

**APPROVED  
DOCUMENT**



**Ministry of Health**

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**Acronyms:**

|       |  |
|-------|--|
| DGKH. | Directorate General Khoula Hospital            |
| TTMs  | Trauma Team Members                            |
| TTL   | Trauma Team Leader                             |
| MVC   | motor vehicle collision                        |
| OT    | Operation theater                              |
| IV    | Intravenous                                    |
| WHO   | World Health Organization                      |
| NCSI  | National center for statistics and information |
| G. S  | General Surgery                                |
| E. D  | Emergency Department                           |
| RT    | Respiratory Therapist                          |
| GCS   | Glasgow Coma Scale                             |
| TCA   | Traumatic Cardiac Arrest                       |
| ICD   | Intercostal Drain                              |
| PRO   | Public Relation office                         |
| HD    | High Dependency                                |
| MTP   | Massive Transfusion Protocol                   |
| ORIF  | Open reduction and internal fixation           |
| ICP   | Intracranial pressure                          |
| RSI   | Rapid Sequence Intubation                      |
| EMS   | Emergency Medical Services                     |

## 1. Definitions

- 1.1 Trauma** is defined simply as physical injury which can be resulted in wounds, broken bones, or internal organ damage.
- 1.2 Primary Survey in Trauma** is the initial assessment and management of a trauma patient. It is conducted to detect and treat actual or imminent life threats and prevent complications from these injuries. A systematic approach using ABCDE is used.
- 1.3 Secondary survey in Trauma** is a rapid but thorough head-to-toe examination assessment to identify all potentially significant injuries. It should be performed after the primary survey, and initial stabilization is complete.
- 1.4 Tertiary survey in trauma** is a simple and easy approach to address the issue of undiagnosed injuries in trauma patients. Tertiary survey consists of reevaluating patients 24 hours after admission by physical examination, review of complementary tests and request for new tests when necessary.
- 1.5 MTP Team Leader** is the trauma team leader should activate the massive transfusion protocol (MTP) if the clinical situation is consistent with a likelihood of massive blood loss emergency. MTP is activated by calling the blood bank [EXT. 1712 or 1782 or DECT 5034 (after working hours)].
- 1.6 MTP Coordinator** is the nursing shift supervisor, to ensure that basic processes are accomplished in a timely manner, communication occurs, samples and blood products are delivered appropriately.
- 1.7 Blood Bank Staff:** is the blood bank technician who should supply the requested blood units as per MTP and notify the blood bank in-charge as early as possible.
- 1.8 Massive Blood Loss;** is the loss of one blood volume (approximately 70 ml/kg) within a 24-hour period. Alternative definitions include either 50% blood volume loss within 3 hours or a rate of loss 150 ml/minute.

# Trauma Management Protocol

## Chapter 1

### 1. Introduction

Trauma is a leading cause of mortality globally. Worldwide, motor vehicle collisions (MVC) are the most leading cause of death between the ages of 18 and 29. According to the World Health Organization (WHO), MVC accounted for 1.25 million deaths in 2014. In addition, it is expected to be the third leading cause of disability worldwide by 2030.

In Oman, according to National center for statistics and information (NCSI) around 10,500 cases of MVC per year from 2019 to 2021 and this resulted in more than 1,600 injured cases and 434 dead. Average of 2000 MVC cases were received in Khoula Hospital from 2015 till 2022. Those traumatic injuries ranged from minor isolated trauma to complex injuries involving multiple organ systems. Consequently, all trauma patients require a systematic evaluation to maximize outcomes and reduce the risk of undiscovered injuries.

Therefore, health care setting is playing a major role in having a best strategy to deliver optimal trauma strategy to prevent unnecessary death and disability.

### 2. Purpose

The purpose of the protocol is to standardize the management of trauma patients within tertiary trauma center DGKH.

### 3. Scope

This protocol applies for all departments in DGKH dealing with management of Trauma patients from arrival to the hospital until discharge.

## Chapter 2

### 4. Structure/policy

It is the protocol of the Directorate General of Khoula Hospital to ensure that all health care workers are aware about the trauma management protocol.

This will facilitate proper resuscitation and management of critically or seriously injured patients who require rapid, organized resuscitation, evaluation, and stabilization to promote optimal outcomes. It will be as the following:

- 4.1 Establishing protocol for trauma management.
- 4.2 Specify the trauma team members (TTMs) and define the roles and responsibilities of each trauma team member.
- 4.3 Define the updated managements and algorithms in trauma management from each department.
- 4.4 Specify the criteria of accepted transferred trauma patients from other hospitals to our institutions (Khoula Hospital).
- 4.5 Develop Massive Transfusion Protocol (MTP) for trauma.

## **5. Procedure**

### **Before procedure**

#### **5.1 Trauma Team Activation (TTA)**

As per approved document Trauma Team Activation Protocol in KH

\*\* If the trauma not listed under the criteria of trauma activation, then will be managed by emergency department and according to the elicited injuries then to be referred to the concerned department as trauma consult as per Trauma Team Activation protocol

#### **5.1.1 Trauma Team Members (TTMs) for trauma activation**

##### **5.1.1.1 Trauma team members consists of:**

- A. 2<sup>nd</sup> on call G.S, Trauma Team Leader (TTL)
- B. Anesthetist ICU on call
- C. 1<sup>st</sup> on call G. S
- D. ED physician
- E. Orthopedic 2<sup>nd</sup> on call
- F. 1<sup>st</sup> ED nurse/ Respiratory Therapist (RT) for Airway & breathing assistance.

