powder and lead to chemical injury that will evolve over 6–12 hours. The injury site will first be erythematous and may not be recognized as a chemical injury by the patient or a health care provider unless the exposure is obtained during history-taking. Hours later, a full-thickness eschar often develops at the site of exposure.

Anhydrous Ammonia: is commonly used as a fertilizer, industrial refrigerant and in the illicit manufacture of methamphetamine. It is a strong base (pH 12), with the penetrating odor of smelling salts. Anhydrous ammonia is activated when it comes in contact with body moisture. Moist or sweaty areas of the body such as the axilla or groin are frequent sites of serious injury; exposure causes blistering of the skin. Contact with vaporizing liquid anhydrous ammonia may cause frostbite due to rapid evaporative cooling. Anhydrous ammonia is an eye irritant that may cause severe eye irritation with corneal injury and permanent vision impairment. Eye injuries require prolonged irrigation of the eye and need to be evaluated by an ophthalmologist.

Respiratory Effects: Inhalation of anhydrous ammonia may result in serious injury to the entire respiratory tract. Delayed effects may include potentially life-threatening edema of the upper and lower airway. Chemical pneumonitis and pulmonary edema may develop up to several hours after exposure. At high concentrations, laryngeal spasm may occur, resulting in rapid asphyxiation. At lower concentrations, effects are more pronounced in children, elderly, and persons with impaired lung function. Inhalation injuries with hypoxemia and copious secretions may require ventilatory support. Immediately after exposure, all clothing (including undergarments), shoes, and jewelry should be removed and disposed of according to organizational protocols. The eyes and affected areas should be copiously irrigated with water for at least 30 minutes.

Hydrofluoric acid burns**:** Hydrofluoric acid is dangerous acid that can deeply penetrate tissues. Treatment of this injury is specialized. Injury of greater than 3% of the body with concentrated hydrofluoric acid can be fatal due to arrhythmia from hypocalcemia.

General Guidelines After hydrofluoric acid exposure, all clothing including undergarments should be removed and disposed of appropriately. The affected areas should be copiously irrigated with water beginning at the scene for at least 30 minutes

1. Apply topical calcium gluconate/carbonate gel to the affected are. The gel is a 2.5% preparation made by mixing 7.5cc of 10% **calcium gluconate** to 22.5cc of sterile surgical lubricant. If the hand or digits are involved, the gel should be placed in a latex glove and then worn. If significant pain persists after 30 minutes, further Tx should be considered.
    a. If the digits are involved and pain persists, then intra-arterial calcium infusion may be indicated (see below).
    b. If the hand or forearm is involved and pain persists, then regional intravenous calcium infusion may be indicated (see below).
    c. If the upper arm is involved and pain persists, then calcium should be administered subcutaneously by injection (see below).
2. Patients require 24 hour monitoring for hypocalcemia if they have burns involving
    a. 1% BSW with greater than 50% HF concentration or b) 5% BSA with less than 50% HF concentration.
3. Patients who are not candidates for burn center transfer will be admitted to the Trauma Service. Consults to Hand or Toxicology will be at the discretion of the Trauma Service.
4. Patient will be discharged with instruction for use of topical calcium gel.

Intra-arterial Calcium Infusion

1. Calcium solution is administered as follows:
2. Solution is prepared by mixing 10 mL of 10% **calcium gluconate** and 40 mL D5W. The final solution is 50 mL volume of a 2% solution.
    a. The solution is administered over 4 hours on an infusion pump.
    b. At the end of the infusion period, the patient is reassessed for further need of calcium therapy. Typically, patients will require 2-3 courses of treatment.
    c. Serum calcium levels should be monitored beyond the third course.
3. Stop the infusion therapy immediately and notify the physician if:
    a. Malfunctioning infusion pump or catheter
    b. Evident of extravasation
    c. Cardiac dysrhythmias

Regional IV Calcium Infusion

1. Preparation of the affected limb:
    a. Patients will typically require analgesia and sedation for the procedure.
    b. Establish intravenous (18 or 20 gauge catheter, 10g preferred) access in the forearm of the affected limb.
    c. Exsanguinate the superficial veins of the limb by elevation and with an elastic wrap.
    d. Apply double cuff tourniquet above the elbow and inflate to 100 mmHg above the systolic blood pressure.
    e. The entire tourniquet time is 30 minutes.
2. Preparation and administration of the calcium solution:
    a. The solution is prepared by mixing 10 mL of 10% **calcium gluconate** and 30 mL of D5W. The final volume is 40 mL.
    b. The solution is administered over 5 minutes through the existing IV site in the forearm of the affected lim.
    c. The tourniquet is then maintained for 25 minutes and released incrementally over a 10-minute period.
3. Stop the infusion therapy immediately if evidence of extravasation.
4. The wound site is re-evaluated when the patient regains consciousness.

5. Limb fasciculations will be observed during the inflation and deflation of the tourniquet and the calcium infusion.

Subcutaneous Calcium Administration

1. Administer 10% **calcium gluconate** solution as 0.5 mL/cm² of tissue with a 27 or 30 gauge needle.
2. Patient is re-evaluated for therapeutic response.

Phenol Burns: Phenol is an acidic alcohol with poor solubility in water, and is frequently used in disinfectants, chemical solvents, and wood and plastic processing. It damages tissue by causing coagulation necrosis of dermal proteins. Initial treatment consists of copious water irrigation followed by cleansing with 50% polyethylene-glycol (PEG) or ethyl alcohol, which increases the solubility of the phenol in water and allows for more rapid removal of the compound. Of note, diluted solutions of phenol penetrate the skin more rapidly than concentrated solutions, which form a thick eschar via coagulation necrosis.

Petroleum Injuries (Not Due to Flame Burns): Gasoline and diesel fuel are petroleum products that may cause severe tissue damage. Prolonged contact with gasoline or diesel fuel may produce (by the process of de-lipidation) a chemical injury to the skin that is actually full thickness but initially appears to be only partial thickness or second degree. Sufficient absorption of the hydrocarbons can lead to organ failure and even death. It is important to look for petroleum exposure in the lower extremities, the back, and the buttocks after a motor vehicle crash, especially if patient extraction is delayed. Clothing and belongings exposed to the fuel are potentially flammable, and must be kept away from any ignition source until appropriate disposal. Systemic toxicity may be evident within 6 to 24 hours, with evidence of pulmonary insufficiency, hepatic and renal failure. Within 24 hours, hepatic enzymes are elevated and urinary output is diminished.

Special Note: Burns Associated with Illicit Drug Manufacturing, Methamphetamine Fires and/or Explosions: Burns associated with illicit drug manufacturing such as methamphetamine {meth lab} explosions pose additional dangers to all healthcare providers. There are many hazardous chemicals involved. Pseudoephedrine, iodine, red phosphorus, ether, hydrochloric acid, sodium hydroxide and methanol can be used to produce methamphetamine. Unsafe manufacturing procedures, dangerous combinations and storage often result in explosions and fires, placing first responders at even greater risk. Patients involved in these incidents are sometimes vague about the circumstances of injury, reporting that he/she was involved in a “fire” of some type. Upon evaluation, the pattern of burn injury is inconsistent with the history being reported. The patient may present with serious burns that appear to be thermal/flame burns in appearance but actually are a combination of flame and chemical injuries. Methamphetamine producers may also be chronic users who also manifest severe tachycardia, dehydration, agitation and paranoia. If it is possible the patient was injured in an illegal drug or meth lab explosion, treatment must include appropriate protective clothing by healthcare providers, decontamination of the skin and eyes, proper disposal of contaminated clothing and belongings, and treatment of the thermal injuries.

Ref:
Advanced Burn Life Support Course provider manual, 2018 UPDATE American Burn Association 311 South Wacker Drive, Suite 4150 Chicago, IL www.ameriburn.org

Hydrofluoric Acid Burns

Hydrofluoric acid is dangerous acid that can deeply penetrate tissues. Treatment of this injury is specialized. Injury of greater than 3% of the body with concentrated hydrofluoric acid can be fatal due to arrhythmia from hypocalcemia.

General Guidelines

1. Apply topical calcium gluconate/carbonate gel to the affected are. The gel is a 2.5% preparation made by mixing 7.5cc of 10% **calcium gluconate** to 22.5cc of sterile surgical lubricant. If the hand or digits are involved, the gel should be placed in a latex glove and then worn. If significant pain persists after 30 minutes, further Tx should be considered.
   a. If the digits are involved and pain persists, then intra-arterial calcium infusion may be indicated (see below).
   b. If the hand or forearm is involved and pain persists, then regional intravenous calcium infusion may be indicated (see below).
   c. If the upper arm is involved and pain persists, then calcium should be administered subcutaneously by injection (see below).
2. Patients require 24-hour monitoring for hypocalcemia if they have burns involving
   a. 1% BSW with greater than 50% HF concentration or b) 5% BSA with less than 50% HF concentration.
3. Patients will be admitted to the Trauma Service. Consults to Hand or Toxicology will be at the discretion of the Trauma Service.
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   e. The entire tourniquet time is 30 minutes.

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    a. The solution is prepared by mixing 10 mL of 10% **calcium gluconate** and 30 mL of D5W. The final volume is 40 mL.
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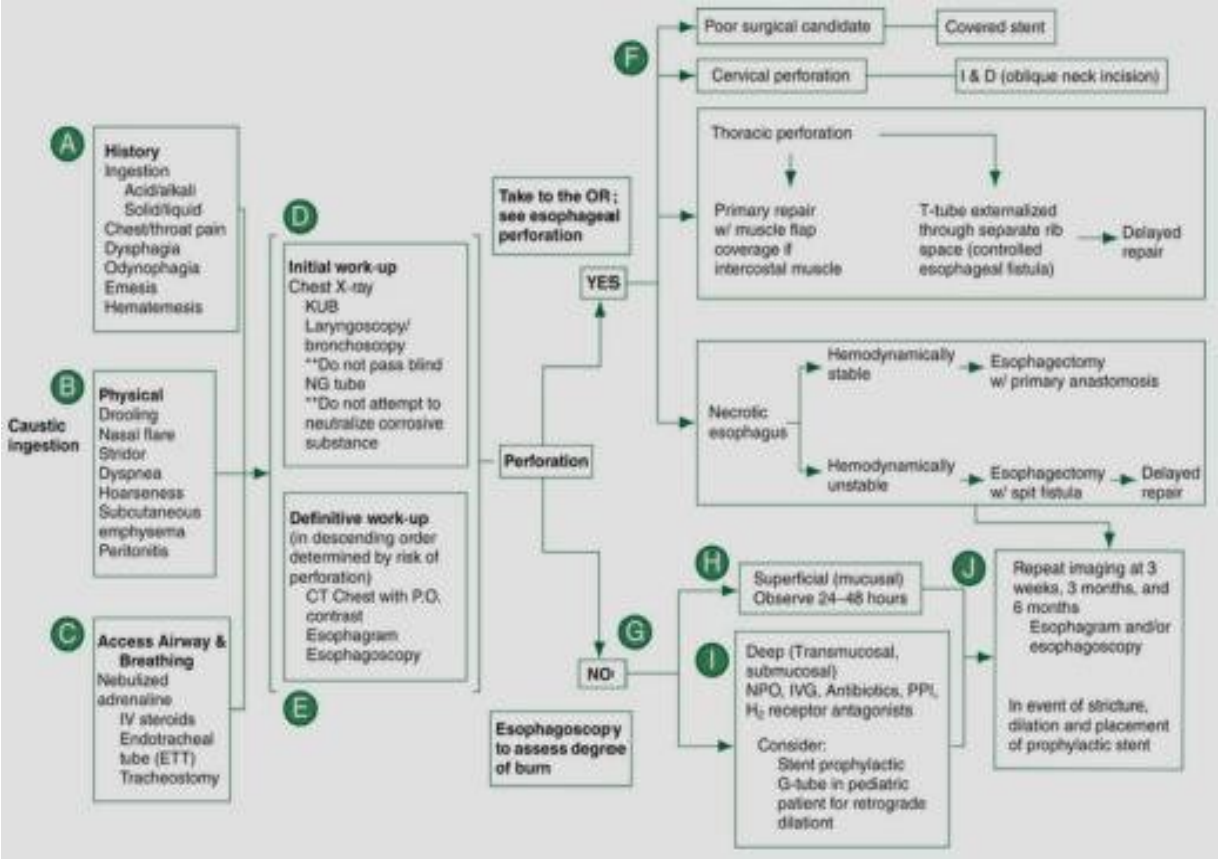
4. The wound site is re-evaluated when the patient regains consciousness.
5. Limb fasciculations will be observed during the inflation and deflation of the tourniquet and the calcium infusion.

Subcutaneous Calcium Administration

1. Administer 10% **calcium gluconate** solution as 0.5 mL/cm² of tissue with a 27- or 30- gauge needle.
2. Patient is re-evaluated for therapeutic response.

Caustic Ingestion

1) Accidental ingestion by children accounts for 80% of cases worldwide whereas in adults most ingestions are intentional, resulting from underlying psychiatric illness
2) Emergency management of caustic ingestion and the treatment of late sequelae require a multidisciplinary approach
3) CT examination is reliable and reproducible in assessing transmural digestive necrosis and improves the selection of patients for surgery
4) Surgical resection of organs subject to transmural necrosis is lifesaving and should be done in first-level hospitals. Age, extent of initial damage and the derangement of laboratory test results and underlying physiology predict survival in these cases
5) Treatment of late sequelae of caustic ingestion relies mainly on endoscopy (dilation, stenting) or complex surgical reconstruction procedures, and should be done in expert referral centers
6) Surgery (emergent or reconstructive) is seldom required in children; on such rare situations, referral to expert centers is indicated
7) In low resource settings, simple solutions such as gastrostomy placement are preferable and can be lifesaving by addressing vital nutritional issues; complex surgery or complex endoscopic procedures should be done very cautiously in that situation
8) Public health programs to educate the public and establish effective measures limiting access to strong corrosive agents are paramount to decrease the incidence and severity of caustic ingestions.



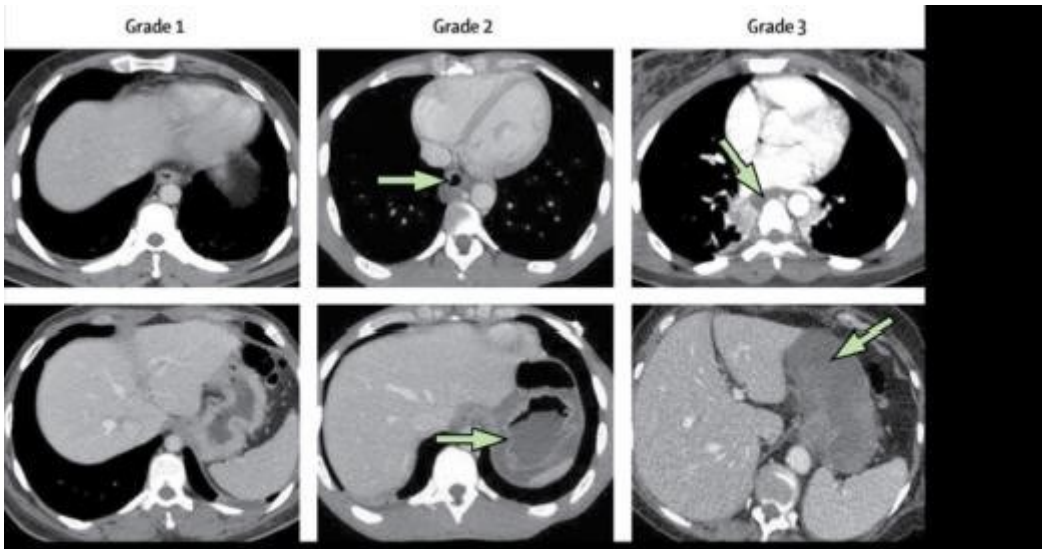


Figure 1
CT grading of corrosive injuries of the oesophagus and the stomach
Grade 1=normal appearance; grade 2=wall and soft tissue oedema, increased wall enhancement (arrow); grade 3=transmural necrosis with absent wall enhancement (arrow).

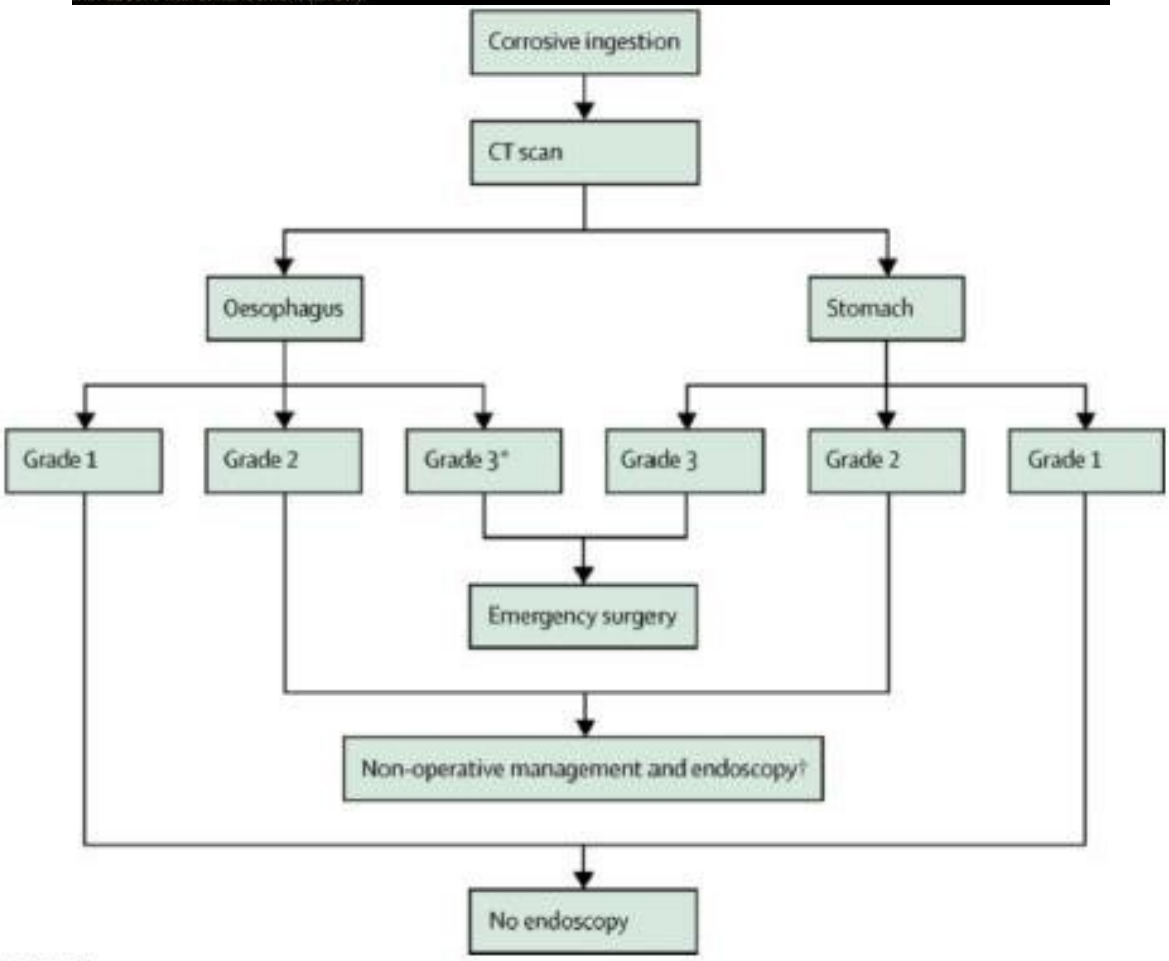


Figure 2
Management algorithm for caustic ingestion in adults
*Perform endoscopy before surgery in case of difficulties with CT interpretation. †Endoscopy done before discharge helps predict stricture risk.

Grade	Definition	Endoscopic Findings
First degree	Superficial mucosal injury.	Mucosal hyperemia and edema; superficial mucosal desquamation.
Second degree	Full-thickness mucosal involvement. No or partial-thickness muscular injury.	Sloughing of mucosa. Hemorrhage, exudate, ulceration, pseudo-membrane formation, and granulation tissue when examined late.
Third degree	Full-thickness esophageal or gastric injury with extension into adjacent tissues.	Sloughing of tissues with deep ulceration. Complete obliteration of esophageal lumen by edema; charring and eschar formation; full-thickness necrosis; perforation.

Reproduced with permission from Estrera A, Taylor W, Mills LJ, et al: Corrosive burns of the esophagus and stomach: a recommendation for an aggressive surgical approach, *Ann Thorac Surg* 1986 Mar;41(3): 276-283.