- G. 2<sup>nd</sup> ED nurse for circulation & medication nurse.
- H. 3<sup>rd</sup> ED nurse for scribing /document in patient flow sheet
- I. Radiographer
- J. Nursing Supervisor
- K. Public Relation Officer (PRO) : to communicate with patient's relatives, police and control the crowd etc.

#### **5.1.1.2 Alert of the trauma activation to the following:**

- A. OT nurse in charge; to be ready in case of emergency operation.
- B. Radiologist on call; In case needed to do FAST in Resuscitation Bay and for CT reporting.
- C. Blood bank: In case of activation of MTP

#### **During procedure:**

### **5.2 Initial Trauma Management**

#### **5.2.1 The trauma management should be as per ATLS guideline.**

Once the patient arrived at resuscitation bay. ED nurse will attach the patient to cardiac monitor, ECG leads, BP cuff and pulse oximetry.

- **Trauma Team Leader (TTL)** will be Emergency Department (ED) doctor will lead the trauma team till the 2<sup>nd</sup> on call General Surgery (GS) arrives to resuscitation bay who will take the lead and it should be within 10 minutes. In case, he/she is busy with any other emergency, the ED doctor continues to lead the team till the 2<sup>nd</sup> on call GS becomes available. General Surgery 3<sup>rd</sup> on call should be readily available if needed by ED physician in this case.

**Note. Trauma Team leader is the decision maker and should be listened to by the rest of the team members.**

- **A (Airway):** ICU anesthetist with airway nurse /Respiratory Therapist (RT)
- **B (Breathing):** GS first on call/ Nurse
- **C (Circulation):** ED doctor with circulating nurse. FAST will be done by ED doctor. Radiologist on call standby if needed for repeat FAST if requested TTL.
- **D (Disability):** 1<sup>st</sup> on call G.S
- **E (Exposure):** orthopedic 2<sup>nd</sup> on call will be responsible for log roll and full exposure of the patient.
- Scribe Nurse to document in patient flow sheet.



## 6.2.2. Detailed description of Roles and responsibilities of each member:

### ❖ **Trauma Team leader (TTL):**

- Stand at the foot of the patient and **not to touch the patient.**
- Identify himself/herself clearly and loudly as trauma leader.
- assign the team members.
- Use a clear and concise order along with close loop communication with trauma team members.
- Run the trauma based on ATLS protocol (A, B, C, D, E)
- Order investigation and needed interventions e.g.: intubation, ICD insertion, FAST, CT etc.)
- Can call any service if needed to resuscitation bay, e.g.: neurosurgeon, plastic, hand, vascular, obstetrician, pediatrician etc.
- One of the responsibilities of Trauma team leader in ED department is to decide where the patient should be admitted and under which service (After discussing with consultant G.S on call).
- Communicate with OT nurse in charge to arrange emergency OT if needed.

### ❖ **A-Airway: Anesthetist ICU on call with ED airway nurse/Respiratory therapist:**

- stand at the head of the patient.
- Check availability and readiness of airway equipment.
- Ensure C Collar is applied.
- perform suction and establish airway if needed and supply oxygen.
- Intubate under direction of TTL if needed.
- Stabilize the neck during log roll.
- maintain airway during shifting the patient to CT /procedure/OT/ICU.

### ❖ **B-Breathing ;1<sup>st</sup> G.S on call /Nurse:**

- Stand at right arm of the patient.
- Expose the chest for assessment (inspection, percussion, auscultation)
- Check the availability of ICD items, needle decompression.
- cover the open chest wound with adhesive bandage taped on 3 sides.
- insert needle decompression /ICD if needed under direction of TTL.
- Examine abdomen (inspection, palpation, auscultation)
- assist on log roll.

### ❖ **C-Circulation; Emergency Physician with Circulation Nurse:**

- Stand at left arm of the patient.
- Establish two large bore cannulas.

- draw labs (CBC, RFT, LFT, RBS, Coagulation, blood grouping, ABG/VBG)
- Start one liter of crystalloids as a bolus for resuscitation then to start blood if needed under direction of TTL. (Preferably warm saline)
- Perform FAST for hemodynamically unstable patient.
- control any significant visible hemorrhage by Applying direct dressing pressure to the site.
- apply hemostatic suture to bleeding scalp wounds.
- administer iv medications (analgesic, iv antibiotics and TT) as directed by TTL.
- Assist with log Roll.

❖ **D-Disability :1<sup>ST</sup> on call GS:**

- Check GCS and pupils' size and response to light.

❖ **E-Exposure: Orthopedics 2<sup>nd</sup> on call:**

- Stand at right leg of the patient.
- Check availability of pelvic binder
- Apply pelvic binder if indicated.
- Assessment should be done for upper and lower limbs for bleeding, deformity, open fractures, and distal pulses.
- Apply pressure to bleeding limbs/Tourniquet if indicated.
- Cover the patient with warm blanket.
- assist in log Roll.

❖ **Nursing shift supervisor.**

- Responsible for communication and bed arrangement according to the patient's need: ICU or General bed after discussion with the trauma leader.

❖ **OT nurse in charge.**

- to arrange emergency OT in case needed.

❖ **Radiologist on call.**

- should be readily available for FAST if needed and for reporting pan CT.

❖ **Public Relations and patient Services (PRO)**

- to communicate with EMS, relatives, and police.

### 6.2.3. Activation of Massive Transfusion Protocol (MTP) in Trauma

As per approved document Massive Transfusion Protocol in Trauma in KH

Massive hemorrhage may occur in trauma and rapid action is required when a potentially uncontrollable bleeding occurs. Timely recognition and efficient management decisions are vital for successful outcomes after major blood loss. Therefore, TTL should activate the MTP in case the patient is needed.

#### **6.2.3.1. Criteria for activation of MTP see Appendix 1**

##### **A. Hemodynamically unstable patient with one of the following:**

- Actual or anticipated 4 units' RBC in < 4 hrs.
- Multiple long bone trauma (>2)
- Combined thoracic, abdominal and pelvis injuries.
- Aortic dissection
- Failed surgical or radiological measures to control bleeding.
- Anticipated ongoing hemorrhage.

#### 6.2.4. Empiric Antibiotics in Trauma Guidelines

6.2.5. As per approved document in KH see **Empiric Antibiotics in Trauma**

| Traumatic wounds  |   |  |
|---|---|--|
| Risk of infection   | Antimicrobial therapy   | Remarks  |
| <p><b><u>Nature of Wound</u></b></p> <p>Tears bruises contusion wounds, puncture wounds, crush injury, bite wounds, contaminated with feces soil, dirt or mineral oil, presence of foreign bodies, wound with edge diastasis, exposure of deep tissue muscle bone</p> | <p>Admission:</p> <p>Ceftriaxone IV 2 gm</p>  | <p>Cleaning, irrigation and debridement, tetanus toxoid. Admission</p>                                     |
|   | <p>For discharge:</p> <p>Cephalexin 500 mg PO QID for 5 days (Paed: 25-50 mg/kg/day q6-12hr)</p>        | <p>Mixed infection</p> <p>Ciprofloxacin 500 mg BID PO for 7 days (Paed:15 mg/kg/dose every 12 hr)</p>      |
| <p><b><u>Location of wound</u></b></p> <p>High concentration of commensal flora (oral mucosa, genitals, armpits) Poorly vascularized parts (hand, foot, lower and upper limbs)</p>  | <p>Admission: Ceftriaxone IV 2g (Paed: 50 mg/kg)</p>  | <p>Cleaning irrigation and debridement. Admission</p>  |
|   | <p>For discharge: Amoxicillin /Clavulanic acid 625mg TID PO for 7 days (Paed: 30-45 mg/kg/day q8hr)</p> | <p>Alter: Both strep and staph</p> <p>Clindamycin 450 mg PO TID for 7 days (Paed: 30 mg/kg/day q6-8hr)</p> |
| <p><b><u>Patient related.</u></b></p> <p>Elderly more 65 years, Immunocompromised (steroids, immunosuppressive agents, splenectomised, HIV, DM, Renal impairment)</p>   | <p>Need admission:</p> <p>Vancomycin IV 1gm (Paed: 20 mg/kg)</p>  | <p>Cleaning irrigation and debridement Admission</p>   |
|   | <p>For discharge:</p> <p>TMP-SMX 1 Tab BID for 7 days</p>   | <p>If renal impairment use Clindamycin 300 mg TID PO for 7 days</p>  |

#### 6.2.6. Algorithms for management of different injuries as following; (See Appendices 2-13)

- Head Injury and Blunt Cerebrovascular Injury (BCVI)
- Airway Management
- Maxillofacial injury
- Penetrating Neck Trauma
- Hemothorax
- Rib Fracture
- Abdominal Trauma
- Pelvis Fracture
- Traumatic Hand Amputation Management
- Management of Vascular injury.
- Burn Management

- Pan CT protocol for trauma patients

**After procedure:**

### **6.3. Trauma Admission Policy**

6.3.1. To facilitate patient care and to eliminate potential misunderstandings between various services caring for trauma patients, it has established the following protocol regarding admission to and transfer of trauma patients between services:

- **Hemodynamically abnormal:** should be admitted under G.S department.
- **Hemodynamically normal:**
  - A. with poly-injuries will be admitted under G.S department.
  - B. with single system injury shall be directly admitted to the appropriate service
- General surgery team will complete tertiary survey within 24 hours of admission for multi-injured patients and hemodynamically abnormal patients. Once suspected occult injuries have been ruled out, the patient may be transferred from general surgery to the next most responsible department for take over.

#### **6.3.2. Most responsible department for takeover will be as per the following priority.**

1-The department who is going to do surgical/radiological intervention e.g., ORIF, emergency craniotomy, debridement, flap cover, revascularization, reimplantation, ICP insertion and nerve repair, etc.