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ICU CARE

Fever > 72 Hours after Injury or Surgery

1. **Fever**: Defined as temperature of ≥ 38.3° C (≥101°F).
   i. Fever is a sign of inflammation, not infection — about 50% of ICU patients who develop a fever have no apparent infection
   ii. Noninfectious sources:
      1. More common: SIRS, early postop fever, PE, platelet transfusions
      2. Less common: drug fever, adrenal failure, acalculous cholecystitis, iatrogenic fever
   iii. Body temperature is most accurately measured by an intravascular thermistor; however, measurement by infrared ear thermometry or with an electronic probe in the rectum is an acceptable alternative
   iv. The following features suggest bacterial infection and should prompt the immediate initiation of broad spectrum antibiotics pending further diagnostic workup:
      1. Temperature greater than 39°C (102°F);
      2. Fall in blood pressure or SBP to less than 90 mmHg
      3. Heart rate higher than 120 beats/min
      4. An increasing lactate or lactate over 2.0 mEq/L
      5. PCT greater than 0.5 ng/mL
      6. Bandemia over 5%
      7. Lymphocytopenia less than 0.5×10^3 cells/μL
      8. Fall in platelet count or platelet count less than 150×10^3 cells/μL
      9. Neutropenia with a neutrophil count less than 0.5×10^3 cells/μL
      10. WBC count greater than 20,000 cells/μL.

2. **Blood Cultures**: In the early post-operative/injury period fever is more likely due to SIRS than infection. Because the information provided by a positive blood culture can have such important prognostic and therapeutic implications, blood cultures should be obtained in patients with a new fever when clinical evaluation does not strongly suggest a noninfectious cause. Two sets of blood cultures should be obtained from different sites.

3. **Physical Examination** is the single most important element in the work-up of fever in the ICU. Do not order labs or studies in the absence of a physical exam finding. Physical examination must include:

   *HEE*NT: exam ears for otis/otorrhea, nasal drainage, mouth for thrush or dental sources

   Chest: Heart sounds noting murmurs, as well as breath sounds, tactile fremitus, secretion production. Calculate a CPIS score. If ≥ 6 and a BAL has not been obtained in the last 48 hours perform culture and initiate empiric antibiotics. Consider bedside ultrasound to evaluate for effusion.

   *Abdome*n: Assess for rigidity, guarding, pain, examine liver edge and gallbladder. Listen for bowel sounds. Includes performing a rectal exam. Consider bedside ultrasound to evaluate for intra-abdominal fluid.

   *Extremitie*s: for swelling (DVT)

Skin: Examine for decubitus ulcers, rash, cellulitis.

Wounds: Examine wound by removing dressings (this may involve casts and other dressings). Remove staples if necessary.

IV sites: Examine all IV sites for erythema, drainage. (Any IV's placed in the field should be replaced. Central lines placed in unsterile conditions should also be scrutinized and replaced if still present)

Consider drug related fever by evaluating medications being administered.
Once a physical examination is completed, adjunctive test may include CBC, CMP, BAL, CXR. Do not order these studies more frequently than once every 24h. Obtain CT scan of chest or abdomen/pelvis as needed if suspicious for any intra-thoracic or intra-abdominal cause of fever.

4. **Urine Cultures**: Most patients in the ICU with a positive urine culture have "asymptomatic bacteriuria" rather than true infections of the urinary tract. Bacteriuria is defined as a quantitative culture $\geq 10^5$ CFU/ml. Bacteriuria should be treated following urinary tract manipulation or surgery, in a patient with kidney stones and in patients with urinary obstruction. Follow IDSA CAUTI guidelines (cited below).

5. **Central lines**: All IV's and central lines placed in the field or ED are to be changed within 24 hours of arrival to ICU. All central lines need to be placed under sterile conditions i.e. sterile gown, cap, mask and a wide sterile drape that completely covers patient.

6. **Nasal tubes**: Change nasal tubes (endotracheal and/or nasogastric) to oral site as permissible. Nosocomial sinusitis has a higher incidence with nasal intubations of > 7 days. Diagnosis requires a CT scan. Antibiotics are not the first line treatment. Call ENT if suspicious.

7. **Diarrhea**: defined as more than two stools per day that conform to the container in which they are placed. Send stool for *C-Difficile* EIA (enzyme immunoassay) test. Requires both a positive antigen and toxin for the diagnosis.

8. **Empiric Antibiotics**: Initiation of therapy may be necessary for unstable or high-risk patients while the diagnostic evaluation is ongoing, and certainly before the results of cultures are available. If work-up is negative and fever resolves, discontinue antibiotics.

9. **No obvious sources documented:** In patients whose clinical picture is consistent with infection and in whom no clinically obvious source has been documented, removal of all central lines greater than 72 hours old is recommended, stool for *C. difficile* toxin (in those patients with loose stools and *not* on stool softeners), and an ultrasound examination, CT, or plain films of the maxillary sinuses are recommended. If the patient is at risk of abdominal sepsis or has any abdominal signs (tenderness, distention, unable to tolerate enteral feeds), a CT scan of abdomen is indicated. Patients with right upper quadrant tenderness require an abdominal ultrasound or CT examination. An indwelling urinary bladder catheter should be removed as soon as it is no longer indicated.

10. **Treatment of fever**: Aggressive treatment of fever is indicated in patients with acute cerebral insults. Treatment of fever with acetaminophen may be appropriate in patients with infections who are highly symptomatic or have decreased cardiovascular reserve. External cooling should be

reserved to patients who have failed treatment with antipyretic agents, as external cooling alone may paradoxically increase heat production.

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ICU Sedation/Analgesia

Analgesia and sedation of the critically ill patient is a vital component of critical care. Unchecked post-traumatic pain and anxiety can provoke a host of deleterious effects. These include increased myocardial oxygen demands, which may lead to ischemia and myocardial infarction, increased minute ventilation and need for prolonged mechanical ventilation, increased ICP, and increased catabolism. Proper administration of analgesics and sedative can help to lessen the likelihood of these undesirable events.

The need for adequate analgesia and sedation must be balanced against the risks of oversedation. Oversedation may result in hemodynamic instability, increased length of stay and costs, increased respiratory complications including VAP, and possibly long-term decreases in cognitive function. Oversedation may also increase the risks of delirium and possibly posttraumatic stress disorder.

Pain

- Preferred parenteral agents in the treatment of pain for adult ICU patients per the SCCM

Agent	Approximate equivalent single IV dose (mg)	Typical infusion rate	Onset peak effect (min)	Duration	Average price per day[a]	Comments
Fentanyl	100–200 mcg	50–200 mcg/h	2–5 min	0.5–2 h	$26/d at a rate of 100 mcg/h	Fastest onset and shortest duration, least hemodynamic effect.
Hydromorphone	1.5–2 mg	0.2–3 mg/h	20–30 min	3–4 h	$23/d at a rate of 1.6 mg/h	5–10× more potent by weight than morphine.
Morphine	10 mg	2–10 mg/h	20–30 min	3–4 h	$20/d at a rate of 10 mg/h	Avoid in hypotension. Active metabolite accumulates in renal dysfunction. May cause itching due to histamine release (not a true allergy). Decreases preload, which may be beneficial in pulmonary edema.

[a]UCSD Medical Center 2/2015, will vary depending on institution.
ICU, intensive care unit; IV, intravenous.

PAD (pain, agitation, delirium) guideline:

Agitation:

- Target level of sedation is a calm patient that can be easily aroused
- Richmond Agitation Sedation Scale (RASS) or Riker Sedation Agitation Scale (SAS) can be used
- Continuous sedation reduces the likelihood of delay in administration of sedatives BUT has been shown to increase the duration of mechanical ventilation and length of ICU stay.
- Providing anxiolysis and amnesia is important
- SCCM Pain, Sedation and Delirium guideline
- Propofol and dexmedetomidine are preferred over benzodiazepines
- Light sedation in mechanically ventilated patient is preferred to deep sedation

Suggested Intravenous Sedation Agents for Adult ICU Patients[a] (San Diego Patient Safety Council)

Agent	Typical IV bolus dose	Typical infusion rate	Onset peak effect	Duration	Average price per day[a]	Comments
Propofol	0.03–0.15 mg/kg (max 20 mg)	5–80 mcg/kg/min	1–2 min	<20 min	$36/d at a rate of 50 mcg/kg/min	Fastest onset and shortest duration. Avoid in hypotension. Dose/rate related hypotension/bradycardia. Avoid IV push bolus due to increased risk of hypotension (if bolus required and low risk of hypotension, limit dose to 10–20 mg). Monitor triglycerides. Provides 1.1 kcal/mL. Monitor for propofol-related infusion syndrome.
Dexmedetomidine	Bolus not recommended: 1 mcg/kg over 20 min	0.2–1.5 mcg/kg/h	30 min	2–4 h	$408/d at a rate of 0.8 mcg/kg/h	No respiratory depression—consider for patient failing spontaneous breathing trial due to agitation/anxiety. Dose/rate related hypotension and bradycardia–bolus not recommended. May cause hyper/hypotension. 10 times cost of midazolam, may not be suitable during resuscitation due to hypotensive effect.
Lorazepam	1–3 mg	2–10 mg/h	15–20 min	2–4 h	$38/d at a rate of 4 mg/h	Slower onset but longer duration. Risk of propylene glycol toxicity with high doses (anion-gap acidosis, ↑ serum creatinine, ↑ lactate). Monitor serum osmolality if rate >6 mg/h and consider possible PG toxicity if osmol gap >10–15. Lorazepam is associated with increased risk of delirium and should be avoided in elderly and mechanically ventilated patients.
Midazolam	1–6 mg	1–10 mg/h	5–10 min	1.5–2 h	$70/d at a rate of 8 mg/h	Fast onset—amnestic effect. Active metabolite accumulates in renal dysfunction. Midazolam 2–3 mg is approximately equivalent to 1 mg lorazepam. Midazolam is associated with increased risk of delirium and should be avoided in elderly and mechanically ventilated patients.

[a] UCSD Medical Center 2/2015, will vary depending on institution.

ICU, intensive care unit; IV, intravenous; PG, propylene glycol.

- Suggested parenteral agents for adult ICU patients

Monitoring and Daily Awakening

- Daily interruption of IV sedation for daily awakening in combination with spontaneous breathing trials is needed
- Benefit: less time on ventilator, less time in ICU and hospital
- Early mobilization during daily awakening leads to increased independent functional status at hospital discharge, shorter duration of delirium, and increased ventilator-free days.

Daily Awakening Trials—Summary Recommendations

Components recommended for a Daily Awakening Trial:

- Consistency—should follow a standardized nurse-driven protocol
- Continuity—need to ensure a set time for the patient during daylight hours
- Coordination—need to ensure Daily Awakening Trial is coordinated with other disciplines, specifically physical therapy, occupational therapy, and respiratory therapy activities

Exclusions to a Daily Awakening Trial:

- Increased intracranial pressure issues
- Neuromuscular blockade
- Pressure-regulated pulmonary ventilation with an inverse ratio
- Coronary artery bypass graft immediate postoperation

Process for weaning drug (per drug)[a]:

- Target—use sedation scale targets (−1 on the RASS)
- Sedatives—decrease by 50% or off
- Narcotics—consider reducing narcotics if still sedated (or SAS of 3–4)

Assess as part of Daily Awakening Trial:

- Pain
- Agitation
- Delirium
- Spontaneous Breathing Trial/rapid shallow breathing index

If continued sedation required, start at lower dose than previously—50% of original or lowest effective dose during titration—the most recent titration dose (before reaching −1 RASS)

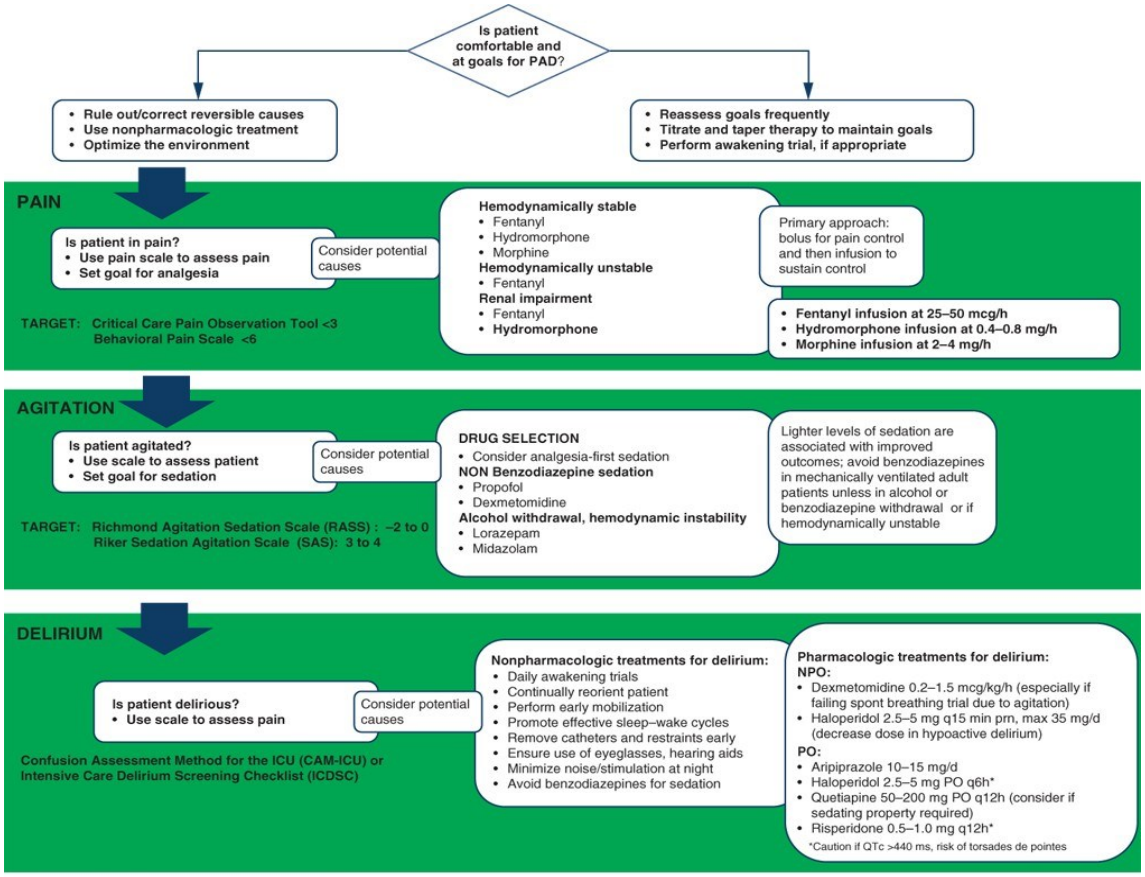
- Bolus and titrate up to reach target goal as appropriate; do not resume at previous rate

[a] Abort Daily Awakening Trial if patient becomes physiologically unstable during procedure.

RASS, Richmond Agitation Sedation Scale; SAS, Riker Sedation Agitation Scale.

Delirium:

- Definition: fluctuation in mental status such as inattention, disorganized thinking, hallucinations, disorientation, and an altered level of consciousness. It
- 65% of hospitalized & up to 87% of ICU patients
- Three types
  - Hyperactive
  - Hypoactive
  - Mixed
- In elderly, delirium is associated with a doubling of mortality.
- Can increase hospital length of stay and increase health care cost.
- Can occur within 24-72h of ICU admission
- Assess using Confusion Assessment Method for the Intensive Care Unit (CAM-ICU) or the Intensive Care Delirium Screening Checklist (ICDSC)
- Assess for QTc prolongation on electrocardiogram (ECG) (<440ms)
- Treatment
- Nonpharmacologic is primary: daily awakening trials, sleep-awake cycle promotion, timely removal of restraints and catheters, ensuring use of glasses and hearing aids, minimizing ICU noise and stimulation, avoid benzodiazepines
- 2018 SCCM PAD guideline recommend dexmedetomidine
- Haloperidol is not currently recommended and has been associated with a reduced seizure threshold, extrapyramidal reactions (dyskinesia), and laryngeal dystonia. It has also been associated with malignant neuroleptic syndrome.
- should only be administered in a monitored critical care setting and with monitoring of QTc intervals.
- Oral agents are longer acting and include aripiprazole, risperidone, or oral haloperidol — associated with QTc prolongation.
- Another oral agent is quetiapine — not strongly associated with QTc prolongation



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Ventilator-Associated Pneumonia

Definitions

- Pneumonia: new lung infiltrate plus clinical evidence that the infiltrate is of an infectious origin, which include the new onset of fever, purulent sputum, leukocytosis, and decline in oxygenation.
- VAP is defined as a pneumonia occurring >48 hours after endotracheal intubation.
- Diagnostic Threshold for VAP (PSB With $<10^3$ Colony-Forming Units [CFU]/mL, BAL With $<10^4$ CFU/mL)

While all-cause mortality associated with VAP has been reported to range from 20% to 50%, the mortality directly related to VAP is debated — estimated at 13% in a meta-analysis. VAP is linked to tremendous resource use and prolonged hospital length of stay related to VAP: prolongs length of mechanical ventilation by 7.6 to 11.5 days and prolongs hospitalization by 11.5 to 13.1 days compared to similar patients without VAP. The excess cost associated with VAP was estimated to be approximately $40 000 per patient.

Diagnosis

- Suggest noninvasive sampling with semiquantitative cultures to diagnose VAP, rather than invasive sampling with quantitative cultures and rather than noninvasive sampling with quantitative cultures
- Invasive respiratory sampling includes bronchoscopic techniques (ie, bronchoalveolar lavage [BAL], protected specimen brush [PSB]) and blind bronchial sampling (ie, mini-BAL). Noninvasive respiratory sampling refers to endotracheal aspiration.
- For patients with suspected VAP whose invasive quantitative culture results are below the diagnostic threshold for VAP, we suggest that antibiotics be withheld rather than continued.

Biomarkers & Clinical Pulmonary Infection Score for Diagnosis

- For patients with suspected HAP/VAP, we recommend using clinical criteria alone, rather than using serum procalcitonin, BALF sTREM-1, CRP, or CPIS plus clinical criteria, to decide whether or not to initiate antibiotic therapy

Initial Treatment of VAP and HAP

- In patients with suspected VAP, we recommend including coverage for S. aureus, Pseudomonas aeruginosa, and other gram-negative bacilli in all empiric regimens.
- suggest including an agent active against MRSA for the empiric treatment of suspected VAP only in patients with any of the following: a risk factor for antimicrobial resistance (see below), patients being treated in units where >10%–20% of S. aureus isolates are methicillin resistant, and patients in units where the prevalence of MRSA is not known.

- suggest including an agent active against methicillin-sensitive S. aureus (MSSA) (and not MRSA) for the empiric treatment of suspected VAP in patients without risk factors for antimicrobial resistance, who are being treated in ICUs where <10%–20% of S. aureus isolates are methicillin resistant
- If empiric coverage for MRSA is indicated, we recommend either vancomycin or linezolid
- When empiric treatment that includes coverage for MSSA (and not MRSA) is indicated, we suggest a regimen including piperacillin-tazobactam, cefepime, levofloxacin, imipenem, or meropenem. Oxacillin, nafcillin, or cefazolin are preferred agents for treatment of proven MSSA, but are not necessary for the empiric treatment of VAP if one of the above agents is used.
- suggest prescribing 2 antipseudomonal antibiotics from different classes for the empiric treatment of suspected VAP only in patients with any of the following: a risk factor for antimicrobial resistance (see below), patients in units where >10% of gram-negative isolates are resistant to an agent being considered for monotherapy, and patients in an ICU where local antimicrobial susceptibility rates are not available.
- suggest prescribing one antibiotic active against P. aeruginosa for the empiric treatment of suspected VAP in patients without risk factors for antimicrobial resistance who are being treated in ICUs where ≤10% of gram-negative isolates are resistant to the agent being considered for monotherapy.
- In patients with suspected VAP, we suggest avoiding aminoglycosides if alternative agents with adequate gram-negative activity are available.
- In patients with suspected VAP, we suggest avoiding colistin if alternative agents with adequate gram- negative activity are available.
- MRSA HAP/VAP be treated with either vancomycin or linezolid rather than other antibiotics or antibiotic combinations.
- For patients with HAP/VAP due to P. aeruginosa
  - recommend that the choice of an antibiotic for definitive (not empiric) therapy be based upon the results of antimicrobial susceptibility testing
  - recommend against aminoglycoside monotherapy
  - not in septic shock or at a high risk for death, and for whom the results of antibiotic susceptibility testing are known — recommend monotherapy using an antibiotic to which the isolate is susceptible rather than combination therapy
  - remain in septic shock or at a high risk for death when the results of antibiotic susceptibility testing are known — suggest combination therapy using 2 antibiotics to which the isolate is susceptible rather than monotherapy
- For patients with HAP/VAP due to ESBL-producing gram-negative bacilli, we recommend that the choice of an antibiotic for definitive (not empiric) therapy be based upon the results of antimicrobial susceptibility testing and patient-specific factors
- In patients with HAP/VAP caused by Acinetobacter species
- suggest treatment with either a carbapenem or ampicillin/sulbactam if the isolate is susceptible to these agents
- If sensitive only to polymyxins — intravenous polymyxin (colistin or polymyxin B) and adjunctive inhaled colistin
- If sensitive only to colistin — suggest not using adjunctive rifampicin

- recommend against the use of tigecycline
- In patients with HAP/VAP caused by a carbapenem-resistant pathogen that is sensitive only to polymyxins, we recommend intravenous polymyxins (colistin or polymyxin B) and suggest adjunctive inhaled colistin.