2- The department who has ongoing acute injuries to tackle even if there is no surgical intervention e.g., pain management /needs rehabilitation related to the sustained injuries.

3-The department with injuries which require long term follow up.

### 6.3.3. Criteria of accepting transferred trauma patients from other hospitals.

#### 6.3.3.1. Hospital Based transfer.

##### A. Peripheral hospitals and Private hospitals

The case will be accepted if the service for acute trauma management is not available there or there is need for operative or invasive intervention which cannot be provided there.

- It is responsibility of the referring doctor to liaise with specialty of concern in KH before transfer.

##### B. Royal hospital

The case will be accepted as it will be from ED of Royal Hospital to ED of Khoula Hospital. This will be after the following:

- Resuscitation and Stabilization of the trauma patient (such as intubation if needed, ICD insertion in case of pneumothorax or laparotomy for active intra-abdominal bleeding etc.)
- Informing the ED of Khoula hospital about the case before shifting.

##### C. Armed Forced Hospital (AFH)

Non- eligible trauma patients for AFH treatment will be accepted in Khoula Hospital after resuscitation and stabilization of the patient and informing ED and concerned department if needed.

##### D. Sultan Qaboos University Hospital (SQUH)

- SQUH has trauma service. The case will be accepted if the service for acute trauma management is not available there or there is need for operative or invasive intervention which cannot be provided there.
- It is responsibility of the referring doctor to liaise with specialty of concern in KH before transfer.

#### 6.3.3.2. Based on the time of injury.

- **Within 1<sup>st</sup> 24 hours from the injury:** The case should be seen in the ED and based on the trauma code activation policy will be the management.
- **More than 24 hours:** The case should be transferred as direct admission to the concerned department after discussion from the transferring hospital with the concerned service.

## **7. Responsibilities**

### **7.1. The Director of the Emergency Department shall:**

- 7.1.1. Emphasize, monitor, and audit protocol implementation.
- 7.1.2. Ensure all the ED staff adhere to this protocol.

### **7.2. Emergency Doctors and nurses shall:**

- 7.2.1. Adhere to this protocol.
- 7.2.2. Identify their roles and responsibilities during trauma activation.
- 7.2.3. Liaise with Trauma team as needed.

### **7.3. The Head of General Surgery department shall:**

- 7.3.1. Ensure all General Surgery doctors adhere to this protocol.

### **7.4. The Director of Anesthesia and ICU shall:**

- 7.4.1. Ensure all anesthesia and ICU doctors are aware and adhere to this protocol.

### **7.5. The Head of Orthopedics Surgery Department shall:**

- 7.5.1. Ensure all orthopedics surgery doctors are aware about this protocol.

### **7.6. The Head of Plastic Surgery Department shall:**

- 7.6.1. Ensure all plastic doctors are aware and adhere to this protocol.

### **7.7. The Head of Hand Surgery Department shall:**

- 7.7.1. Ensure all hand surgery doctors are aware and adhere to this protocol.

### **7.8. The Head of OMFS Department shall:**

- 7.8.1. Ensure all hand OMFS doctors are aware and adhere to this protocol.

### **7.9. The Head of Obstetrics and Gynecology Department shall:**

- 7.9.1. Ensure all obstetrics and gynecology doctors are aware about this protocol.

### **7.10. The Radiology Department shall**

- 7.10.1. Adhere to this protocol.

### **7.11. The Blood Bank shall:**

- 7.11.1. Adhere to this protocol.

- 7.12. The Emergency Department Nurse in-charge shall:**  
**7.12.1.** Ensure ED nursing staff adhere to this protocol.  
**7.12.2.** Monitor and audit nurses practice related this protocol.

- 7.13. Nursing Shift Supervisor shall**  
**7.13.1.** Adhere to this protocol.

- 7.14. Main Operation Theater In -Charge shall:**  
**7.14.1.** Adhere to this protocol.

- 7.15. The Public Relation Officer shall:**  
**7.15.1.** Adhere to this protocol.