Length of therapy

- For patients with VAP, we recommend a 7-day course of antimicrobial therapy rather than a longer duration
- Recommend de-escalating
- For patients with HAP/VAP, we suggest using procalcitonin levels plus clinical criteria to guide the discontinuation of antibiotic therapy, rather than clinical criteria alone and suggest not using CPIS to guide discontinuation

Risk Factors for multidrug-resistant Pathogens

Risk factors for MDR VAP
Prior intravenous antibiotic use within 90 d
Septic shock at time of VAP
ARDS preceding VAP
Five or more days of hospitalization prior to the occurrence of VAP
Acute renal replacement therapy prior to VAP onset
Risk factors for MDR HAP
Prior intravenous antibiotic use within 90 d
Risk factors for MRSA VAP/HAP
Prior intravenous antibiotic use within 90 d
Risk factors for MDR *Pseudomonas* VAP/HAP
Prior intravenous antibiotic use within 90 d

Abbreviations: ARDS, acute respiratory distress syndrome; HAP, hospital-acquired pneumonia; MDR, multidrug resistant; MRSA, methicillin-resistant *Staphylococcus aureus*; VAP, ventilator-associated pneumonia.

Andre C. Kalil, Mark L. Metersky, Michael Klompas, John Muscedere, Daniel A. Sweeney, Lucy B. Palmer, Lena M. Napolitano, Naomi P. O'Grady, John G. Bartlett, Jordi Carratalà, Ali A. El Solh, Santiago Ewig, Paul D. Fey, Thomas M. File, Jr, Marcos I. Restrepo, Jason A. Roberts, Grant W. Waterer, Peggy Cruse, Shandra L. Knight, Jan L. Brozek, Management of Adults With Hospital-acquired and Ventilator-associated Pneumonia: 2016 Clinical Practice Guidelines by the Infectious Diseases Society of America and the American Thoracic Society, *Clinical Infectious Diseases*, Volume 63, Issue 5, 1 September 2016, Pages e61–es111

Severe Sepsis and Septic Shock

Definitions:

- *Sepsis* is now defined as life-threatening organ dysfunction caused by a dysregulated host response to infection.
- *Septic shock* is a subset of sepsis with circulatory and cellular/metabolic dysfunction associated with a higher risk of mortality.

Abridged Recommendations and Best Practice Statements:

- Initial Resuscitation
- At least 30 mL/kg of IV crystalloid fluid within the first 3 hours followed by frequent reassessment of hemodynamic status
- Hemodynamic assessment to determine type of shock
- Target MAP 65mmHg in patients with septic shock requiring vasopressors
- Diagnosis
- Appropriate routine microbiologic cultures (including at least 2 sets of blood) be obtained before starting antimicrobial therapy if doing so results in no substantial delay in the start of antimicrobials.
- Antimicrobials
- Initiate IV empiric broad-spectrum antimicrobials as soon as possible and within1h for both sepsis and septic shock
- Narrow antimicrobials once pathogen identified, 7-10days is adequate for most serious infections
- Source control as promptly as possible
- Fluid therapy — Crystalloids as fluid of choice
- Vasoactive medications
- Norepinephrine (NE) as first choice
- Add vasopressin or epinephrine to raise MAP or decrease NE dose
- Corticosteroids used if unable to restore hemodynamic stability with fluids and vasopressors, suggested dose 200mg/day
- Mechanical ventilation recommendations
- Tidal volume of 6mL/Kg predicted body weight, plateau pressure of 30cm H2O, and higher PEEP over lower PEEP in sepsis-induced ARDS
- Prone positioning in sepsis-induced ARDS and P/F ration <150
- Conservative fluid strategy for patients with established sepsis-induced ARDS who do not have evidence of tissue hypoperfusion
- Recommend against B2 agonists, pulmonary artery catheters
- Head of bed elevation between 30-45 degrees

- Using spontaneous breathing trials and a weaning protocol
- Glucose control target less than or equal to 180
- Bicarbonate therapy — recommend against the use of sodium bicarbonate therapy to improve hemodynamics or to reduce vasopressor requirements in patients with hypoperfusion-induced lactic acidemia with pH ≥ 7.15
- Venous thromboembolism prophylaxis
- Recommended use with LMWH as the preferred agent
- Stress ulcer prophylaxis to be given for patient with risk factors for gastrointestinal bleeding
- Nutrition
- Initiate early enteral nutrition
- Recommend against parenteral nutrition over the first 7 days
- Goals of care — to be set with family and patients

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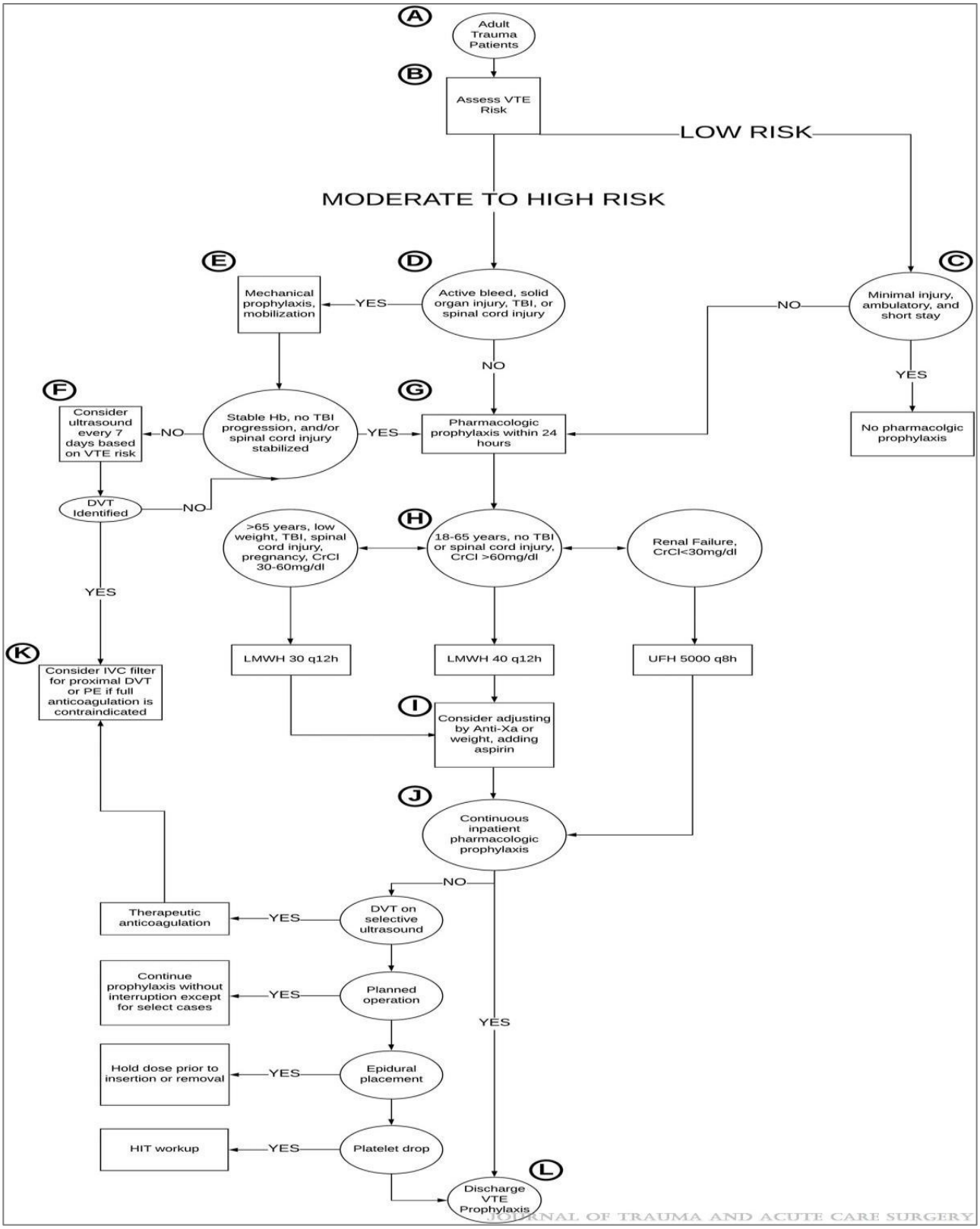
DVT/PE Prophylaxis in Adults Following Multiple Trauma

Western Trauma Association Updated Guidelines

- High Rate of VTE in trauma patients
  - DVT rate 58% without chemical ppx
  - Pulmonary embolism — observed in 2 to 22 %
  - In severe TBI — as high as 53.8%
- Algorithm further details
  - A: Age 18+
  - B: ISS 10+ — initiate ASAP
    - Spine or pelvic fractures, repair of venous injury, a history of VTE, or patients with inherited clotting disorders have increased VTE risk and should be considered for pharmacologic prophylaxis.
    - Trauma patients with minor injuries — independent predictors of increased VTE risk are increased age, obesity, and lower extremity fractures
  - C: Minor trauma may not need DVT ppx
    - Trauma patients capable of ambulation but confined to bed because of intoxication, restraints, or other reasons should receive pharmacologic prophylaxis.
    - Trauma patients who require hospital admission for more than 24 hours require pharmacologic prophylaxis, whereas those hospitalized for less than 24 hours do not
  - D: Appropriate delay for active bleed, coagulopathy, instability, solid organ injury, TBI, or spinal trauma — needs to be a short delay
    - Prothrombin time and platelet count are not as reliable at predicting systemic coagulopathy as viscoelastic hemostatic assays, which may demonstrate hypocoagulability and hypercoagulability after trauma the time of injury
      - The hypocoagulability due to trauma largely resolves within 24 hours, after which hypercoagulability becomes prevalent.
    - Solid organ injury — 12-24h safe in most — Grade IV and V may be initiated within 24h
    - Type of TBI - cerebral contusion, localized petechial hemorrhages, or diffuse axonal damage - no delay needed
      - CT showing no progression - initiate ppx within 24h, nearly all within 72h
        - Those trauma centers that provide pharmacologic prophylaxis within 24 hours after TBI have significantly lower rates of VTE with no difference in rates of late neurosurgical intervention
    - Spine trauma — initiate asap
      - Pharmacologic prophylaxis preoperatively or the same day of spine surgery — the VTE rate decreased and the rate of spinal hematoma was unchanged

    - Pharmacologic prophylaxis initiated within 48 hours of operative fixation of traumatic spine fractures did not increase the risk of bleeding, progression of neurological injury, or postoperative complications including spinal hematoma
- E: Add mechanical prophylaxis with intermittent pneumatic compression and mobilization
- F: Weekly venous compression duplex in patients at high risk who cannot be started or maintained on pharm ppx
- G: Pharmacologic prophylaxis must be initiated as soon as possible and for most trauma patients may be initiated within 24 hours.
    - Despite evidence that it may be started before most surgical procedures — pharmacologic prophylaxis is delayed or skipped for pending surgery which increases VTE rate
- H: After deciding to start pharmacologic prophylaxis, the specific anticoagulant and initial dose should be determined for each patient. Enoxaparin is the recommended choice for most trauma patients with higher doses now considered the standard of care
    - LMWH increased bioavailability, longer plasma-half life, and more predictable pharmacokinetics and pharmacodynamics compared to UH
    - Interacts less with platelets, which may reduce bleeding complications compared with unfractionated heparin; has a lower incidence of heparin-induced thrombocytopenia (HIT); and does not have associated osteoporosis observed with heparin
    - Dose: 18-65yo, >50kg and Cr clearance >60 — 40mg BID (30mg results in inadequate ppx)
        - 18-65yo, <50kg, Cr cl 30-60 — 30mg BID
        - Can also be weight dosed: 30 mg for 50 to 60 kg patients, 40 mg for 61 to 99 kg patients, 50mg for >100kg
        - ESRD or Cr Cl <30 — hsq q8h
        - Brain/spinal trauma — less VTE and higher survival than UFH, 30mg BID, consider anti-xa dose titration
        - Pregnant — 30 mg BID, titrate dose
- I: Many trauma patients require dose adjustment after initiating enoxaparin
- J: The continuous, uninterrupted dosing of pharmacologic prophylaxis should be the standard for most trauma patients throughout their hospital stay
    - Patients who miss two to four doses have 8.5 times higher DVT risk compared with those with no missed doses
    - For TBI patients who are started on pharmacologic prophylaxis, interrupted dosing causing 600% increase VTE rate
    - Held for multitude of reasons (procedures, concern for bleeding, epidural removal, error) — rate of bleeding with prophylaxis no different without it
    - Appropriate indications for holding or altering pharmacologic prophylaxis include acute thrombus, craniotomy, spinal surgery, epidural placement, or HIT
- K: Inferior vena cava filters may be considered in the setting of proximal DVT or PE when there is a contraindication to appropriate therapeutic anticoagulation

- L: Trauma patients with TBI, orthopedic or spine injuries, and those who undergo major surgery are at particular VTE risk and should be considered for post discharge pharmacologic prophylaxis



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Heparin-Induced Thrombocytopenia

Heparin-Induced Thrombocytopenia (HIT) occurs in up to 5% of patients receiving therapeutic or prophylactic doses or unfractionated heparin (UH). HIT generally occurs 5 to 12 days after initiation of UH/LMWH, however, patients with previous exposure to UH/LMWH may develop HIT within 24 hours of exposure to UH/LMWH and are at particularly high risk for thrombotic complications. Exposure to extremely small amounts of heparin, such as those used to coat central catheters or flush intravenous lines has been associated with HIT. The use of low molecular weight heparin (LMWH) reduces the incidence of HIT by up to 90%.[1,2]

HIT is a clinical diagnosis that may be confirmed by laboratory testing. The American Society of Hematology has developed a '4T's' grading scale to determine the pretest probability of HIT[3,4] (See Table). A score of 0-3 indicates a low risk for HIT (<0.1%); 4-5 an intermediate risk (0.1-10%); 6-8 indicates high risk (>10%). All patients receiving UH/LMWH should have their risk assessed daily. Patients at low risk (score, 0-3) may be continued on UH/LMWH with continued daily risk assessment. Patients at intermediate or high risk should have heparin discontinued followed by confirmatory immunoassay (See algorithm below).

In patients with acute HIT complicated by thrombosis (HITT) or acute HIT without thrombosis (isolated HIT), the ASH guideline panel *recommends* discontinuation of heparin and initiation of a non-heparin anticoagulant.

When a non-heparin anticoagulant is being selected, the ASH guideline panel *suggests* argatroban, bivalirudin, danaparoid, fondaparinux, or a direct oral anticoagulant (DOAC).

The choice of agent may be influenced by drug factors (availability, cost, ability to monitor the anticoagulant effect, route of administration, and half-life), patient factors (kidney function, liver function, bleeding risk, and clinical stability), and experience of the clinician.

- In patients with critical illness, increased bleeding risk, or increased potential need for urgent procedures, argatroban or bivalirudin may be preferred because of shorter duration of effect. These patients may require close monitoring.
- In patients with moderate or severe hepatic dysfunction (Child-Pugh class B and C), it is advisable to avoid argatroban or use a reduced dose.
- Fondaparinux and the DOACs are reasonable options in clinically stable patients at average risk of bleeding. The same contraindications to their use in the treatment of acute VTE should be applied in determining their appropriateness for patients with HIT.
- In patients with HIT complicated by life- or limb-threatening thromboembolism (eg, massive pulmonary embolism or venous limb gangrene), a parenteral non-heparin anticoagulant may be preferred because few such patients have been treated with a DOAC.
- With respect to the choice of DOAC, most of the published experience in HIT is with rivaroxaban. Various dosing regimens have been reported. For patients with acute HITT,

rivaroxaban at a dose of 15 mg twice per day for 3 weeks followed by 20 mg once per day is preferred. For patients with acute isolated HIT, rivaroxaban 15 mg twice per day until platelet count recovery (usually a platelet count of ≥150 × 10^9/L) followed by 20 mg once per day is preferred if there is an indication for ongoing anticoagulation.

In patients with acute isolated HIT and no asymptomatic DVT identified by screening compression ultrasonography, the ASH guideline panel *suggests* that anticoagulation be continued, at a minimum, until platelet count recovery (usually a platelet count of ≥150 × 10^9/L). The ASH guideline panel *suggests against* continuing treatment for ≥3 months unless the patient has persisting HIT without platelet count recovery (conditional recommendations). These recommendations apply only to patients with isolated HIT. The ASH guideline panel did not address the duration of anticoagulation in patients with acute HITT and no other indication for anticoagulation in whom anticoagulation is typically given for 3 to 6 months.

Heparin-Induced Thrombocytopenia

TYPES

- HIT type 1
  - Mild, transient drop in platelet count that typically occurs within the first two days of heparin exposure
  - The platelet count typically returns to normal with continued heparin administration
  - Mechanism appears to be direct effect of heparin on platelets, causing non-immune platelet aggregation
  - The typical platelet count nadir is ~100,000/microL
  - This form of HIT is not considered clinically significant, is not associated with thrombosis, and patients can be managed without discontinuation of heparin

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- HIT type II
  - Clinically significant syndrome due to antibodies to platelet factor 4 (PF4) complexed to heparin, referred to as HIT antibodies or PF4/heparin antibodies
  - These antibodies can cause thrombosis and thrombocytopenia
  - The risk of thrombosis, including life-threatening limb gangrene, persists until both heparin is eliminated and a non-heparin anticoagulant is initiated

ONSET

- Heparin can cause a significant decrease in platelet count by immune mediated action. Heparin can bind to platelets, and upon exposure to heparin, IgG antibodies are created that identify and bind to complexes of platelet factor 4 (PF4) and heparin. This can lead to venous and arterial thrombosis.
  - Usual onset: usually 5-10 days after starting heparin therapy.
  - Early onset: within the first 24 hours of exposure, may occur if the patient has been exposed to heparin in the previous 1-3 months and has circulating antibodies already present.
  - Delayed onset: can present up to 3 weeks after discontinuing heparin therapy

PRESENTATION

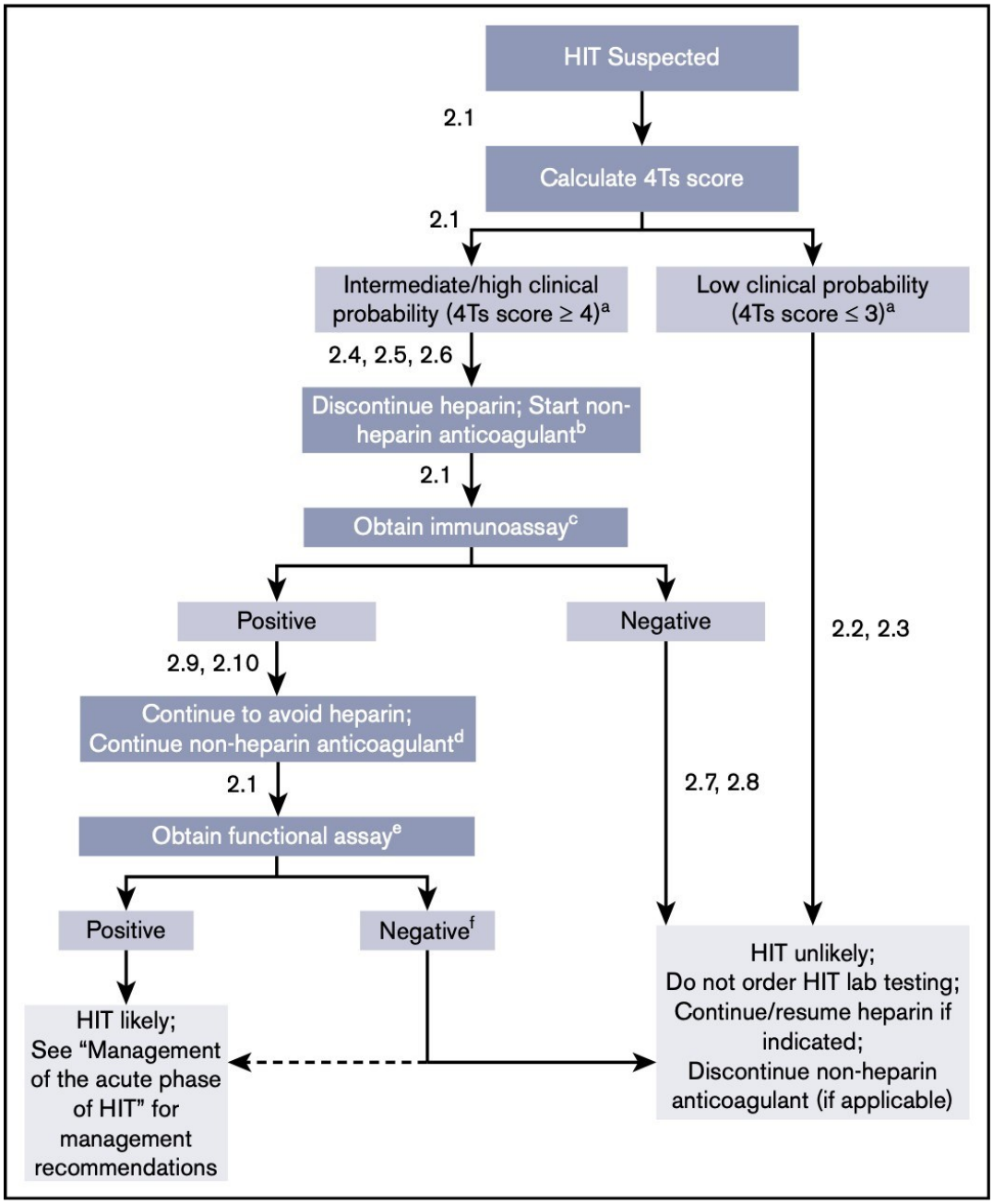
- Thrombocytopenia observed in 85-90% of patients
  - Platelet count <150,000/microL OR 50% drop in platelets from beginning of therapy
- Thrombosis is the presenting finding in up to 25% of patients, and can occur in up to 50% of patients
  - May develop before thrombocytopenia observed
  - Venous thrombi are more common than arterial thrombi
  - Complications include death (most commonly due to PE), skin necrosis, limb gangrene, and organ infarction