**8. Document History and Version Control**

| <b>Version</b> | <b>Description</b> | <b>Review Date</b> |
|----------------|--------------------|--------------------|
| 1              | Initial Release    | 2023               |
| 2              | Version two        | 2026               |
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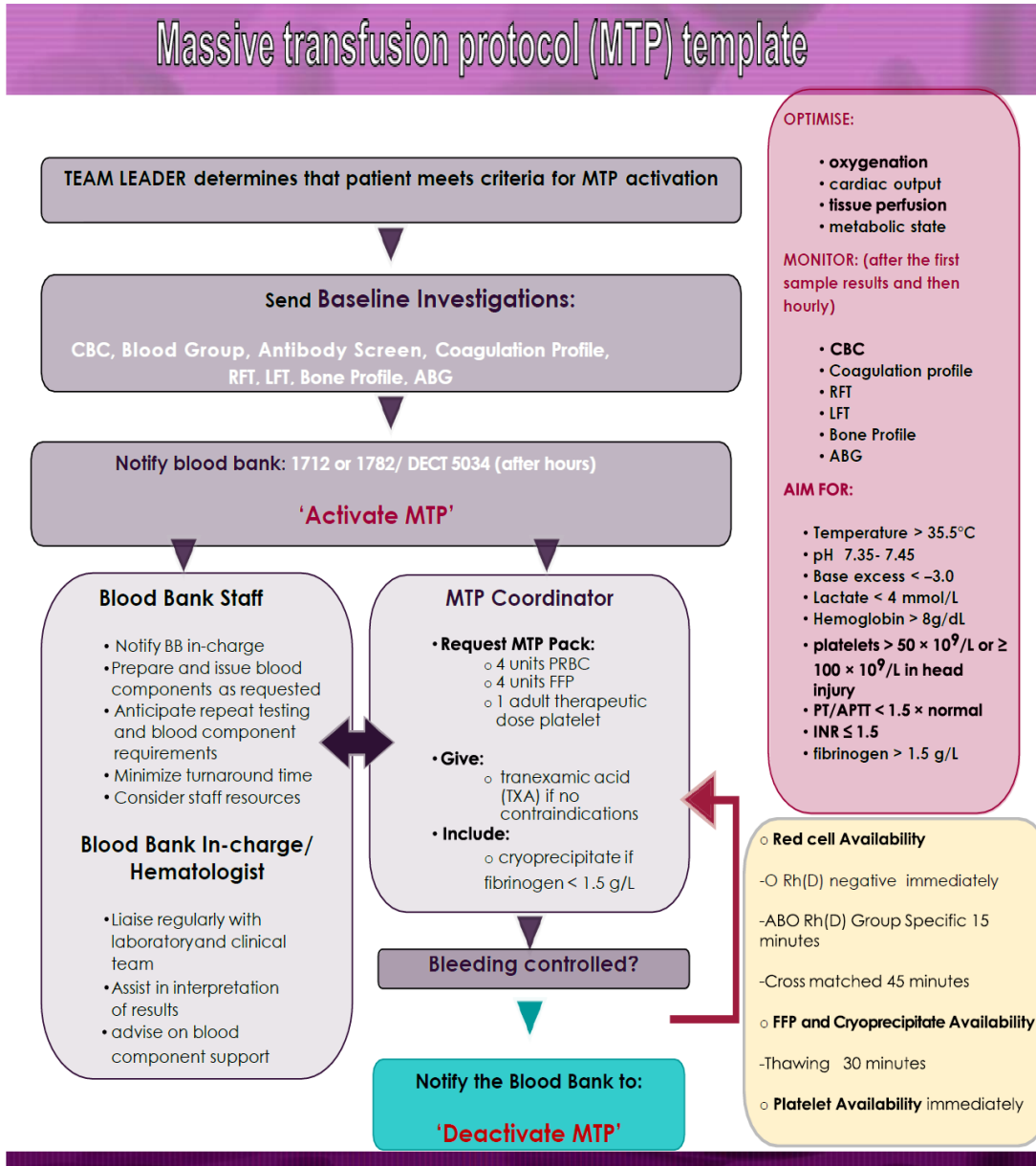
**9. Related Documents:**

- 9.1. Trauma Team Activation Protocol in KH (MoH/DGKH/ED/PRT/025/Vers.01)
- 9.2. Empiric Antibiotics in Trauma (MoH/DGKH/ED/PLO/026/Vers.01)
- 9.3. CT protocol for trauma patients ( (MoH/DGKH/RAD/Manual/015/Vers.01)



## 10. References

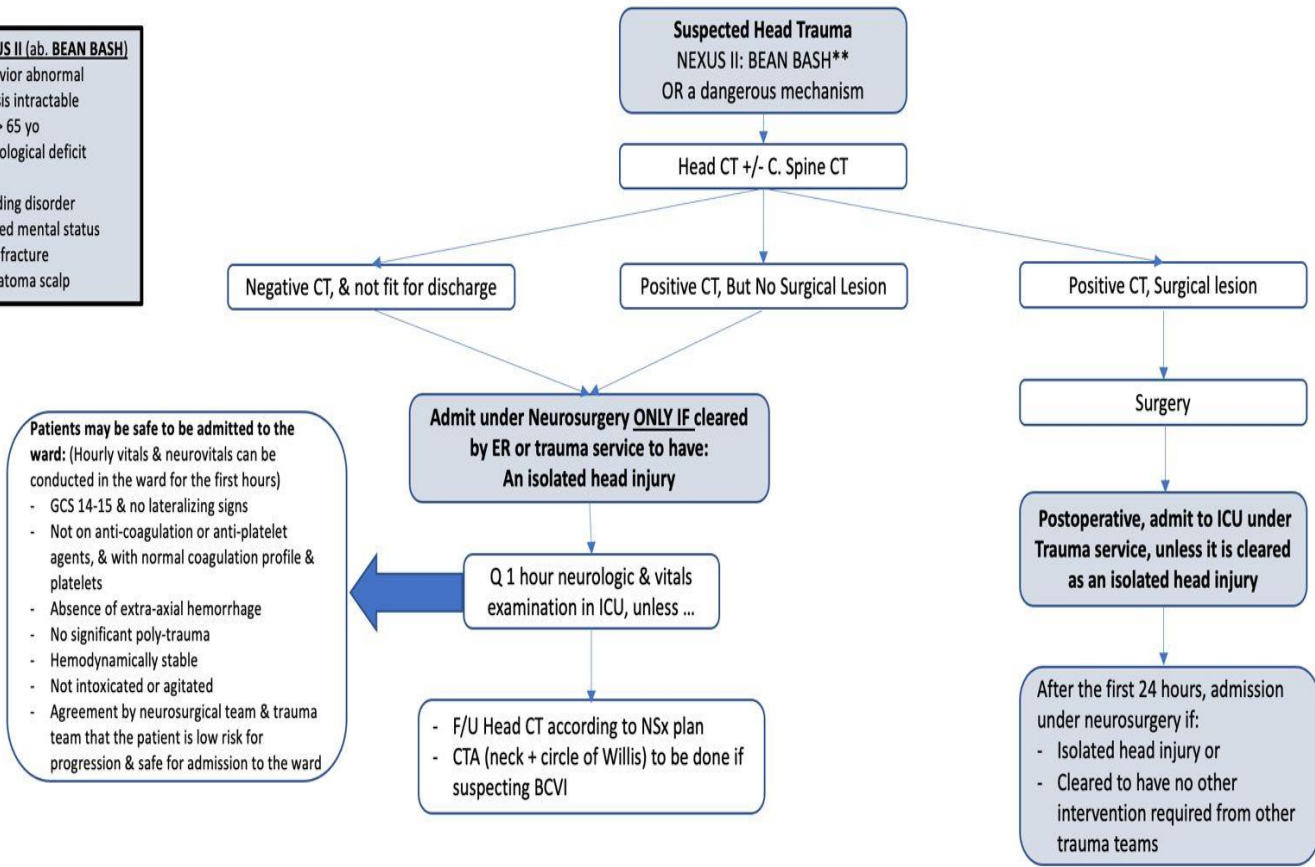
| Title of book/ journal/ articles/ Website   | Author                    | Year of publication |
|---|---------------------------|---------------------|
| <a href="https://www.who.int/news-room/fact-sheets/detail/road-traffic-injuries">https://www.who.int/news-room/fact-sheets/detail/road-traffic-injuries</a> | World Health Organization | 2022                |
| Predicting factors for major trauma patient mortality analyzed from trauma registry system. Asian Journal of Surgery.                                       | Chiang, Y. et al          | 2021                |
| The impact of trauma systems on patient outcomes. Current Problems in Surgery Journal   | Choi, J. et al            | 2021                |
| Omannews.gov.om   | Oman News Agency          | 2023                |
| Aftertrauma.org   | Center for Trauma Science | 2023                |



**Appendix 2 Head Injury diagram**

**NEXUS II (ab. BEAN BASH)**  
 Behavior abnormal  
 Emesis intractable  
 Age > 65 yo  
 Neurological deficit

Bleeding disorder  
 Altered mental status  
 Skull fracture  
 Hematoma scalp



**Appendix 3A Blunt Cerebrovascular Injury (BCVI)**

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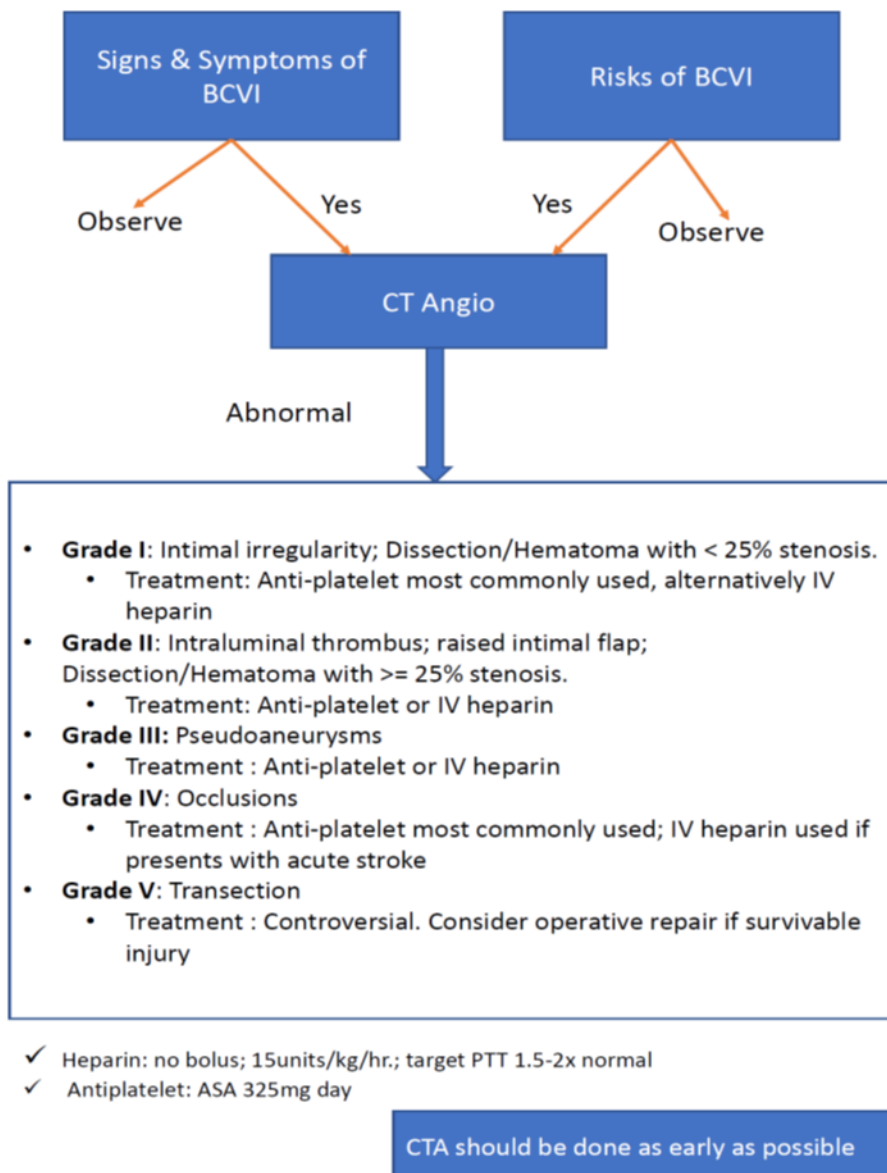
#### SIGNS & SYMPTOMS OF BCVI:

- Hemorrhage from mouth, nose, ears of potential arterial origin
- Large or expanding cervical hematoma (consider surgery)
- Cervical bruit in patient < 50
- Evidence of cerebral infarction on CT
- Unexplained or CT incongruous central or lateralizing neurologic deficit, transient ischemic attack, or Horner's syndrome.

#### RISKS OF BCVI:

- Mechanism compatible with severe cervical hyperextension/rotation or hyperflexion, particularly if associated with complex facial fractures
- Near-hanging, seat belt abrasion, or other soft tissue injury of the anterior neck with significant cervical swelling
- High Risk associated injuries
  - GCS ≤ 6
  - Petrous bone fracture Displaced mid-face (Lefort II/III) fractures.
  - Cervical vertebral body or transverse foramen fracture
  - Any C1-3 fracture.
  - Subluxation or Ligamentous injury
  - Diffuse axonal brain injury.
  - Basilar skull fracture involving the carotid canal.

## **Appendix 3B**



## Appendix 4 Advance Trauma Airway Management Guidelines

### 4.1. Difficult airway predictors

#### 1. Difficult BVM (MOANS)

|                                  |   |
|----------------------------------|---|
| <b>Mask seal</b>                 | Bushy beards, crusted blood on the face, or disruption of lower facial continuity   |
| <b>Obesity / Obstruction</b>     | Obesity, pregnancy, angioedema, Ludwig’s angina, upper airway abscess, epiglottitis |
| <b>Age</b>                       | Age > 55  |
| <b>No teeth</b>                  | May leave denture in edentulous patients.   |
| <b>Sleep apnea / Stiff lungs</b> | COPD, asthma, ARDS, others  |

#### 2. Difficult Laryngoscopy and Intubation (LEMON)

|                              |   |
|------------------------------|---|
| <b>Look externally</b>       | Use your clinical gestalt, evidence of lower facial disruption, bleeding, small mouth, agitated patient   |
| <b>Evaluate</b>              | Use the 3 -3-2 rule: mouth open, mandible, glottis  |
| <b>Mallampati score</b>      | In order of increasing difficulty Class I -IV   |
| <b>Obstruction / Obesity</b> | Four cardinal signs of upper airway obstruction: stridor, muffled voice, difficulty swallowing secretions, sensation of dyspnea. Obese patients frequently have poor glottic views. |
| <b>Neck mobility</b>         | May not be able to optimally move the head and neck due to trauma, arthritis, ankylosing spondylitis. Immobilize the neck and consider using video laryngoscopy.                    |

#### 3. Difficult Extraglottic Device (RODS)

|   |
|---|
| <b>R</b> estricted mouth opening              |
| <b>O</b> bstruction                           |
| <b>D</b> isrupted or <b>D</b> istorted airway |
| <b>S</b> tiff lung or cervical <b>S</b> pine  |