DIAGNOSIS

- Diagnosis of HIT is based on clinical features and laboratory evidence of HIT antibodies
- **4Ts score** quantifies the clinical findings associated with HIT and helps to establish a pretest probability of HIT:

	Score = 2	**Score = 1**	**Score = 0**
Thrombocytopenia	▪ PLT fall >50% fall AND nadir ≥20,000/microL	▪ PLT fall of 30-50% or nadir 10-19,000/microL	▪ PLT fall <30% fall or nadir <10,000/microL
Timing of PLT fall (Heparin start date is Day 0)	▪ Clear onset between days 5-10 after start of heparin OR ▪ PLT fall ≤1 day if prior heparin exposure within last 30 days	▪ Consistent fall at 5-10 days but unclear (ie, missing PLT counts) OR ▪ PLT fall ≤1 day AND prior heparin exposure within 30-100 days OR ▪ Onset after day 10	▪ PLT fall at <4 days without recent exposure
Thrombosis	▪ Confirmed new thrombosis ▪ Skin necrosis at injection site ▪ Anaphylactic reaction to IV bolus dose of heparin ▪ Adrenal hemorrhage	▪ Progressive or recurrent thrombosis ▪ Non-necrotizing (erythematous) skin lesions ▪ Suspected thrombosis that has not been proven	▪ None
Other causes of thrombocytopenia	▪ None apparent	▪ Possible other cause (sepsis, initiation of ventilator, drugs)	▪ Definite (ie, DIC, surgery within last 72 hours, confirmed bacteremia/ fungemia, chemotherapy or radiation in last 20 days, post-transfusion purpura, PLT <20 & drug implicated in D-ITP, non- necrotizing skin lesions at LMWH injection site, etc)

- **Pretest clinical scoring interpretation**
  - The sum of the point values gives a total from 0 to 8 points
  - Pretest probabilities for HIT are:
    - 0-3 points – Low probability (risk of HIT <1%)
    - 4-5 points – Intermediate probability (risk of HIT ~10%)
    - 6-8 points – High probability (risk of HIT ~50%)


HIT Suspected
2.1
Calculate 4Ts score
2.1
Intermediate/high clinical probability (4Ts score ≥ 4)[a]
Low clinical probability (4Ts score ≤ 3)[a]
2.4, 2.5, 2.6
Discontinue heparin; Start non-heparin anticoagulant[b]
2.1
Obtain immunoassay[c]
Positive
Negative
2.2, 2.3
2.9, 2.10
Continue to avoid heparin; Continue non-heparin anticoagulant[d]
2.1
2.7, 2.8
Obtain functional assay[e]
Positive
Negative[f]
HIT likely; See "Management of the acute phase of HIT" for management recommendations
HIT unlikely; Do not order HIT lab testing; Continue/resume heparin if indicated; Discontinue non-heparin anticoagulant (if applicable)

American Society of Hematology (ASH) 2018 Recommendations:

Score:

Category	**2 Points**	**1 Point**	**0 Points**
Thrombocytopenia	**Nadir 20-100, or >50% platelet fall**	**Nadir 10-19, or 30-50% fall**	**Nadir<10 or <30% fall**
Timing of platelet count fall	Days 5-10, or < or =1 Day if heparin Exposure within the past 30 days	>10 Days or timing unclear (but fits with HIT), Or <1 day if heparin Exposure w/in past 30-100 days	<1 day (no recent heparin)
Thrombosis of other Sequelae	Proven thrombosis, skin Necrosis, or acute systemic reaction after Heparin bolus	Progressive, recurrent, or silent thrombosis; erythematous skin lesions	None
Other cause for thrombocytopenia	None evident	Possible	Definite

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Prophylactic Use of Antibiotics in Trauma Patients

Penetrating Abdominal Trauma, Prophylactic Antibiotic Use in — EAST Practice Management Guideline 2012

Prophylactic antimicrobials have an important role in decreasing infection in patients with penetrating wounds of the abdomen when associated with an injury to a hollow viscus. Numerous studies demonstrate the importance of broad- spectrum aerobic and anaerobic coverage. Studies, to date, do not support more than 24 hours of antimicrobial coverage for prevention of infection associated with a hollow viscous injury.

Recommendations

Level 1

1. A single preoperative dose of prophylactic antibiotics with broad-spectrum aerobic and anaerobic coverage should be administered to all patients sustaining penetrating abdominal wounds.
2. Prophylactic antibiotics should be continued for not more than 24 hours in the presence of a hollow viscus injury in the acutely injured patient.
3. Absence of a hollow viscus injury requires no further administration of antibiotics.

Level 2

There are no Level 2 recommendations.

Level 3

1. In patients admitted with hemorrhagic shock, the administered dose of antibiotics may be increased twofold or threefold and repeated after transfusion of every 10 units of blood until there is no further blood loss.
2. Aminoglycosides should be avoided because of suboptimal activity in patients with significant injuries if possible.

Goldberg SR, Anand RJ, Como JJ, Dechert T, Dente C, Luchette FA, Ivatury RR, Duane TM; Eastern Association for the Surgery of Trauma. Prophylactic antibiotic use in penetrating abdominal trauma: an Eastern Association for the Surgery of Trauma practice management guideline. J Trauma Acute Care Surg. 2012 Nov;73(5 Suppl 4):S321-5. doi: 10.1097/TA.0b013e3182701902. PMID: 23114488.

Tube Thoracostomy, Presumptive Antibiotics in — EAST Practice Management Guideline 2012

Postraumatic empyema and pneumonia are portents complications of tube throacostomy, and prophylactic/presumptive (if pleural cavity is already violated) antibiotics have been advocated to decrease the incidence of these infections. The practice of administering antibiotics is controversial.

Recommendations:
There is insufficient published evidence to support any recommendation either for or against the use of presumptive antibiotics to reduce the incidence of empyema or pneumonia in TT for traumatic hemopneumothorax.
*Decision to administer antibiotics will be left to the judgment of the attending surgeon.

Moore FO, Duane TM, Hu CK, Fox AD, McQuay N Jr, Lieber ML, Como JJ, Haut ER, Kerwin AJ, Guillamondegui OD, Burns JB; Eastern Association for the Surgery of Trauma. Presumptive antibiotic use in tube thoracostomy for traumatic hemopneumothorax: an Eastern Association for the Surgery of Trauma practice management guideline. J Trauma Acute Care Surg. 2012 Nov;73(5 Suppl 4):S341-4. doi: 10.1097/TA.0b013e31827018c7. PMID: 23114491.

Prophylactic Antibiotic Use in Open Fractures — EAST Practice Management Guideline 2011

An open fracture is defined as one in which the fracture fragments communicate with the environment through a break in the skin. The presence of an open fracture either isolated or as part of a multiple injury complex increases the risk of infection and soft tissue complications.

Open Fractures — Gustilo Classification

Type I	Open fracture with a skin wound <1 cm in length and clean.
Type II	Open fracture with a laceration >1 cm in length without extensive soft tissue damage, flaps, or avulsions.
Type III	Open segmental fracture with >10 cm wound with extensive soft tissue injury or a traumatic amputation (special categories in Type III include gunshot fractures and open fractures caused by farm injuries).
III_A	Adequate soft tissue coverage.
III_B	Significant soft tissue loss with exposed bone that requires soft tissue transfer to achieve coverage.
III_C	Associated vascular injury that requires repair for limb preservation.

Recommendations

Level I

1. Systemic antibiotic coverage directed at gram-positive organisms should be initiated as soon as possible after injury.
2. Additional gram-negative coverage should be added for type III fractures.
3. High-dose penicillin should be added in the presence of fecal or potential clostridial contamination (e.g., farm- related injuries).
4. Fluoroquinolones offer no advantage compared with cephalosporin/aminoglycoside regimens. Moreover, these agents may have a detrimental effect on fracture healing and may result in higher infection rates in type III open fractures.

Level II

1. In type III fractures, antibiotics should be continued for 72 hours after injury or not >24 hours after soft tissue coverage has been achieved.
2. Once-daily aminoglycoside dosing is safe and effective for types II and III fractures.

Hoff WS, Bonadies JA, Cachecho R, Dorlac WC. East Practice Management Guidelines Work Group: update to practice management guidelines for prophylactic antibiotic use in open fractures. J Trauma. 2011 Mar;70(3):751-4. doi: 10.1097/TA.0b013e31820930e5. PMID: 21610369.

SPECIAL ISSUES

Trauma Nutrition

Adequate nutrition is mandatory for patients suffering traumatic injury. There are well documented increases in resting energy expenditure and obligate catabolism in the severely injured patients. The metabolic response to trauma is associated with dramatic changes in metabolism, with utilization of lean body tissue to serve as gluconeogenic substrates and to support immune and repair functions. The hormonal milieu following trauma overrides the normal response to starvation where lean body mass is preserved and instead promotes progressive loss of skeletal muscle The physical unloading of muscle with inactivity, bed rest, and immobility is associated with decreasing muscle protein synthesis, mediated by multiple mechanisms, including calcium-dependent proteolysis, ATP-dependent proteolysis, lysosomal proteolysis, and free radical oxidative activation. These physiologic processes lead to deterioration of lean body mass in trauma and are compounded by the difficulty in providing nutrition therapy.

Depending on the extent of the trauma, these patients may have prolonged stays in the ICU and should undergo timely nutrition reassessment. Energy requirements vary depending on numerous factors. Resting energy expenditure (REE) peaks over 4–5 days but continues to remain high for 9–12 days (with some elevation in energy expenditure persisting for over 21 days). Approximately 16% of total body protein is lost in the first 21 days, with 67% of that protein loss coming from skeletal muscle alone. Energy goals should be in the range of 20–35 kcal/kg/d, depending on the phase of trauma. Lower energy provision is suggested early in the resuscitative phase, with liberalization of energy delivery as the patient enters into the rehabilitation phase. Requirements for protein are similar for other ICU patients but may be at the higher end of the provision range, from 1.2–2 g/kg/d.

The American Society of Enteral and parenteral Nutrition recommend early enteral feeding with a high protein polymeric diet be initiated in the immediate post trauma period (within 24–48 hours of injury) once the patient is hemodynamically stable; this should be standard practice.

Similar to other patients, those trauma patients with traumatic brain injury should undergo early enteral nutrition in the immediate post trauma period (within 24–48 hours of injury) once the patient is hemodynamically stable.

Provision of enteral nutrition is safe in the open abdomen and has not been shown to affect the closure rates.

Further, we have adopted the following management strategy from Vanderbilt University:

ASSESSMENT AND EVALUATION

- All patients admitted to the Trauma Intensive Care Unit require a nutrition risk assessment within 24 hours and a nutrition plan within 48 hours
- Consult Nutrition Service as needed for specific recommendations (i.e. tube feeding formulations, oral supplements, poor oral intake, education)

ADMINISTRATION

•Enteral nutrition (EN) preferred over parenteral nutrition (PN)

•Reduce risk of aspiration by reducing sedation, elevating HOB 30 –45 degrees, performing mouth care per VAP Guidelines and minimizing transport out of ICU

Oral Nutrition:

Oral intake preferred method of nutrition if appropriate for patient

•Initiate regular diet with oral diet advancement (add oral supplement to optimize po intakes)

Enteral Nutrition

•Initiate EN 24 –48 hours following onset of critical illness and admission to ICU, after resuscitation efforts completed and/or hemodynamic stability achieved

•Initiate tube feedings and advance as quickly as tolerated in 24 –48 hours to goal within 48 –72 hours

•Weaning EN (transitioning to PO diet): consider cycling: Cycle EN x 12hr, 7p to 7am (for 50% of needs during first few days of transition)

•Wean off EN once patient consistently consumes and tolerates on average 50% or more of meals

•Lower GI tract preferable if EN access needed, especially with high aspiration risk, but nutrition should not be delayed if only gastric access obtained

-Access -Gastric: Short term: Orogastric tube (OGT), Nasogastric tube (NGT), Cortrak post-pyloric

-Long term: Percutaneous endoscopic gastrostomy (PEG)

-Post-pyloric: Short term: DHT (placement confirmed by abdominal radiographic imaging (KUB))

-Long term: PEG-Jejunostomy (for unsuccessful placement DHT for post-pyloric access)

Parenteral Nutrition: If low nutrition risk and unable to meet > 60% energy and protein requirements via EN within 7-10days, then initiate PN

-If high nutrition risk present (malnutrition upon admission, inability to use GI tract expected for more than 3-5 days) and EN not feasible, initiate PN as soon as possible after resuscitation efforts completed

-If high nutrition risk present (malnutrition upon admission determined by AND/ASPEN criteria and inability to use GI tract expected for more than 3-5 days), initiate PN as soon as possible after resuscitation efforts completed

•Wean TPN when 60% of TF goal met or 60% of meals consumed

•Decrease TPN to ~half, decrease dextrose/AA per PN team order

•Wean off TPN as TF rate advances or per clinical judgment. If LOS>7days and pt has not consistently met on average near 100% estimated needs

consider nutritional provision from a combination of PO/EN/PN routes.

DOSING:

•Dosing weight: Use ideal body weight (IBW) or upper IBW for height if actual body weight > 20% IBW

Hamwi Method:

Men: 106# (48kg) for 1st5 feet, then add 6# (2.7kg) per inch >5 feet, +/-10%

Women: 100# (45kg) 1st5 feet, then add 5# (2.3kg) per inch >5feet, +/-10%o

Use actual body weight if weight < IBW

Energy goals:25 –35 kcal/kg dosing weight/day

If BMI >35(Class II or Class III Obesity), use 22 –25 kcal/kg IBW/day

Protein goals: General 1.2 –2.0 g/kg dosing weight/day

Obesity: If BMI 35–40, use > 2g/kg IBW/day. If BMI > 40, use 2.5g/kg IBW/day

Renal Failure:HD1.5 to 2.0 g/kg dosing weight

CRRT: 2.0-2.5g/kg dosing weight

Hepatic Failure: 1.2-2.0/kg dry or actual body weight/day

Spinal Cord Injury: 2.0/kg dosing weigh

Traumatic Brain Injury: 1.5-2.0/kg dosing weight

Open Abdomen: 15 –30G/liter of exudate lost.

Fluid Needs: 1ml/kcal baseline to Cover additional losses (i.e. fever, diarrhea, other GI output)

MONITORING Serum protein markers (i.e. prealbumin, CRP) not recommended for evaluation of nutritional status or goals

GI Intolerance: Gastric residual volume (GRV) not utilized as routine evaluation of tolerance. Daily physical examination, patient symptoms, clinical risk factors, and abdominal radiographic films should be utilized to determine tolerance. Prokinetic agents may be introduced if GI intolerance suspected or for patients with high risk of aspiration. Consider QTc prolongation.

Erythromycin 200mg IV or per tube q6h x 3 days

Metoclopramide 10mg IV q6h x 3 days

Naloxone 8mg q8h x 3 days, then 8mg q6h prn

For persistent diarrhea and C. Diff infection ruled out, initiate _____ 4 packets in 24 hours

Special considerations: Refeeding syndrome. Replete electrolytes, provide thiamine, folic acid and MVI prior to initiation of tube feedings

Patients at risk for refeeding syndrome, initiate trophic feedings (no more than 25% of goal) and then check BMP, phosphorus and magnesium levels

Advance tube feedings slowly over 3 –4 days

Check BMP, phosphorus and magnesium levels daily as EN advances to goal

Routine administration of low carbohydrate tube feeds are not recommended per ASPEN guidelines

Trauma in Pregnancy

1 in 12 pregnancies is complicated by trauma. Two-thirds are injured in MVC, with falls and assaults the next most common. Up to 20% of pregnant women are victims of domestic violence. Trauma is the leading cause of non-obstetrical maternal death. Life threatening maternal trauma is associated with 50% fetal loss rate; less severe injuries still have fetal loss rates of up to 5%.[1] Since minor injuries are much more common, most fetal losses result from relatively minor maternal injuries. Thus, special attention must be paid to the pregnant trauma patient, with a coordinated effort among emergency physicians, trauma surgeons, obstetricians, and sometimes neonatologists.[2,3]

INITIAL MANAGEMENT

The highest priority in a pregnant trauma victim is to evaluate stabilize the mother.

AIRWAY –Special concerns for a pregnant patient's airway include the increased risk for aspiration due to decreased GI motility and upward displacement of the gravid stomach.

BREATHING – The fetal 0_2-hemoglobin dissociation curve is shifted to the left, so minimal decreases in maternal $SA0_2$ can significantly compromise fetal oxygenation.

CIRCULATION – Physiologic changes in pregnancy (30-50% increase in blood volume, peripheral vasodilation) may result in delayed manifestation of shock. Fetal perfusion may be compromised in presence of normal vital signs. Supine positioning may lead to hypotension as the uterus compresses the IVC. This can be avoided by positioning the mother's right hip on a pillow or IV bag to displace the uterus to the left.

GESTATIONAL AGE DETERMINATION

Age may be estimated by the uterine fundal height: if it is below the umbilicus, the fetus in 20 weeks or less and is not viable; if it is above the umbilicus, the distance in cm from the pubis to the top of the fundus roughly correlates with the gestational age in weeks (+/- 2 weeks). Ultrasonographic measurement of biparietal skull diameter (BPD), abdominal circumference, and femur length provides a more accurate determination. BPD is the best single test, but the others allow estimation of fetal weight.

DIAGNOSTIC TESTING

Exposure of a fetus to extremely large doses of ionizing radiation may have teratogenic, carcinogenic, or genetic effects. The rate of childhood leukemia increases from 1/3000 (background) to 1/2000 among children exposed in utero to ionizing radiation. The greatest potential risk of anomalies is during organogenesis in the first trimester. However, total exposure of less than 5 rads has never been associated with anomalies, growth restriction, or spontaneous abortions. This allows multiple diagnostic tests (Table 1).[5] ACOG guidelines state that concern about possible effects of radiation exposure should not prevent medically indicated diagnostic x-rays from being performed on the mother.[6] Shielding is reasonable if practical. There are no documented adverse fetal effects of MRI, but it is arbitrarily recommended to avoid MRI in the first trimester.

Estimated Fetal Exposure for Various Imaging Methods

Plain Films	**Fetal dose (rads)**
Cervical spine	0.002
Upper or lower extremity	0.001
Chest (2 views)	0.00007
Abdominal (multiple views)	0.245
Thoracic spine	0.009
Lumbosacral spine	0.359
Pelvis	0.040
Hip (single view)	0.213
CT scans (slice thickness: 10mm)	**Fetal dos (rads)**
Head (10 slices)	<0.050
Chest (10 slices)	<0.100
Abdomen (10 slices)	2.600

TYPES OF TRAUMA

Blunt trauma may cause fetal death by maternal loss of life or direct fetal injury. More commonly, the uterus bears the brunt of the injury. Over 50% if fetal losses are due to **placental abruption**. Abruption typically occurs within 6 hours of the event. The classic triad of frequent contractions, bleeding and abdominal pain occurs in fewer than half of cases, and ultrasound will identify placental clot only 50% of the time. Thus, the only clues to abruption may be contractions and abnormal fetal heart tracing. Up to 2 L of blood can be sequestered retroplacentally, so if the mother is hypotensive without a source consider abruption. **Uterine rupture** is not common and also may be hard to diagnose. The classic presentation is searing pain, abnormal fetal heart rate and transabdominal palpation of fetal parts. The mother may rapidly deteriorate, and there is a very high fetal loss rate. **Fetal-maternal hemorrhage**, defined by the presence of fetal blood cells in the maternal circulation, can lead fetal anemia and fetal compromise. When Rh (+) fetal cells are exchanged with Rh (-) maternal blood, the mother will make immune globulins against Rh (+) blood cells. In subsequent pregnancies with Rh (+) children, hemolysis of fetal blood cells can potentially cause fetal death. To avoid these potential complications, **all** pregnant trauma patients with Rh (-) blood type should receive a vial of Rh immune globulin (Rhogam) within 72 hours of the incident. The amount of blood exchanged can be estimated by the Kleihauer-Betke test, which is performed on maternal blood. Although the amount of blood exchange does not accurately predict fetal prognosis, additional vials of Rhogam must be administered when there has been >30 ml hemorrhage.

Penetrating trauma is associated with relatively high fetal loss rates due to umbilical cord, placental, or fetal trauma. Cesarean section is frequently necessary. The distended uterus may shield the maternal viscera and it displaces the bowels superiorly.

Burns over 40-50% BSA correlate with very poor fetal survival, prompting some to recommend Cesarean Section.[7,8]

Electrical injuries have not been well studied. The link between minor household electrical shocks and stillbirths is unclear, but fetal mortality is as high as 50-75% following significant electrical injury such as lightning strike. Early fetal heart monitoring should be considered.[7,8]

SURGERY ON THE PREGNANT PATIENT

Surgery may be required to treat or stabilize a mother. General anesthesia has not been linked with any specific problems. It is important to maintain uterine perfusion by maintaining high maternal $SA0_2$, providing fluid resuscitation, operating in the left uterine displacement position, and avoiding vasopressors hen possible. Fetal heart monitoring can be performed during surgery by placing the monitor in a sterile sleeve.

PERIMORTEM CESAREAN SECTION

Once there is maternal loss of vital signs there should be an immediate consideration for the performance of a Cesarean section if the fetus is viable. Survival is optimized if performed within 4 minutes. If the fetus is delivered >15 after maternal death, fetal survival is only 5% and most of those survivors have severe neurological sequelae.[3]

DISPOSITION

If a pregnant patient <22 weeks has been evaluation and treated and is ready for discharge by trauma services with obstetric input, she should be instructed to contact her obstetrician within 24 hours for a follow-up appointment. She should also be instructed to call if she develops any lower abdominal pain, bleeding, fluid loss or a decrease in fetal movement.

If a pregnant patient with a viable fetus has been stabilized, she should undergo fetal monitoring for 4-6 hours for minor trauma, and at least 24 hours for major trauma If the mother is stable for transfer to a trauma center that offers obstetric services, she may be transferred there. Prior to discharge every pregnant trauma patient should have a blood type determination and receive Rhogam if Rh (-). Tetanus toxoid is safe to administer in pregnancy. Local anesthetics, acetaminophen, and narcotics can be used when indicated. Nonsteroidal anti-inflammatory agents should be avoided. Safe antibiotics include penicillins, erythromycins (excluding EES), cephalosporins, clindamycin and gentamicin Tetracyclines, chloramphenicol, and quinolones should be avoided.

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Screening Brief Intervention and Referral to Treatment (SBIRT) for Alcohol and Substance Use Disorder

Purpose:

Screening, Brief Intervention and Referral for Treatment (SBIRT) is a structured set of questions designed to identify individuals at risk for alcohol use problems, followed by a brief discussion between an individual and a service provider, with referral to specialized treatment as needed. Screening asks several questions to determine whether individuals are misusing alcohol—that is, are they drinking too much, too often, or experiencing harm from their drinking.

Policy:

Screening for alcohol misuse will be performed with the AUDIT-C tool as part of the hospital admission assessment on all injured patients. Patients who screen positive for alcohol misuse will receive a referral to social services. The hospital social worker will complete the brief intervention and referral to treatment and document their interventions in the "Trauma Screening Tools" flowsheet.

Supportive Data:

The Alcohol Use Disorders Identification Test-Concise (AUDIT-C) is a brief alcohol screening instrument that reliably identifies persons who are hazardous drinkers or have active alcohol use disorders (including alcohol abuse or dependence). The AUDIT-C is a modified version of the 10 question AUDIT instrument.

The AUDIT-C has 3 questions and is scored on a scale of 0-12. Each AUDIT-C question has 5 answer choices valued from 0 points to 4 points. In men, a score of 4 or more is considered positive, optimal for identifying hazardous drinking or active alcohol use disorders. In women, a score of 3 or more is considered positive. Generally the higher the score, the more likely it is that a person's drinking is affecting his or her safety.

Procedure:

1. **Screening:** For every trauma admission, the ED or bedside nurse will complete the AUDITC screening available in the medical record.
    a. A positive score (4+ for female patients, 3+ for male patients) will trigger a consult order for social work.
    b. A blood alcohol level > 0.08 g/dL (> 80 mg/dL) can also be considered a positive screen for potential alcohol abuse.
2. **Brief Intervention:** A social worker will meet with the patient to provide feedback and information about the screen results.
    a. Acknowledge patient's AUDIT-C score or positive blood alcohol level; specify the implications of the patient's alcohol use.
    b. Encourage the patient to think about and talk about how drinking contributed to their injury, what they like and dislike about their current drinking pattern, and how they may want to change their patterns to reduce their injury risks. This discussion helps patients come to their own decisions about drinking and using drugs.

   c. Provide clear, respectful, motivational and professional advice about the need to reduce risk by decreasing or quitting drinking, and avoiding high-risk alcohol situations. The optimal result is for patients to set and express their own goals and a plan to achieve them.
   d. 3. **Referral**: Utilizing therapeutic communication, the Social Worker will offer the patient resources/referrals to treatment for alcohol use disorder, including: Internal Substance Use Navigator (SUN)
   e. Internal Behavioral Health consult
   f. External community resources (e.g. residential treatment, detox programs, intensive outpatient programs, outpatient programs, community support groups)
   g. Recommend patients consult their primary care provider or hospital specialist
4. Documentation of the Brief Intervention and outcome (ex: patient declined, referral sent, SUN contacted, etc.) will be documented by the Social Worker in the medical record.
5. If patient is altered and unable to be screened due to cognitive limitations, patient will be marked as "unable to assess." If patient improves during hospital stay, consider assessment.
6. If needed, the social worker can notify trauma team to consult with psychiatry.

AUDIT-C

1. **How often do you have a drink containing alcohol?**
   Never
   Monthly or less
   2-4 times a month
   2-3 times a week
   4 or more times a week
2. **How many standard drinks containing alcohol do you have on a typical day?**
   1 or 2
   3 to 4
   5 to 6
   7 to 9
   10 or more
3. **How often do you have six or more drinks on one occasion?**
   Daily or almost daily
   Weekly
   Monthly
   Less than monthly
   Never

References:

Committee on Trauma, American College of Surgeons. Alcohol Screening and Brief Intervention (SBI) for Trauma Patients: *https://www.facs.org/media/wdanhnsc/alcohol-screening-and-brief-intervention-sbi-for-trauma-patients-cot-quick-guide.pdf*

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Bush K, Kivlahan DR, et al (1998). The AUDIT alcohol consumption questions (AUDIT-C): An effective brief screening test for problem drinking. Ambulatory Care Quality Improvement Project (ACQUIP). Arch Intern Med. 158:1789-95

Post Traumatic Stress Disorder Screening and Intervention

Purpose:

To define a process to identify injured patients who are at high risk for mental health problems after sustaining a traumatic event. To provide screening for injured patients who are at high risk for psychological sequelae (posttraumatic stress disorder (PTSD) and depression) with subsequent referral to a mental health provider.

Policy:

All trauma patients will be screened for PTSD and depression prior to discharge. Exclusion criteria include severe traumatic brain injury and patients not currently oriented to person, place, time, or situation. Any patient has the right to refuse to receive a screening.

Supportive Data:

Per the American College of Surgeons Verification, Review, and Consultation program Resources for Optimal Care of the Injured Patient (2022 Standards): "All [Level 1 and level 2] trauma centers must meet the mental health needs of trauma patients by having: A protocol to screen patients at high risk for psychological sequelae with subsequent referral to a mental health provider."

PROCEDURE:

- Prior to discharge, trauma patients will be screened by the nurse for risk for postinjury PTSD and depression using the Injured Trauma Survivor Screen (ITSS) in the electronic medical record.
- For patients who screen positive, an automatic consult to social work will be initiated.
- If the patient's condition does not allow for participation in screening or the consult, this will be documented in the medical record. The patient's condition will be monitored for improvement and the screening will be initiated when the patient's condition is improved.
- The social work consult and evaluation will determine subsequent intervention, which will be documented in the medical record. If the treatment plan requires follow-up after discharge, the plan will be documented.
- Screening results and completion of consult will be recorded in the trauma registry.

Injured Trauma Survivor Screen (ITSS)

1 = Yes 0 = No

Before this injury	PTSD	DEP
1. Have you ever taken medication for, or been given a mental health diagnosis?		1 0
2. Has there ever been a time in your life you have been bothered by feeling down or hopeless or lost all interest in things you usually enjoyed for more than 2 weeks?		1 0
When you were injured or right afterward		
3. Did you think you were going to die?	1 0	1 0
4. Do you think this was done to you intentionally?	1 0	
Since your injury		
5. Have you felt emotionally detached from your loved ones?		1 0
6. Do you find yourself crying and are unsure why?		1 0
7. Have you felt more restless, tense or jumpy than usual?	1 0	
8. Have you found yourself unable to stop worrying?	1 0	
9. Do you find yourself thinking that the world is unsafe and that people are not to be trusted?	1 0	
≥ 2 is positive for PTSD risk ≥ 2 is positive for Depression risk SUM =		

References:

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Mild Traumatic Brain Injury Cognitive Screening and Evaluation

Traumatic brain injury (TBI) occurs in 2,000,000 patients per year with a significant number of these resulting in lifelong debilitation. The majority of these head injuries are considered minor (GCS 13-15). However, this patient population is not homogenous. The incidence of clinically significant traumatic brain injury in patients with a GCS of 13 or 14 (15-30%) is much higher than in patients who present with a GCS of 15 (4-6%).

Definition:

MTBI is defined as an acute alteration in brain function caused by a blunt external force and is characterized by a Glasgow Coma Scale (GCS) score of 13 to 15, loss of consciousness for 30 minutes or less, and duration of posttraumatic amnesia of 24 hours or less. If a brain CT scan has been performed, its result must be normal. The terms mild traumatic brain injury and concussion may be used interchangeably.

Procedure:

Consistent with the latest guidelines from EAST

Trauma Team members should not routinely use magnetic resonance imaging (MRI), positron emission tomography, or nuclear magnetic resonance in the clinical management of patients with MTBI at the present time.

Patients with an isolated MTBI and a negative brain CT scan result and not taking anticoagulants or antiplatelet medication may be discharged from the ED if they have no other injuries or issues requiring hospital admission.

Patients on anticoagulants or antiplatelet agents will be admitted for observation and repeat CT scanning will be done within 24 hrs; Isolated mild TBI in this population will follow the procedures for a level three activation

Patients will be advised by trauma team members that measurable deficits in cognition and memory usually resolve at 1 month but that in 20% to 40% of cases, postconcussive symptoms may persist for 3 months or longer.

Occupational therapy evaluation will be done for symptoms of mild TBI or concerns about cognitive functioning with option for outpatient concussion clinic referral

The ability to safely operate a motor vehicle may be impaired for a variable length of time in patients with MTBI. The timing of resumption of driving should be individualized; if this is a concern Occupational therapy and outpatient concussion evaluation will be pursued

The timing of returning to work for patients with MTBI should be individualized. For patients with responsible or hazardous professions, Formal neuropsychologic testing will be ordered by the trauma team in consultation with occupational therapy.

Biochemical markers such as S-100, neuron-specific enolase, and serum tau will not be routinely used in the clinical management of patients with MTBI except on the recommendation of a neurologist should diagnostic questions occur over mental status alterations on the part of the patient

EAST GUIDELINE, 2012: Traumatic Brain Injury, Mild J Trauma. 73(5):S307-S314, November 2012

Reporting Child Abuse and Neglect and Referrals to the Child Protection Program

Washington Hospital Patient Care Services Division	**Policy#: 106**
Protocol: Suspected Child Abuse/Neglect Protocol	**Unit(s): Generic**
Responsible Person/Department: Patient Care Services	**Last Revision/Approval Date: 03/2023**

PURPOSE:

To outline the nursing management for patients presenting with suspected child abuse.

LEVEL:

Independent

SUPPORTIVE DATA:

1. It is a nursing responsibility and mandated by California law to report the known or suspected incidence of child abuse to a child protective agency immediately or as soon as practically possible by telephone. A written report shall be sent within 36 hours of receiving the information concerning the incident.
2. Child abuse or neglect includes a physical injury that is inflicted by other than accidental means on a child less than 18 years old by another person.
   This includes:
   - Sexual abuse (assault and or exploitation) of a child
   - Neglect
   - Willful cruelty or unjustifiable punishment
   - Unlawful corporal punishment or injury
   - Abuse or neglect in out-of-home care

   Further clarification of each of these categories is located in the Consent Manual, Chapter 19.
3. Refer to Numbered Memorandum 3-138 for additional information as necessary.
4. If sexual assault is suspected, for 13 years old and below, consult Children's Hospital, Oakland after the Medical Screening Exam (MSE) for further direction.
5. Notify attending physician, charge nurse, and Director/Nurse Manager/Supervisor.
6. Refer to age related protocols as necessary.
7. Refer to the pain management protocol as necessary.

CONTENT:

ASSESSMENT

1. Identify any life threatening emergencies.
2. Interview child and adult separately for history of event.
3. Identify if history is characteristic of child abuse.
   a. History given by parents is inconsistent with existing injury.
   b. Absence of any history of or explanation for injury.
   c. Family reluctant to give information get child's self-report of signs and symptoms.
   d. Child is developmentally incapable of the specific self-injury.
   e. Delay in seeking medical care.
   f. Inconsistencies or changes in the history.
   g. History of repeated injuries or hospitalization.
   h. Inappropriate response to the severity of the injury.

i. Unexplained growth failure.
j. Lack of adequate food, clothing, and/or shelter.
k. Inattention to a child's emotional needs, failure to provide psychological care, or permitting the child to use alcohol or other drugs.
l. Lack of appropriate medical care, mental health treatment, or use of inappropriate medical care that jeopardizes a child's health.
m. Failure to educate child or attend to special education needs.
n. Vital signs.

PHYSICAL EXAM

4. Observe for lack of expression (attachment) and regressive behavior.
5. Inspect all skin surfaces for bruising, types and patterns of injury. Injuries often associated with physical maltreatment include:

INTERVENTIONS

Provide private room.
6. Treat physical injuries as ordered.
7. Obtain lab and x-ray studies as ordered.
8. Update immunization status as ordered.
9. Consult with Social Services or Child Protective Services (CPS) as needed.
10. Do not remove child from mother or father unless instructed to do so by CPS.

REPORTING

11. Call report to appropriate agency immediately or as soon as is practically possible.
    a. Child Protective Services - Call first then follow-up with one page report (on-line at CPS).
    b. Law Enforcement Agency where the incident occurred.
    c. Social Services at Washington Hospital (they will notify Department of Health Services).
    d. Sexual Assault Response Team (SART).

EVIDENCE

12. Assist with gathering of physical or diagnostic evidence. May photograph.

DOCUMENTATION

13. Document all phone calls in the patient chart including the agency contacted and the name of the person taking report.
14. Complete nurses' notes.
15. Complete CPS form SS8572 (Suspected Child Abuse Report) in all cases.
16. Complete form DOJ900 (Medical Report – Suspected Child Abuse/Neglect) for physical exam without suspected sexual abuse.
17. Complete OCSP925 (Medical Report – Suspected Child Sexual Abuse) for physical exam with suspected sexual abuse.

REFERRAL

18. Forward all documentation to Nurse Manager/Supervisor who will give it to Hospital Administration for distribution to the appropriate authorities.

Components of the History and Physical Examination Suspicious for Child Abuse
D.Bensard D. Pediatric Trauma. In: Feliciano DV, Mattox KL, Moore EE. eds. Trauma, 9e. McGraw-Hill; Accessed May 25, 2021. *https://accesssurgery-mhmedical-com.cmich.idm.oclc.org/content.aspx?bookid=2952&sectionid=249121331*

https://www.michigan.gov/mdhhs 0,5885,7-339-73971_7119_50648_7193—,00.html

Informed Consent and the Care of the Trauma Patient

The care of the injured patient presents many difficult and unusual challenges not limited to medical issues alone. Legal matters punctuate the care of trauma patients and cover a wide range of topics from concerns regarding informed consent, to medical futility and end of life care, to the concept of urgent medical necessity. Medical practitioners may find themselves in precarious and unfamiliar legal situations that may be stressful for the physician and ultimately may hinder the delivery of top-notch care. This section will serve to answer some of the more common questions regarding informed consent. Remember, it is essential that complex medico-legal decision be made with attending physician input and if possible, Risk Management as well.

Informed Consent:

True informed consent involves a process whereby a medical professional describes a proposed therapy to a patient in layman's terms, states the risks and benefits of the proposed therapy and alternative therapies. The patient's questions and concerns must be addressed, and the medical professional has an obligation to ensure that the patient has a good understanding of the situation and is able to participate in the process. In trauma patients altered mental status due to head injury, hypotension, shock, pain, alcohol or other substances frequently preclude informed consent. In these circumstances and if time or the situation will allow, the medical professional has an obligation to contact next-of-kin NOK (including acquaintances) so that informed consent can be obtained as long as no urgent life-saving intervention is required. **It is inappropriate to delay life-saving intervention in order to contact NOK or obtain informed consent**. Close friends or acquaintances may also serve as NOK and may be able to offer insight about a patient's wishes regarding healthcare.

Informed Consent in the Impaired Patient:

It is not uncommon for trauma patients to have issues that make obtaining informed consent difficult if not impossible. In general, if a patient has a life-threatening injury and will not consent to or comply with medical care (let alone consent to care), the practitioner is not obligated to abide by the patient's wishes. However, the patient's life should not be put at risk while this consent occurs. If NOK are not immediately available and life-threatening condition exists, the physician should proceed with any necessary interventions. This may include the need to "control" the patient with physical or pharmacological restraints. The interpretation of a "life-threatening" injury is problematic, and there is little guidance in the law as to what this encompasses, nor is it clear whether only the suspicion of a life-threatening injury would fall into this category. In situations where urgent action is required, it is imperative that the attending physical documents the urgency of the situation and that the procedure was done without consent on the basis "urgent medical necessity". While an intoxicated individual may seem sensible as they vehemently refuse an operation, you must assess their capacity to understand the situation. If you have doubts about their capacity, consult with others on the team, especially the attending physician, and if time allows a Risk Manager.

Diagnosis of Brain Death: Adult

PURPOSE:

Except for those patients who will be donating organs, termination of treatment should promptly follow a diagnosis of death using neurological criteria. Once a patient has been pronounced dead based upon neurological criteria, the law does not prohibit the removal of medical intervention, including ventilatory support.

POLICY:

The Board of Directors, in concurrence with the recommendations of the Medical Staff, has approved the following policies and procedures regarding determination of brain death.

The Uniform Determination of Death Act provides for the determination of death by either circulatory-respiratory or neurologic criteria: "An individual who has sustained either (1) irreversible cessation of circulatory and respiratory functions, or (2) irreversible cessation of all functions of the entire brain, including the brain stem, is dead. A determination of death must be made in accordance with accepted medical standards." (Health and Safety Code Section 7180) Separate Code sections also require that a death diagnosed on neurological grounds must be independently confirmed by a second physician, and that neither physician making such a determination shall participate in the procedures for removing or transplanting a body part from the deceased.

Brain death is a clinical diagnosis. Although brain death can be established by clinical criteria alone, a confirmatory test may be used to support the clinical diagnosis. These studies are not required by law.

Death has occurred and the physician must inform family and cease all medical interventions unless organ donation is considered. If organ donation may occur, interventions necessary to accomplish satisfactory organ retrieval will be continued.

PROCEDURE:

A. The listed procedural guidelines should be followed for use with the determination of brain death by the neurological criteria.

1. Both physicians should document in the deceased's record the basis for the determination of brain death (clinical examination, confirmatory tests, etc.).

2. All imminent brain dead patients are to be considered potential donor patients. After evaluation by California Transplant Donor Network (CTDN), if the patient is considered to be medically suitable for donation, the family will be presented with the option of donation. Please refer to the memorandum on anatomical donation for transplantation.

3. The attending physicians should inform the deceased's family, significant others, and other appropriate surrogate decision makers of the determination of death and the need to remove all medical interventions. Family members should have an opportunity, if they so desire, to request confirmation of the neurological determination by a physician of their choosing before ventilatory support or other such

interventions are removed. Family members will be given a reasonably brief period of accommodation from the time that the patient is declared brain dead, before medical interventions are discontinued, in order to gather family or next of kin at the bedside. During that time, only previously ordered cardiopulmonary support will be provided. The determination of death remains a medical decision.

Reasonable effort will be made to accommodate religious and cultural practices requested by the deceased's family or other appropriate surrogate decision makers.

The Hospital will provide a copy of this policy to the deceased's family or appropriate surrogate decision makers upon request.

Except in those cases in which medical interventions should be continued in order to preserve the viability of organs to be transplanted, or for unusual humanitarian reasons, all forms of medical interventions (e.g., intravenous lines, ventilator, and so forth) should be removed after the physician has pronounced the patient dead.

4. The patient's body temperature must be greater than or equal to 36.5 degrees C (97 degrees F).

5. There must be neither history nor evidence of CNS depressant drugs causing the patient's coma, nor the presence of neuromuscular blocking agents.

6. There must be no evidence of shock or metabolic encephalopathy.

7. The cause of the patient's coma must have been established.

B. The clinical exam must demonstrate irreversible cessation of the entire brain, including the brain stem. Currently accepted clinical criteria for determination of brain death include:

1. Absent Cerebral Function:

Deep coma is present and there is cerebral unreceptivity and unresponsivity. Although not legally necessary and not clinically recommended, a determination of electrocortical inactivity on EEG or absence of cerebral perfusion in a nuclear flow study confirms absent cerebral function.

2. Absent Brain Stem Functions:

a. Pupils must be non-reactive to bright light.

b. Absent oculocephalic and oculovestibular reflexes, tested by Doll's head maneuver and by installation of iced water in either external auditory canal.

c. Absent corneal reflexes.

d. Absent gag reflex.

e. Apnea - The patient's endotracheal/trach tube is disconnected from the ventilator and is connected to a 100% oxygen T-piece blow-by system. The patient is monitored by the physician

at bedside for up to a 10 minute period for the return of any spontaneous respiratory efforts. An arterial blood gas is then obtained to ensure that the pCO_2 is greater than 60mm Hg.

f. Peripheral nervous system activity and spinal cord reflexes may persist after brain death. True decerebrate or decorticate posturing or seizures are inconsistent with the diagnosis of brain death.

g. Complete and accurate clinical decision making and clear documentation essential on the determination of brain death: Clinicians are encouraged to use the attached "checklist for determination of brain death"

Checklist for Determination of Brain Death

Prerequisites (all must be checked) Coma, irreversible and cause known.
Neuroimaging explains coma.
CNS depressant drug effect absent (if indicated toxicology screen; if barbiturates given, serum level <10 µg/mL).
No evidence of residual paralytics (electrical stimulation if paralytics used).
Absence of severe acid-base, electrolyte, endocrine abnormality.

- Normothermia or mild hypothermia (core temperature >36.5 C)
- Systolic blood pressure >100 mmHg
- No spontaneous respiration

Examination (all must be checked)
Pupils nonreactive to bright light.
Corneal reflex absent.
Oculocephalic reflex absent (tested only if C-spine integrity ensured).
Oculovestibular reflex absent.
No facial movement to noxious stimuli at supraorbital nerve, temporomandibular joint.
Gag reflex absent.
Cough reflex absent to tracheal suctioning.
Absence of motor response to noxious stimuli in all four limbs (spinally medicated reflexes are permissible).

Apnea testing (all must be checked)
Patient is hemodynamically stable.
Ventilator adjusted to provide normocarbia ($PaCO_2$ 35-45 mm Hg).
Patient preoxygenated with 100% FiO_2 for >10 minutes to PaO_2>200 mm Hg.
Patient well-oxygenated with a positive end-expiratory pressure (PEEP) of 5 cm of water.
Provide oxygen via a suction catheter to the level of the carina at 6 L/min or attach T-piece with continuous positive airway pressure (CPAP) at 10 cm H_2O.
Disconnect ventilator.
Spontaneous respirations absent
Arterial blood gas drawn at 8-10 minutes, patient reconnected to ventilator. PCO2 ≥60 mm Hg, or 20 mm Hg rise from normal baseline value.

OR:
Apnea test aborted.

Ancillary testing (only one needs to be performed) (to be ordered only if clinical examination cannot be fully performed due to patient factors, or if apnea testing inconclusive or aborted)

Cerebral angiogram
HMPAO SPECT
EEG
TCD

Adopted from The American Academy of Neurology 2010©

Trauma Scoring Systems

Multiple trauma scoring systems have been developed over the years . These scores were developed for trauma triage and others were used to evaluate and predict outcomes:

Revised Trauma Score (1989) uses the initial respiratory rate, systolic blood pressure and GCS of the patient. The score has good inter-rater reliability. The higher the score, the higher the probability of survival. The scores range from 0-7.8.

Injury Severity Score (1974) is based on an abbreviated injury score (AIS). Each injury is assigned an AIS score, ranging from 1 (minor) to 6 (lethal). The highest AIS within each of six body regions – head/neck, face, thorax, abdominal/pelvic contents, extremities, external structure – is identified. The ISS=the sum of the square of the three highest of these scores. Scores range from 0-75; any AIS of 6 automatically results in ISS=75. It does not consider age of physiologic status and may misrepresent injury severity when injuries are confined to single body region (e.g. in penetrating trauma). Below is an example of an ISS calculation:

ISS BODY REGION	INJURY	AIS CODE	HIGHTEST AIS	AIS²
HEAD/NECK	Cerebral contusion ICA: complete transection	140604.3 320212.4	4	16
FACE	Ear Laceration	210600.1	1	
CHEST	Rib fractures, left side, ribs 3-4	450220.2	2	
ABDOMINAL	Retroperitoneal hematoma	543800.3	3	9
EXTREMITIES	Fractured femur	851800.3	3	9
EXTERNAL	Overall abrasions	910200.1	1	
				ISS=34

NISS (New Injury Severity Score) considers the three highest AIS scores, irrespective of body region. This improves its predictive power for penetrating injury.

The **TRISS Method** is a logistic regression equation based on the Revised Trauma Score, ISS and age. It also allows for the difference between blunt and penetrating injury.

The **ASCOT** is a severity and characterization of trauma score that is uses components of the Revised Trauma Score but in a separated manner of Glasgow Coma Scale, systolic blood pressure and respiratory rate. It also uses a different scoring system for injury to the different body regions, analogous to the ISS, and also includes age. Predicted outcome is based on logistical regression analysis.

The **APACHE II** (Acute Physiology and Chronic Health Evaluation) is a predictor of mortality derived from a logical equation utilizing both acute and chronic conditions. The acute physiology score includes 12 data points: temperature, mean arterial blood pressure, heart rate, respiratory rate, paO_2, pH, sodium potassium, creatine, hematocrit, white count, and Glasgow coma score (the acute score ranges from 0-72). The chronic score accounts for respiratory failure (asthma, COPD, aspiration), a heart failure (valvular dx, CHF, CAD), liver failure, immunosuppression, age and operative status (elective, emergent, non-operative).

For **APACHE II** calculation: http://www.sfar.org/scores2/apache22.html

For further details: **Trauma Scoring Systems**
www.trauma.org/scores/index.html

Trauma Service Performance Improvement & Patient Safety Plan

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Trauma Service Performance Improvement & Patient Safety Plan

I. Philosophy

Washington Hospital (WH) is dedicated to ensuring the resources and support needed to create and sustain a trauma program that meets the rigorous criteria to be designated as a Level II Trauma Center by Alameda County and the American College of Surgeons Committee on Trauma, as well as anything else necessary to become a highly reliable organization providing expert trauma care.

II. Mission

Our mission is to provide high quality, safe, evidence-based patient care, through physician driven performance evaluation and continuous patient care improvement. Measures of our performance are intended to be transparent for both internal (clinical staff, hospital administrators, and Board of Directors) as well as external (state agencies and the American College of Surgeons) review. Our internal performance improvement process involves a multidisciplinary approach toward rapid problem identification, followed by data-driven analysis, and then coordination and optimization of resources to resolve gaps in performance goals and continuously improve quality of care.

III. Authority/Scope

The Trauma Service is a service of the WH managed according to the MS PIPS Committee.

The Trauma Medical Director is appointed by the Medical Executive Committee to direct the Trauma Performance Improvement (PI) Program. The Trauma Medical Director and the Trauma Program Director are responsible and accountable for developing and maintaining this Performance Improvement and Patient Safety (PIPS) plan that systematically evaluates and ensures that a high standard of medical care is rendered to injured patients. WHHS's Administration, Medical Staff, employees and ultimately the Board of Trustees are responsible and accountable for providing an environment that supports and facilitates the PIPS process

The Trauma Services at WH has two standing committees charged with the responsibility of monitoring and evaluating trauma care and all activities that relate to an injured patient's care. One Committee (PIPS) is appointed by the Medical Executive Committee and is subject to Medical Staff bylaws, rules and policies. Committee information and documents are maintained and used so as to preserve the protection of California Business and Professions Code, Section 1157. The second committee is a hospital committee, the Trauma Operations Committee, established to manage System Issue referrals. A third committee is *ad hoc* and directs any needed PPE to the correct Medical Staff committee. The Service's activities span the injured patient's full continuum of care. The following committees are established and charged with upholding this commitment.

- Performance Improvement and Patient Safety Committee (PIPS) includes the trauma office staff, the Medical Staff members as well as management/ leadership

from other care disciplines and the ED liaison. This committee assists with patient reviews and referral to other committees.

- Trauma Operation Committee is a hospital administrative committee. Medical staff referral of trauma-specific System Improvement referrals will be handled at this committee in conjunction with the MS Professional Practice Evaluation (PPE) Policy & Procedures. This committee includes management/ leadership staff from all care disciplines within Washington Hospital. This committee is charged with identification, review, evaluation and mitigation of system issues.
- When required, The Trauma Medical Director will convene a specific trauma peer review committee that will be a part of WH Medical Staff surgical peer review, ultimately reporting to the Medical Executive Committee.

IV. Credentialing

Physicians will be credentialed and proctored per Medical Staff bylaws, rules, regulations and policies. Additionally, surgeons taking trauma call will meet requirements for ATLS, continuing medical education and committee attendance as set forth by the American College of Surgeons Committee on Trauma and hospital protocols.

The Trauma Program Director in collaboration with Nurse Managers and Nurse Educators and Clinical Nurse Specialist will be responsible for overseeing competency

(credentialing) and continuing education of nurses working with trauma patients.

V. Trauma Patient Population Criteria

The trauma patient is defined as any patient with ICD 10-CM discharge diagnosis of SOO- S99 with 7th character modifiers of A, B, or C only, TO?, Tl4, T20-28 with7th character modifier of A only., T30-T32, T79.Al-T79.A9 with 7th character modifier of A only; excluding the following isolated/superficial injuries as defined by the NTDB inclusion criteria, and/or transferred in, out, admit >23 hr. death in ED.

VI. Data Collection and Analysis

Washington Hospital will see that all patients that meet criteria for entry into the trauma registry are monitored for compliance with or adherence to standards of care as established by the Trauma Service and PIPS. The Trauma Program Director and Trauma Registrar shall maintain the Trauma Registry for data collection, documentation, and tracking patients meeting trauma criteria. The Trauma Registry shall be maintained and used so as to preserve the protection of Section 1157. As part of the registry function, processes of care will be monitored continuously to identify cases to be screened. The PIPS Committee will review identified cases.

Information will include occurrence or audit filter-based issues, provider specific issues, trended data, and system or resource failure problems. Any document generated that includes quality improvement or peer review information shall contain the appropriate warranty of non-disclosure under Medical Staff bylaws and related statutes, including applicable state and federal laws. Individuals taking part in discussions or document preparation shall not disclose the information outside of peer review sessions.

A. Concurrent
   1. Attempts to identify issues at Washington Hospital shall occur daily. Many performance improvement issues will be identified during rounds conducted by trauma staff. Mechanisms used to identify occurrences include, but are not limited to, the following.
      a) Direct visualization of the Resuscitation Record and patient's progress notes
      b) Direct verbal contact with care providers and ancillary personnel

B. Retrospective
   1. Issues are identified by looking at trends in the Trauma Registry Data Base. The Trauma Program Director and/or Trauma Registrar shall produce monthly reports to identify trends.

VII. Process for Monitoring Compliance

A. Standards of Quality Care: Review and monitoring shall occur for all trauma patients that meet criteria for entry into the trauma registry regarding compliance with the standards of quality trauma care as established by the Trauma Service and local, regional and national standards.

B. Death reviews: All trauma related deaths are reviewed as they relate to trauma care and system issues. All mortalities are reported to full PIPS committee.

C. Quality Indicators/Audit filters: Audit filters and Quality Indicators as defined by the ACS-COT and/or the trauma program or trauma system will be monitored, tracked, and reported through PIPS Committee. The Trauma Medical Director will determine and monitor corrective actions consistent with PPE P&P, department of surgery and hospital guidelines and procedures.

   1. Medical Admissions: Injured patients who are admitted to the Medical service will be reviewed by the TMD and TPD at weekly review.
      a) All are expected to have been examined and/or discussed with the trauma surgeon on-call.
      b) If the patient was not being seen by trauma, the case is referred to ED director for review, counseling of staff, and discussion at monthly meetings. The ED director will report on follow-through at the monthly PIPS meeting.
      c) If length of stay is > 7 days review at PIPS will be considered.
   2. Complications: Complications that occur in trauma patients are recorded in the trauma registry and reviewed by the TMD and escalated to PIPS/PPE as appropriate. The PIPS/P P E committee determines appropriate referrals and recommendations if indicated for mitigation. Complications to be monitored will include, but are not limited to, Pulmonary Emboli, Pneumonia, DVT, Decubitus Ulcers, UTI, unplanned intubations, and unplanned admits to ICU.
   3. System Issues: Any issues identified that are not provider related or involve

other sections or departments will be reviewed by TOPIC either independent of PIPS/PPE or supplemental to PIPS/PPE.

VIII. **Review Process**

Processes of care will be monitored continuously by utilizing Quality Indicators/audit filters defined by the regional trauma system, the American College of Surgeons Committee on Trauma, and the PIPS Committee. These cases will be reviewed by the Trauma Program Director (TPD) and Trauma Medical Director (TMD) to determine further action.

A. Daily Review: When a performance improvement issue is identified, an approved quality improvement method will be promptly initiated to resolve the issue with attempts to promptly "close the loop."

1. Issues that affect individual patients can often be resolved concurrently during daily rounds. Trauma staff shall notify the TPD or TMD of issues and begin appropriate follow-up during the remainder of the patient's hospitalization.
   Notes will be made on the Trauma Abstract Form and/or in the Trauma Registry Database (as needed), with the abstract to remain on file in the Trauma Service Administration Offices for not longer than four years.

B. Weekly Review: The Trauma Medical Director or assistant Medical Director shall conduct weekly Trauma meetings and shall include discussion of issues that affect individual patients admitted the week before. These meetings shall also constitute first review of charts that have been flagged through the previously mentioned Quality Indicators/audit filters and determination of cases that should be discussed at the full monthly PIPS committee meeting. Notes from meetings will be documented on the patient abstract form and included in the Trauma Registry section.

1. Identified issues of high significance will be reviewed under the following levels:

C. Levels of Review:

1. Primary: The Trauma Program Director or designee will complete an initial review. After review of all the pertinent information the TPD will determine if the clinical care is appropriate and no issues have been identified or that an issue exists and should be addressed by the TMD and/or PIPS Committee.
2. Secondary: If the TPD identifies a potential clinical care or system issue, the case will be referred to the TMD for expertise, analysis and judgment. This will often but not exclusively take place during weekly trauma division meetings. They may begin further investigation, implement action without formal referral to PPE or system committees, or decide to send it to the appropriate Pl committee or Medical Staff department for further investigation and review. For cases that are referred to committees, follow-up documentation of disposition is to be provided back to the Trauma Service.
3. Tertiary: When the TPD and TMD determine a case will go to trauma committee, they will identify all background information, pertinent protocols

(or lack thereof) and specify individual issues to be discussed. The issue is then formally reviewed by the appropriate committee (PIPS, PPE or Operations, depending on the nature of the case.). The committee may communicate with individual physicians, other clinical sections or departments to request additional data or give input. Determination of judgments will be made by the committee using the criteria below.

4. Quaternary: When a committee identifies an issue that needs to be escalated, it will be sent to Medical Staff committees with appropriate jurisdiction. A summary of their findings will be returned to the trauma office and documented in the trauma registry for follow-up and loop closure.

D. Determination of Judgments: For issues going forward to Level 3 review, PIPS/PPE will render a judgment, with recommendations to the provider's Department or to the hospital administration for System Improvement referrals, regarding the classification of the issue based on TJC Patient Safety Event Tracking. Additionally, mortalities will be classified using one of the following categories as required by the ACS-COT.

1. Unanticipated Mortality with Opportunity for Improvement
2. Anticipated Mortality with Opportunity for Improvement
3. Mortality without Opportunity for Improvement

E. Documentation of Analysis and Evaluation: A specified member of the trauma staff will document and maintain thorough minutes on division review, PIPS, PPE and Trauma Operations issues and enter that determination into the Trauma Registry. The TPM will review minutes and insure appropriate documentation of loop closure in the Registry. A query from the trauma registry will track issues, judgment, recommendations, actions and loop closure.

F. Referral Process for Investigation or Review: Cases determined to require further investigation or judgment by Division Review or PIPS Committee may be referred to the appropriate Medical Staff department via appointed liaisons, committee or department chairpersons for review. A separate Trauma PPE shall be a part of this review. The committee or TMD will review their response to the referral for potential follow-up planning. The Trauma Medical Director may also, at his/her discretion solicit external review of cases with the agreement of the Medical Staff Chief of Staff and hospital administration per MS Bylaws, Policies and Rules.

IX. Performance Improvement Process Committee

A. Structure: PIPS Committee is a multidisciplinary committee created by the Medical Executive Committee and functioning under the auspices of Trauma Medical Director and Trauma Program Director. Monthly reports will be presented to Medical Executive Committee (MEC). Representatives of Quality & Safety will be invited to PPE, PIPS and Trauma Operations meetings on an as needed basis.

B. Goal: The charge of the committee is to evaluate the overall care of trauma patients from a clinical and systems perspective and to perform interdisciplinary implementation of improvement strategies. It is responsible for establishing

objective criteria for identifying issues for review and determining compliance with standard of care. The goal of the committee is to improve patient outcomes through identification and mitigation of opportunities for improvement. The Trauma Program Performance Improvement Coordinator will serve as the coordinator for this activity. The Trauma Medical Director will preside over the meetings.

C. Members: Required members of PPE will include a minimum of all of the Trauma Division staff, Trauma Medical Director, Physician liaisons, Director of Quality, Trauma Program Director, Director of Critical Care, and Emergency Services Director.

D. Meeting Criteria: Members must attend 50% of all meetings. This meeting will occur monthly at the call of the Chair.

E. Location: This meeting will be conducted at the Anderson Auditorium, 2500 building or alternative as needed.

X. Trauma Operations Committee Structure

A. Structure: TOC committee is a multidisciplinary review committee functioning under the auspices of the Trauma Program Director Representatives of Quality & Safety will be invited to PPE, PIPS and TOC meetings.

B. Goal: The charge of the committee is to evaluate the care of trauma patients from a systems perspective and to perform interdisciplinary implementation of improvement strategies. It is responsible for establishing objective criteria for identifying issues for review and determining compliance with standard of care. The goal of the committee is to improve patient outcomes through identification and mitigation of opportunities for improvement. The Trauma Program Director will preside over the meetings with input from the Trauma Medical Director.

C. Members: Members of TOCS will include a minimum of all of the trauma office staff, the Trauma Medical Director, and Trauma Program Director, Representatives of critical care, 6West, intermediate care, respiratory, dietary, Cath lab/ IR, hospital administration, ED, quality, surgical services, rehab, social work and pharmacy will be invited as needed.

D. Meeting Criteria: members must attend 50% of all meeting. This meeting will occur monthly at the call of the chair.

E. Location: WHHS Hybrid

XI. Operational Staff Responsibility for Trauma PI

A. Roles and responsibilities: for operational support of trauma performance improvement:

I. The TMD and TPD maintain responsibility for trauma performance improvement and its integration into hospital quality programs. They receive data support

from the trauma registrar(s) and other trauma staff. The TMD monitors this process. Representatives from other clinical and hospital departments as well as the hospital Patient Safety and Quality will participate when appropriate. This ensures multidisciplinary collaboration and compliance with hospital regulations.

2. The TMD is responsible for chairing the PIPS Committees, and constituted Trauma PPE and also for the initial review of all physician related issues including all deaths and screened complications. The TMD is responsible for coordinating performance improvement activity relative to clinical departments and/or physicians as well as associated remedial action. Trauma surgeons will be reviewed annually. The review will include a physician report card generated quarterly by the TPD utilizing registry data.
3. The TPD is responsible for identification of issues and their initial validation, the maintenance of PI data in the trauma registry and protecting confidentiality, facilitating data trends and analysis, and coordinating surveillance of protocols, guidelines, clinical pathways established by trauma and related departments within the hospital. The TPD is assisted by the trauma registrar and any other trauma clinicians, e.g. midlevel providers, included in care of trauma patients.
4. The Trauma Registrar interfaces with the TPD and TMD to assist with identification of issues using registry filters and compilation of reports to support the PI process

B. Corrective Action Planning: The TMD oversees all corrective action planning and implementation. Structured plans may be created by any of the PPE, PIPS, or Trauma Operations committee members in an effort to improve sub-optimal performance, including root cause analysis. The goal is to create ongoing improvement through demonstrable outcome changes that lead to loop closure. Evaluation and re-evaluation are part of that process using plan methodology of plan, do, check, act (PDCA). Re-evaluation and trending will be demonstrated through the trauma registry. Corrective action, per the MS PPE Policy for physicians and APP, or through the hospital policies for hospital staff personnel, may include:

- Education
- Referral to department or hospital committee
- Trending
- Protocol or guideline
- Counseling
- Proctoring/change in privileges or credentials
- Focused audit
- External review
- Enhanced methods of communication
- Establishing ad hoc committee or task force

C. Confidentiality Protection: All performance improvement activities and related documents will be considered confidential and protected as specified by Washington Hospital administrative and Medical Staff policies, and HIPAA.

XII. Loop Closure/Event Resolution and Re-evaluation

A. Loop closure/Event resolution is achieved when change or correction of behavior has been identified through various means and no further action is required. These may include:
- Completion of education as documented in department meeting minutes or by attendance at lectures or conferences;
- Changes in guidelines, process or procedure has been developed and implemented;
- Counseling or disciplinary action has been taken and documented;
- PI issues may be monitored for trends and readdressed if repeat occurrences are identified.

B. Loop closure/Event Resolution will be reported at PIPS Committee and/or TOC at least annually. These will include measures and trend analysis where applicable. Within their scope of authority, the Trauma Medical Director and Trauma Program Manager are ultimately responsible to insure processes have been completed for loop closure/event resolution.

I. All areas of the hospital may be involved in the developmental process of loop closure/event resolution and involves the organized Medical Staff and hospital department/service managers or, when necessary, senior executive leadership. Documentation of loop closure/event resolution is maintained in the trauma office and the trauma registry.

XIII. Integration into Hospital Performance Improvement Process

The Trauma PI program provides a multi-disciplinary and multi-departmental approach to reviewing quality of patient care across all departments and divisions. PIPS Review and Trauma Operations Committees are integrated and collaborate with the appropriate Medical Staff and hospital committees as needed and as dictated by Medical Staff and hospital quality directives.

Addendum A

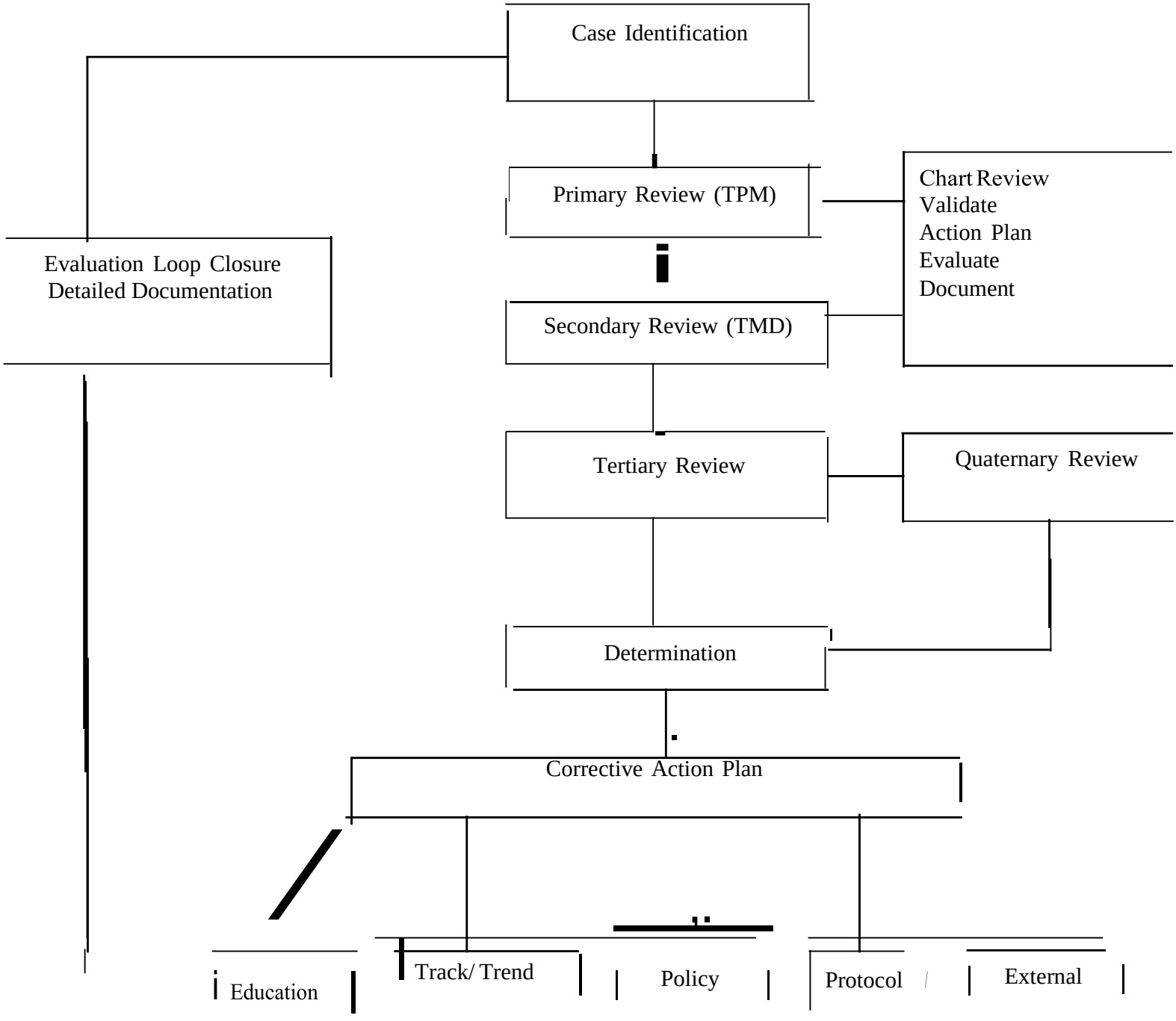
Quality Indicators/ Audit Filters

The following issues will be monitored and reviewed as described in Review Process XIII. B above and brought to the appropriate Committee as they occur or as deemed necessary by the Trauma Medical Director for other PPE or hospital committee review. The primary issues and calendar of review for current issues facing the institution have been separated from this list and defined below.

1. Referring hospital issue
2. Scene time >20 min
3. No pre-hospital vital signs
4. Lack of spinal precautions
5. Unable to intubate in field
6. No trip form/incomplete documentation
7. Delay in trauma activation/altered trauma priority
8. ED LOS; >2 hrs. (level I) *I* >6 hrs. (level **II)**
9. Any ED documentation issue (MD or NSG)
10. Undertriage
11. No head CT in ED: Patient on anticoagulants with reported/witnessed/evidence of head injury
12. MTP activated
13. Patients with GCS <8 without airway
14. Any transfer out (specify reason)
15. Admit to non-surgical service
16. Trauma consult not requested
17. No specialty consult requested (ortho/NS/etc) specify
18. Any readmission <30 days
19. Multi-system traumatically injured patient admitted to any ICU
20. Delay in OR availability
21. Anesthesia response time >30 min
22. Any other OR system issue
23. Craniotomy >4 hrs for epidural/subdural; excluding ICP monitoring
24. Exploratory lap > 1 hr with hypotension or >4 hrs without
25. Abd/thoracic/vascular/crani surgery >24 hrs
26. Open fractures without antibiotics >60 minutes
27. Neurosurgical response >30 min epidural hematoma >30 CM3 with GCS <8
28. Ortho response >30 min: type Illopen fx/compartment syndrome
30. Delay in TS response >15 min (level I) and >2 hrs (level **II)**
31. Change in interpretation of radiologic imaging
32. JR response >30 min when responding from outside of hospital

33. Fall during hospitalization
34. Any MD or NSG documentation issue (specify)
35. ETOH >0.08 or + Screening tool with no substance abuse intervention
36. Line or tube pulled by patient
37. No pharmacologic VTE prophylaxis within 48 hrs with no contraindication documented
38. SS 2:: 25
39. Any delay or error in assessment/diagnosis/treatment (specify)
40. Other
41. Death

Addendum B


Case Identification
Primary Review (TPM)
Chart Review
Validate
Action Plan
Evaluate
Document
Evaluation Loop Closure
Detailed Documentation
Secondary Review (TMD)
Tertiary Review
Quaternary Review
Determination
Corrective Action Plan
Education
Track/ Trend
Policy
Protocol
External

Washington Hospital Healthcare System

SINCE 1948

Memorandum

DATE: June 20, 2024

TO: Washington Township Health Care District Board of Directors

FROM: Ed Fayen, Executive Vice President

SUBJECT: Budget for the Morris Hyman Critical Care Pavilion Infill Project

Upon completion of the MHCCP in November of 2018, 58,895 square feet of unimproved shell space remained in the building for future development. We are currently awaiting final HCAI approval of the design drawings for the buildout of this shell space.

The Infill Project will include the buildout of new Operating Room, Central Sterile Processing, Imaging, and Pharmacy departments. The Security department will be relocated as part of the project. The Operating Room and Imaging departments are medical equipment intensive; the equipment investment in this project will be more than twice what the MHCCP project required.

The Operating Room department is made up of 8 OR's, including 3 Hybrid OR's (one each for Cardiac Surgery, Neurosurgery, and Trauma). The Central Sterile Processing department will be located directly below the operating rooms with separate "clean" and "dirty" elevators. The Imaging department will include all current modalities, and a 3T MRI in the acute care building for the first time, to better serve stroke, trauma, and neurosurgery patients. The pharmacy department will have two separate, sterile compounding rooms with state-of-the-art hoods.

The budget for the Morris Hyman Critical Care Pavilion Infill Project is as follows:

Construction Cost	42,621,610
Design Contingency	3,185,670
Construction Contingency	4,242,633
Owner Contingency	2,121,316
Total Construction	**$52,171,229**
Design Cost	8,769,516
Project Management	2,299,871
Total Design/Project Management	**$11,069,387**
OSHPD Costs	1,611,079
Testing and Inspection	1,612,541

Washington Hospital Healthcare System
SINCE 1948

Memorandum

Total Permits, Testing and Inspection	**$3,223,620**
Medical Equipment	15,364,559
IT Equipment	635,934
Furniture, Fixture and Equipment	5,000,000
Total Equipment	**$21,000,493**
Total Infill Project Budget	**$87,464,729**

The Infill Project (except for equipment and furniture costs) will be paid for with General Obligation Bond funds from Measure XX, approved by District voters on November 3, 2020.

I recommend the Board pass Resolution No. 1264, approving the $87,464,729 Project Budget for the Morris Hyman Critical Care Pavilion Infill Project, and direct the CEO to execute the proper documents and notifications to seek competitive bids for this project.

RESOLUTION NO. 1264

RESOLUTION OF THE BOARD OF DIRECTORS OF WASHINGTON TOWNSHIP HEALTH CARE DISTRICT TO APPROVE THE BUDGET FOR THE MORRIS HYMAN CRITICAL CARE PAVILION INFILL PROJECT

WHEREAS, Washington Township Health Care District is a local health care district ("District") that owns and operates a general acute care hospital and provides essential healthcare services to the population residing within the District's political boundaries, including the cities of Fremont, Newark, Union City, parts of South Hayward and Sunol;

WHEREAS, the Board previously determined that it would be necessary to build in unused shell space in the basement and on the first floor of the Morris Hyman Critical Care Pavilion (the "MHCCP Infill Project") to support the expansion of services offered by the District;

WHEREAS, the MHCCP Infill Project will include the buildout of the new Central Sterile Processing, Imaging, Pharmacy, and Operating Room Departments.

WHEREAS, the Operating Room Department will consist of 8 Operating Rooms, including 3 Hybrid Operating Rooms (one each for Cardiac Surgery, Neurosurgery, and Trauma). The Central Sterile Processing Department will be located directly below the operating rooms with separate "clean" and "dirty" elevators. The Imaging Department will include all current modalities and, for the first time in Hospital history, will include a 3T MRI in the acute care building to serve stroke, trauma, and neurosurgery patients. The Pharmacy Department will have two separate, sterile compounding rooms with state-of-the-art hoods.

WHEREAS, the total budget for MHCCP Infill Project is estimated to be $87,464,729, including $21,000,493 in equipment costs;

WHEREAS, General Obligations funds from Measure XX (approved by the voters on November 3, 2020) will be used to pay for the MHCCP Infill Project, not including the equipment costs. Equipment costs will be funded separately;

NOW, THEREFORE, be it resolved that:

1. The Board approves the total estimated budget for the MHCCP Infill Project in the amount of $87,464,729.

2. The Board authorizes the Chief Executive Officer to proceed with the necessary next steps to complete the MHCCP Infill Project, including executing necessary notifications to seek competitive bids for the MHCCP Infill Project and

3. The Chief Executive Officer is hereby authorized to enter into any agreement necessary to carry out the intent of this Resolution and to take any and all further actions which, in the determination of the Chief Executive Officer, are necessary and proper to effectuate the intent of this Resolution.

Passed and adopted by the Board of Directors of the Washington Township Health Care District this 26th day of June, 2024 by the following vote:

AYES:

NOES:

ABSENT:

JACOB EAPEN, M.D. President, Board of Directors Washington Township Health Care District	BERNARD STEWART, DDS Secretary, Board of Directors Washington Township Health Care District

Washington Hospital Healthcare System

Washington Hospital Budget Estimate

FY 2025

DIRECTORS AND OFFICERS

WASHINGTON TOWNSHIP HEALTH CARE DISTRICT
2000 Mowry Avenue
Fremont, California 94538
(510) 797-1111

BOARD OF DIRECTORS

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ADMINISTRATION

KIMBERLY HARTZ
Chief Executive Officer

MEDICAL EXECUTIVE COMMITTEE

2024 - 2026

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Chief of Staff

AARON BARRY, M.D.
Chief of Staff – Elect

SHAKIR HYDER, M.D.
Immediate Past Chief of Staff

RANJANA SHARMA, M.D.
Medical Staff Liaison Officer

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Department of Anesthesiology

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KADEER HALIMI, M.D.
Chairperson
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JESSIE XIONG, M.D.
Medical Director of Pathology

BRIAN SMITH, M.D.
Chief Medical Information Officer

JOHN ROMANO, M.D.
Chief Medical Officer
PPEC Liaison Officer
Physicians Well-Being Committee

WASHINGTON HOSPITAL

TABLE OF CONTENTS

MISSION STATEMENT

As the local Health Care District, our mission is to meet the health care needs of the District residents through medical services, education and research.

Within this scope, Washington Township Health Care District is committed to assuming the leadership role in improving and maintaining the health status of the residents by:

Identifying and assessing community health care needs.

Developing mechanisms to respond to the identified needs within the financial capabilities of the District.

Committing to a culture of patient safety and accountability.

Adopting identified best practices.

Providing access to high quality, cost-effective health services through an integrated delivery system.

Partnering with a diverse medical staff, academic medical centers and other providers to meet the health care needs of the District residents.

Providing appropriate employee, professional and community educational resources to enhance patient care and health promotion throughout the District.

To support the fulfillment of the mission, the District's strategic vision is to be the regional medical center of Southern Alameda County offering services that span the full range of care within the available financial resources.

Resolved by the Board of Directors
Washington Township Health Care District
April 22, 2020

WASHINGTON HOSPITAL
BUDGET ESTIMATE

(In thousands)

I.	REVENUE			$649,607
	A. Net Operating Revenue		$621,752	
	Patient Revenue	$2,640,859		
	Less: Contractual Allowances and Provisions	2,036,103		
	Net Patient Revenue	604,757		
	Other Operating Revenue	16,995		
	B. Net Non-Operating Revenue		$27,857	
	Investment Income	$6,917		
	Rental Income, Net of Amortization	941		
	General Obligation Bond Property Tax Revenue	16,476		
	Foundation Donation	3,521		
II.	EXPENDITURES			$649,607
	A. Operating Expenditures		$617,633	
	Salaries, Wages & Benefits	$385,776		
	Supplies & Services	181,199		
	Insurance	4,052		
	Utilities	7,838		
	Reserves - Depreciation	38,768		
	B. Non-Operating Expenditures		$31,974	
	Plant & Equipment	$38,349		
	General Obligation Bond Debt Service	19,577		
	Revenue Bond Debt Service	15,665		
	Funding of Affiliate Operations, Net	27,854		
	Reserves - Capital & Operations	(69,472)		

INCOME STATEMENT

(In thousands)	Projected* FYE 2024	Budget FY 2025	Change	Percent Change
Patient Revenue				
Inpatient	$ 1,385,780	$ 1,555,804	$ 170,024	12.3%
Outpatient	1,026,850	1,085,055	58,205	5.7%
Total Patient Revenue	**$ 2,412,631**	**$ 2,640,859**	**$ 228,229**	**9.5%**
Contractual Allowances	(1,812,536)	(1,987,622)	(175,086)	-9.7%
Provisions for Charity and Doubtful Accounts	(43,553)	(48,481)	(4,928)	-11.3%
Total Contractual Allowances and Provisions for Charity and Doubtful Accounts	(1,856,089)	(2,036,103)	(180,014)	-9.7%
Contractual Allowances as a % of Revenue	75.1%	75.3%		
Provision for Charity and Doubtful Accounts as a % of Revenue	1.8%	1.8%		
Net Patient Revenue	**$ 556,542**	**$ 604,757**	**$ 48,215**	**8.7%**
Other Operating Revenue	11,514	16,995	5,481	47.6%
Net Operating Revenue	**$ 568,056**	**$ 621,752**	**$ 53,696**	**9.5%**
Operating Expenses				
Salaries	270,802	290,731	(19,929)	-7.4%
Benefits	91,373	95,045	(3,673)	-4.0%
Professional Fees	44,810	50,385	(5,575)	-12.4%
Supplies	74,983	84,250	(9,267)	-12.4%
Purchased Services	28,229	31,062	(2,834)	-10.0%
Utilities	6,398	7,838	(1,440)	-22.5%
Insurance	4,035	4,052	(16)	-0.4%
Marketing & Advertising	427	1,408	(982)	-230.2%
Software Licenses & Maintenance	7,405	8,458	(1,053)	-14.2%
Other Expenses	2,803	5,636	(2,833)	-101.1%
Depreciation	39,350	38,768	582	1.5%
Total Operating Expenses	**$ 570,614**	**$ 617,633**	**$ (47,019)**	**-8.2%**
Income from Operations	**$ (2,558)**	**$ 4,119**	**$ 6,677**	**261.0%**
Operating Margin	**-0.5%**	**0.7%**		
Net Non-Operating Income & Expense				
Investment Income	8,141	6,917	(1,224)	-15.0%
General Obligation Bond Property Tax Revenue	16,656	16,476	(180)	-1.1%
Interest Expense	(21,355)	(19,796)	1,558	7.3%
Rental Income, Net	937	941	5	0.5%
Bond Issuance Cost	(2,567)	-	2,567	100.0%
Realized Gain/(Loss) on Investments	3,308	2,507	(802)	-24.2%
Unrealized Gain/(Loss) on Investments	-	-	-	-
Foundation Donation	8,121	3,521	(4,600)	-56.6%
Federal Subsidies	2,700	2,110	(590)	-21.8%
Total Net Non-Operating Income & Expense	**$ 15,942**	**$ 12,676**	**$ (3,266)**	**-20.5%**
Net Income	**$ 13,384**	**$ 16,795**	**$ 3,411**	**25.5%**
Net Margin	**2.4%**	**2.7%**		
Net Loss of Affiliate Operations	**$ (26,518)**	**$ (27,854)**	**$ (1,336)**	**-5.0%**
Total Net Income / (Loss)	**$ (13,134)**	**$ (11,059)**	**$ 2,075**	**15.8%**

** Projected equals FYTD 2024 April Annualized*

Washington Hospital Healthcare System
2000 Mowry Avenue, Fremont, California 94538-1716 | 510.797.1111
www.whhs.com

DATE: June 26, 2024

TO: Washington Township Health Care District Board of Directors

FROM: Kimberly Hartz, Chief Executive Officer

SUBJECT: Proposed Fiscal Year 2025 Budget Estimate for the Washington Township Health Care District

The Budget Estimate for Fiscal Year 2025 will be presented to the Board of Directors at the June 26, 2024 meeting. Upon approval by the Board of Directors, the Budget will constitute authority for the Chief Executive Officer to meet the financial obligations of the Washington Hospital Healthcare System within available funds, in accordance with the District's Mission Statement, applicable laws, regulations, procedures and precedents pertaining to the District.

The FY 2025 Budget for Washington Hospital provides for net operating revenue in the amount of $621,751,510 and total operating expenses of $617,632,756. This year, total depreciation is budgeted at $38,767,537. As a result, we are projecting a net operating income of $4,118,754. Capital spending requests are budgeted at $38.3M. These capital requests will be funded with $18M from bond proceeds and donations, as well as $20M from the District's cash flow. In addition, the proposed FY 2025 Budget Estimate includes $27,854,000 to fund operations of the Washington Township Hospital Development Corporation and Washington Township Medical Foundation. These two entities are integral to meeting our goal of continuing to improve the health of District residents.

The operational and financial challenges of the past few years, marked by the pandemic, prompted the System to re-evaluate our growth plans and embark on a "Road to Recovery." Starting in FY22, we focused on stabilizing and optimizing the operations of the organization, building the needed infrastructure, and recapturing patient volumes that had diminished during the height of the pandemic, as patients delayed accessing care. The System worked diligently in FY23 and FY24 towards these goals in spite of the economically challenged environment. Highlights from FY24 include our growth in Oncology resulting in an additional $8M in net operating income and surpassing our $10M fundraising goal set by the Washington Hospital Healthcare Foundation for our new Regional Cancer Center. We continued to make integral improvements in Revenue Cycle resulting in improved collection rates.

However, our biggest achievement in FY24 was the successful preparation and survey process to be the county's newest regional Trauma center. This could not have been done without the effort of all our WHHS staff and physicians. The hard work and dedication across multiple areas has ensured that as of July 1, 2024, we will be ready to take our first Trauma patients. Everyone worked tirelessly to complete education and drills, ensure we have the appropriate supplies and equipment and update needed policies and procedures. We are ready to provide the community with this much needed service with the upmost dedication to our Patient First Ethic. Our journey doesn't end on July 1st when we see our first patient. Trauma care is a continuous journey, one that requires ongoing commitment, dedication and improvement.

While we had wins and losses along our three-year Road to Recovery, we feel the organization is ready to move to a more forward-thinking outlook. For FY25, we will be transitioning to a Strategic Long Range Financial Plan (LRP). A LRP uses our three-to-five-year strategic plan and integrates this into our budget planning, cash management, and operational forecasts. This plan will detail out specific initiatives along with a robust pro forma and valuation, as well as an informed and decisive operational execution plan that moves us to a break-even consolidated net operating income. The LRP will include initiatives on Revenue Integrity, Operational and Labor Efficiencies, as well as Targeted Strategic Growth initiatives, while never losing sight of our Patient First Ethic. These efforts will require our staff, our physicians, and our management team to work closely and collaboratively in order to achieve results that are crucial to our viability, future success and sustainability.

Washington Hospital Healthcare System
2000 Mowry Avenue, Fremont, California 94538-1716 | 510.797.1111
www.whhs.com

Even as we work to achieve these operational improvements and meet the needs of our District and community today, we're also keeping our focus on the road ahead. We are taking steps to grow and expand the services our community will need tomorrow, by making the required investments today. We continue to focus on new growth and building scalable infrastructure to accommodate this growth in our strategic service lines.

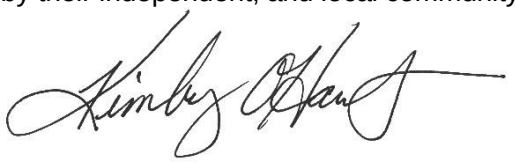
In FY25, we're starting construction on the Regional Cancer & Infusion Center, as well as one of two planned Urgent Care Clinics, that will serve our population's emergent health needs while relieving the pressure on our Emergency Room. In addition, we will begin construction on the remaining space in Morris Hyman Critical Care Pavilion (our Infill Project) that will house key departments including the Operating Rooms, Imaging Center and Pharmacy. Phase 3 of the Facility Master Plan is in final design phase and will be ready to start construction in FY26. This will ensure that we meet the California Seismic requirements and provide state of the art facilities for the community. These and other capital initiatives are vital to maintaining the high level of care we provide to our community well into the future. We are extremely thankful to our community for supporting this next phase of our Facility Master Plan.

Along with our physical assets, we also continue to prioritize our people. We do this through Physician and staff recruitment and retention, to serve our community with the best talent available as we grow important clinical service lines. We continue to see strong growth in our cancer care services year over year. We have expanded our orthopedic service line and have partnered with our physicians to further expand into additional clinic space and outpatient surgery centers. Oncology, Orthopedics, Neurosciences, Cardiac, and Maternal Child Health continue to be key areas for the organization.

As we move into FY25, we'll continue to deal with a very challenging and difficult health care environment. Couple this with inflationary pressures creating significant escalation in our cost of labor, pharmaceuticals, and supplies.

Overall, the FY25 budget provides the resources necessary to sustain and further the clinical excellence we provide here at Washington Hospital Healthcare System. It also supports our institutional commitment to be your Provider of Choice for health services.

Maintaining our financial health is essential to caring for our community, investing in new technologies and services, and preparing for the future, including any unexpected emergency. We are confident that the hard work, resilience, and compassion shown by our staff and physicians each and every day, will ensure that even during uncertain and difficult times, the health care needs of our patients will be met and exceeded by their independent, and local community healthcare system.



Kimberly Hartz
Chief Executive Officer

PLANS AND PRIORITIES

The major strategic initiatives for Fiscal Year 2025 are:

- Drive Continuous Improvements in Quality and Safety
- Continue to implement Strategies in Utilization Management, Care Coordination, and Revenue Cycle
- Optimize Payer Contracting Reimbursement Rates
- Leverage Mission Critical Technology to Enhance Patient Experience, and reduce overall denials
- Continue appropriate Cost Savings Initiatives, including Labor Productivity, Vendor Consolidation, and Standardizing and Centralizing Operational Functions
- Implement next phase of our campaign to refresh the WHHS brand
- Retain focus to provide high quality patient care with the opening of the new Trauma center
- Strategic growth initiatives (including partnerships and joint venture agreements)
    - Cancer Care Services, Cath Lab, Cardiac and Neuro Programs, and Urgent Care
- Capital Investments in our future, including the Expansion of Patient Services (In-Fill Project) and relocating WTMF into the Fremont Office Center (FOC)

These priorities have been included in the budget.

SERVICE VOLUMES

Discharges for FY25 are budgeted to increase 13%, driven by anticipated growth due to Trauma designation.

Corresponding to the expected increase in discharges and partially offset by the expected decline in average length of stay, Patient Days are expected to increase 11%. The average length of stay is projected to decrease by 1.8%, due to ongoing care coordination and utilization management efforts.

Surgical cases overall are budgeted to increase by 20% driven primarily by Trauma. The anticipated growth is partially offset by the expected decline in joint replacement cases, which migrated to our existing and new outpatient surgery centers.

Total Cath Lab cases are budgeted to increase by 16%, driven by increases in cardiac and peripheral cases.

Outpatient visits continue to outperform the budget and will continue to grow. The anticipated growth is in imaging services and emergency room.

These changes are reflected in revenues, reimbursement and expenses in this Budget.

PATIENT REVENUES

Gross patient revenue is expected to increase 9.5% due to the volume increases as outlined above and to the new Trauma cases expected.

The contractual write-off and provision for doubtful accounts percentage is increasing to 77.1%

contractual adjusted rate mainly due to the run rate of government payors increasing over FY24 and anticipating that trend to continue into FY25 as well as being conservative in trauma reimbursement assumptions. However, initiatives in the revenue cycle will help offset some of the shift to government payors.

As a result, Net Patient Revenue is expected to increase by 8.7%.

OTHER OPERATING REVENUES

The 47.6% increase in other operating revenues is primarily driven by directed payment program, and payor rate changes.

OPERATING EXPENDITURES

Significant factors influencing the overall 8.2% increase in operating expenditures for the budget year are as follows:

- Salaries and Wages are expected to increase 7.4% due to wage inflation and increases in FTEs related to Trauma
- Employee Benefits are expected to increase 4.0% mostly driven by the increase in Salaries and Wages
- Professional fees are expected to increase 12.4% primarily due to market-based rate increases to recruit and retain physicians (especially in the area of Anesthesia) as well as cost related to the development of the Trauma program
- Supplies are expected to increase 12.4% due to increased volume related to Trauma and inflation especially in the pharmaceutical drug area
- Purchased Services are expected to increase 10% due to costs related to the Trauma program development, increase in security services, and an expected increase in recruitment fees
- Utilities are expected to increase 23% due mainly to inflation in energy cost
- Insurance is expected to remain relatively flat as premiums remain consistent
- Marketing & Advertising is expected to increase 230% as the System implements its re-branding efforts, as well as begins advertising related to the new Trauma Program
- Software Licenses & Maintenance is increasing 14.2% due to inflation and annual fees for the 70+ applications
- Depreciation is decreasing 1.5% as certain assets have been fully depreciated and GASB reclasses that occurred in FY24 impacted overall amount

NON-OPERATING INCOME

- Investment income is projected to decrease 15% given the volatility of the markets
- Rental income is estimated to remain flat
- As part of the District's continuing budget policy, realized and unrealized gains or losses on the investment portfolio are not budgeted due to the unpredictability of market performance
- General Obligation Bond Property Tax Revenue of $16.5 million provides for the debt service requirements on our General Obligation Bonds for the year
- The Washington Hospital Healthcare Foundation (Charitable Foundation) is expected to provide $3.5M in donations for various capital and operational needs of the hospital
- Interest Expense is expected to remain flat

AFFILIATE OPERATIONS

- The FY 2025 Budget Estimate includes support for Washington Township Medical Foundation (WTMF), DEVCO and our other affiliates' operations. This support will represent a projected Total Net Income loss of $11.1M, which is approximately a $2.1M improvement over projected FYE24.

VOLUMES

	Projected FYE 2024	Budget FY 2025	Change	Percent Change
Discharges	10,598	11,991	1,393	13.1%
Patient Days	57,589	63,911	6,322	11.0%
Average Daily Census (ADC)	157	175	18	11.3%
Outpatient Observation Days	3,994	4,873	880	22.0%
Average Length of Stay	5.4	5.3	(0.1)	-1.8%
Deliveries	1,502	1,531	29	1.9%
Surgical Cases	5,632	5,885	253	4.5%
Joint Replacement Cases	2,291	2,289	(2)	-0.1%
Cardiac Surgical Cases	138	151	13	9.4%
Neuro-Surgical Cases	309	347	38	12.3%
Endoscopy Cases	1,360	1,353	(7)	-0.5%
Other Surgical Cases	1,144	1,269	125	10.9%
Vascular Cases	390	476	86	22.1%
Cath Lab Cases	2,088	2,420	332	15.9%
Cardiac Cases	1,048	1,207	159	15.2%
Peripheral Vascular Cases	400	485	85	21.3%
Neuro-Radiology Cases	62	71	9	14.5%
Non-Vascular Cases	578	657	79	13.7%
Emergency Room Visits	60,376	65,163	4,787	7.9%
Trauma Cases	-	850	850	-
Outpatient Visits	103,187	107,049	3,862	3.7%

PERFORMANCE INDICATORS

	Projected FYE 2024	Budget FY 2025	Percent Change
Productivity			
Total Productive FTEs*	1,444.9	1,557.4	-7.8%
Non-Productive FTEs	213.9	204.5	4.4%
Total Paid FTEs	1,658.8	1,761.9	-6.2%
Paid FTEs/Adjusted Occupied Bed	6.06	5.93	2.1%
Productive FTEs/Adjusted Occupied Bed	5.27	5.24	0.7%
Financial Indicators			
Contractual Allowances as a % of Revenue	75.1%	75.3%	
Provision for Charity & Doubtful Accounts as a % of Revenue	1.8%	1.8%	
Supplies/Net Patient Revenue %	13.5%	13.9%	
Operating Margin	-0.5%	0.7%	
Net Margin	2.4%	2.7%	

** Of the 1,557 Productive FTEs, 104 are due to Trauma Volume and will continue to flex based on actual Trauma cases.*

HOSPITAL REVENUE

(In thousands)	Projected FYE 2024	Budget FY 2025
Patient Revenue:		
Inpatient	$ 1,385,780	$ 1,555,804
Outpatient	1,026,850	1,085,055
Total Goss Revenue	**$ 2,412,631**	**$ 2,640,859**
Contractual Allowances and Provisions:		
Contractual Allowances by Payors	(1,812,536)	(1,987,622)
Provision for Charity and Doubtful Accounts	(43,553)	(48,481)
Total Contractuals and Provisions for Charity and Doubtful Accounts	**$ (1,856,089)**	**$ (2,036,103)**
Net Patient Revenue	**$ 556,542**	**$ 604,757**
Other Operating Revenue	**$ 11,514**	**$ 16,995**
Total Operating Revenue	**$ 568,056**	**$ 621,752**
Total Net Patient Revenue as a Percent of Gross Revenue	**23.1%**	**22.9%**

OPERATING EXPENSES

(In thousands)	Projected FYE 2024	Budget FY 2025	Percent Change
Salaries	$ 270,802	$ 290,731	-7.4%
Benefits	91,373	95,045	-4.0%
Professional Fees	44,810	50,385	-12.4%
Supplies	74,983	84,250	-12.4%
Purchased Services	28,229	31,062	-10.0%
Utilities	6,398	7,838	-22.5%
Insurance	4,035	4,052	-0.4%
Marketing & Advertising	427	1,408	-230.2%
Software Licenses & Maintenance	7,405	8,458	-14.2%
Other Expenses	2,804	5,636	-101.0%
Depreciation	39,350	38,768	1.5%
Total Operating Expenses	**$ 570,615**	**$ 617,633**	**-8.2%**

NON-OPERATING INCOME & EXPENSE

(In thousands)	Projected FYE 2024	Budget FY 2025	Percent Change
Investment Income	$ 8,141	$ 6,917	-15.0%
General Obligation Bond Property Tax Revenue	16,656	16,476	-1.1%
Interest Expense	(21,355)	(19,796)	7.3%
Rental Income, Net	937	941	0.5%
Bond Issuance Cost	(2,567)	0	-100.0%
Foundation Donation	8,121	3,521	-56.6%
Federal Subsidies	2,700	2,110	-21.8%
Subtotal	$ 12,634	$ 10,169	-19.5%
Realized Gain/(Loss) on Investments *	3,308	2,507	24.2%
Unrealized Gain/(Loss) on Investments *	0	-	-
Total Net Non-Operating Income & Expense	**$ 15,942**	**$ 12,676**	**-20.5%**

* Washington Hospital does not budget for gains or losses on investments.

CAPITAL BUDGET

(In thousands)		Budget FY 2025
Strategic Capital Projects		
Warm Springs Buildout Phase 1	$	4,000
Phase 3 - Design, Permitting, & Construction - Hospital		3,000
Cancer and Infusion Center Redesign		8,000
Morris Hyman Critical Care Pavilion (MHCCP) Infill Project		7,000
Various Rental Property Tenant Improvements		3,000
Urgent Care Clinics		2,500
Enterprise ERP System		2,200
Total New Capital Request	**$**	**29,700**
Routine Capital Equipment and Projects		
Enterprise Storage Replacement	$	1,900
Stryker System 9 Power Equipment Upgrade (Trauma)		1,500
Alaris Pump and Server replacement per FDA Notice		1,168
Enterprise Backup System Replacement		502
Philips Volcano Ultrasounds		331
WHHS Equipment Refresh		275
Sonopet Replacement		65
GE NextGen LOGIQ ultrasound		63
Copiers		50
Gamma Probe Replacement		42
Alaris Server Support Space		42
Hillrom Labor Beds		42
Steris Surgical Tables		36
Transthoracic 3D cardiac ultrasound transducer for the OR		32
Telecom Refresh		20
Philips VS30 montitor		18
Viza Vue Modified Barium Swallow (MBS) Chair		17
EKG machine 15-lead		16
Chairs		12
Draeger Transcutaneous Bilimeter		9
Impulse 7000DP analyzer		9
Other Capital Projects		2,500
Total Routine Capital Equipment and Projects	**$**	**8,649**
Total Capital Spend	**$**	**38,349**

RESOLUTION NO. 1265
BUDGET ESTIMATE
FY 2024-2025

BE IT RESOLVED, that the following be, and the same is hereby adopted as the estimate of the Board of Directors as the amount of money required for the Fiscal Year 2024-2025:

SALARIES, WAGES & BENEFITS	$385,776
SUPPLIES & SERVICES	181,199
INSURANCE & UTILITIES	11,890
RESERVES – DEPRECIATION	38,768
FIXED ASSETS	38,349
REVENUE BOND PRINCIPAL & INTEREST	15,665
GENERAL OBLIGATION BOND PRINCIPAL & INTEREST	19,577
FUNDING TO AFFILIATED OPERATIONS	27,854
RESERVES – CAPITAL & OPERATIONS	<69,472>
TOTAL	$649,607

AND, BE IT FURTHER RESOLVED that WASHINGTON TOWNSHIP HEALTH CARE DISTRICT shall, for the benefit of the communities served by the District, continue to financially support WASHINGTON TOWNSHIP HOSPITAL DEVELOPMENT CORPORATION in its operations to promote the charitable and community service mission of the District.

PASSED AND ADOPTED by the Board of Directors of WASHINGTON TOWNSHIP HEALTH CARE DISTRICT this 26TH day of June, 2024, by the following vote:

AYES:

NOES:

ABSENT:

_____	_____
JACOB EAPEN, MD President of the Washington Township Health Care District Board of Directors	BERNARD STEWART, DDS Secretary of the Washington Township Health Care District Board of Directors

Washington Hospital Healthcare System

SINCE 1948

Memorandum

DATE: June 14, 2024

TO: Kimberly Hartz, Chief Executive Officer

FROM: Ed Fayen, Executive Vice President

SUBJECT: **Bids for the UCSF-WHHS Cancer Center Project**

The Board approved the budget for this project on July 26, 2023. The UCSF-WHHS Cancer Center Project was advertised to a group of pre-qualified general contractors. Nine contractors were pre-qualified for the project and participated in the Bid Walk. Boldt, Clark, Dome Construction, and Rudolph & Sletten declined to bid on the project.

Five contractors submitted construction bids that were opened on June 11, 2024. Four of the five bids were verified and found to be complete. One pre-qualified bidder was late to the Bid Opening and was disqualified.

The four bids are as follows:

XL Construction	$11,741,656
Herrero	$11,798,443
Deacon Construction	$11,985,786
James R. Griffin	$12,594,279

After careful review of all submitted bids, it has been determined that **XL Construction**, of Milpitas, California is the most responsible bid for this project. This bid falls within the construction budget approved by the Board of Directors.

It is requested that the Board of Directors accept the bid received from XL Construction for this project and direct the Chief Executive Officer to enter into and execute the necessary contractual documents to complete this project.

Washington Hospital Healthcare System

SINCE 1948

Memorandum

DATE: June 18, 2024

TO: Kimberly Hartz, Chief Executive Officer

FROM: Tina Nunez, VP Ambulatory Care and Administrative Services

SUBJECT: Approval for Phase I Fremont Office Center Project Management and Architect Fees

Washington Township Medical Foundation (WTMF) has clinics that are spread across many sites throughout the Health Care District. With the District's purchase of the Fremont Office Center (FOC), located at 39300 Civic Center Drive, the vision is to consolidate the many clinics of the medical foundation into one medical office building. This would not only create efficiencies but more importantly would elevate the patient experience. Moving the clinic sites into FOC will be in three phases with Phase I being the largest including 32,000 square feet on multiple floors as well as the updates to the building infrastructure to accommodate the future phases. Phase I will include a Welcome Center along with Primary Care, Women's Health and Pediatric clinics.

In order to move forward with Phase I, we are requesting the Board approve the project management and the architect fees. Once we have construction documents, we will bring the construction proposal to the Board for Phase I. Stahl Companies is providing the project management oversight and a request for proposal (RFP) was developed for the selection of the architect firm.

Three architectural firms were invited to participate in the RFP process. The architectural firms were asked to participate in a job walk, an interview, and to submit a lump sum bid for schematic design through construction administration. The interview included representation from a diverse group including WHHS leadership, WTMF finance, physician, construction team, and WTMF clinic operations.

Presentations addressed design team approach, introduction of key staffing and their roles, technical aspects such as assessment of building and current infrastructure, permitting and schedule, and relevant project experience with projects of comparable size. Interviews were held with all three firms on May 30, 2024.

After carefully reviewing all submitted proposal packages, we recommend Boulder Associates of San Francisco as the lowest responsible bidder based on the criteria specified in the Request for Proposal dated April 30, 2024. The Boulder team excelled in every aspect of the scoring criteria, which will be crucial for meeting the Foundation's expectations in creating a holistic clinical experience for our patients. Boulder has extensive experience in constructing medical office buildings, having completed over 75 MOB projects, and will provide a strong project manager to lead the design process.

The total project fees are as follows:

Project management	$ 489,090
Architect	$1,663,015
Contingency (10%)	$ 215,211
Total	$2,367,316

In accordance with District Law, Policies and Procedures, it is requested that the Board of Directors authorize the Chief Executive Officer to proceed with entering into the necessary agreements for project management and architect schematic design in an amount not to exceed $2,367,316. The amount identified as necessary for this phase will be partially funded by budgeted Fiscal Year 2025 Capital Budget funds, and from operational cash flow.