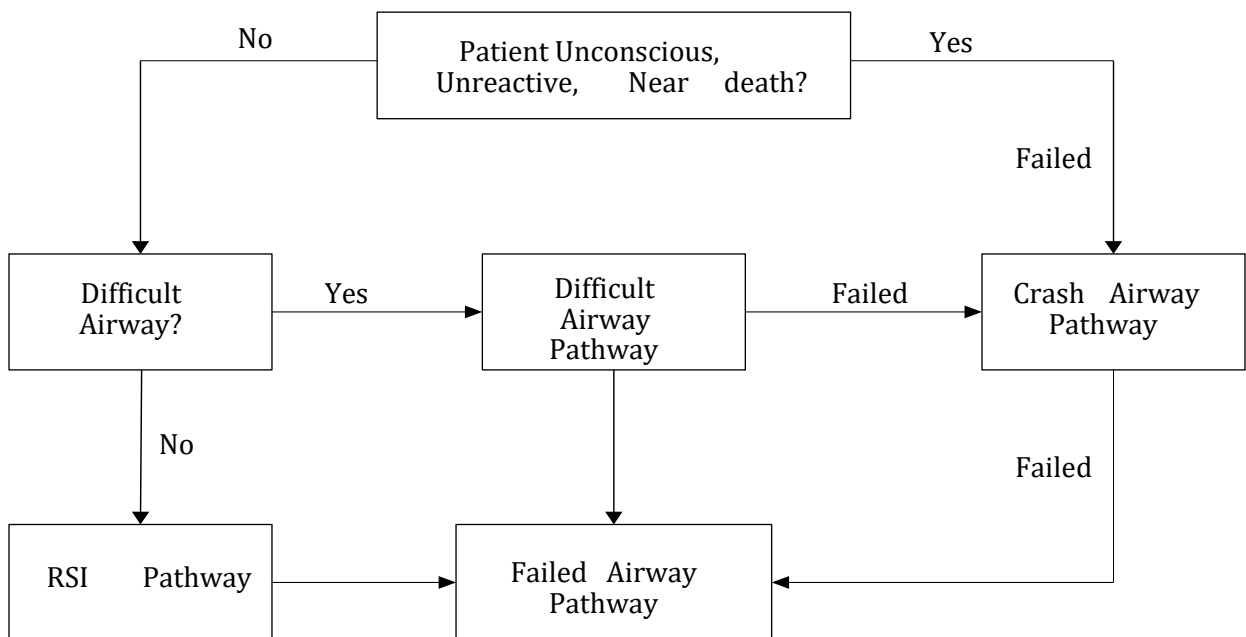
#### 4. Difficult Cricothyrotomy (SHORT)

|  |
|--|
| <b>S</b> urgery or other airway obstruction        |
| <b>H</b> ematoma (includes infection/abscess)      |
| <b>O</b> besity                                    |
| <b>R</b> adiation distortion (and other deformity) |
| <b>T</b> umor                                      |

## 4.2. Indications for intubation

- A. Failure of airway maintenance, i.e. loss of airway reflexes
- B. Failure of airway protection, i.e. GCS < 9
- C. Failure of ventilation
- D. Failure of ventilation
- E. Patient condition is predicted to deteriorate

Once the decision is made to intubate the patient assess where the patient fits in the universal emergency airway algorithm



## 4.3 Universal emergency airway algorithm

If the patient has no predictors for a difficult airway, follow these steps for RSI and the following algorithm:

- Plan
- Preparation

### SOAPME

- i. Suction — at least one working suction, place it between mattress and

bed

- ii. Oxygen — NRBM and BVM attached to 15 LPM of O<sub>2</sub>, preferably with nasal prongs for apneic oxygenation
- iii. Airways — 7.5 ET tube with stylet fits most adults, 7.0 for smaller females, 8.0 for larger males, test balloon by filling with 10 cc of air with a syringe — Stylet – placed inside ET tube for rigidity, bend it 30 degrees starting at proximal end of cuff (i.e. straight to cuff, then 30 degree bend) — Blade – Mac 3 or 4 for adults – curved blade — Miller 3 or 4 for adults – straight blade — Handle – attach blade and make sure light source works — Backups – ALWAYS have a surgical cric kit available! — have video laryngoscope, LMA and bougie at bedside iv.

Pre oxygenate – 15 LPM NRBM

- v. Monitoring equipment/Medications — Cardiac monitor, pulse ox, BP cuff opposite arm with IV — Medications drawn up and ready to be given
- vi. End Tidal CO<sub>2</sub>

3. Protect the cervical spine.
4. Preoxygenation
5. Put to sleep (induction)

### **Induction agents**

- i. Ketamine
  - Dose: 1.5 mg/kg IV (4mg/kg IM)
  - Onset: 60-90 sec
  - Duration: 10-20 min
  - Use: any RSI, especially if hemodynamically unstable (OK in TBI, does not increase ICP despite traditional dogma) or if reactive airways disease (causes bronchodilation)



- Drawbacks: increased secretions, caution in cardiovascular disease (hypertension, tachycardia), laryngospasm (rare), raised intra-ocular pressure

#### ii. Propofol

- Propofol 1-2.5 mg/kg IBW + (0.4 x TBW) (others simply use 1.5-2.5 mg/kg x TBW as the general guide)
- Onset: 15-45 seconds
- Duration: 5 – 10 minutes
- Use: Haemodynamically stable patients, reactive airways disease, status epilepticus
- Drawbacks: hypotension, myocardial depression, reduced cerebral perfusion, pain on injection, variable response, very short acting

#### iii. Fentanyl

- Dose IV 2-10 mcg/kg TBW
- Onset: <60 seconds (maximal at ~5 min)
- Duration: dose dependent (30 minutes for 1-2 mcg/kg, 6h for 100 mcg/kg)
- Use: may be used in a low dose as a sympatholytic premedication (e.g. TBI, SAH, vascular emergencies); may used in a 'modified' RSI approach in low doses or titrated to effect in cardiogenic shock and other hemodynamically unstable conditions
- Drawbacks: respiratory depression, apnea, hypotension, slow onset, nausea and vomiting, muscular rigidity in high induction doses, bradycardia, tissue saturation at high doses

#### iv. Midazolam

- Dose: 0.3mg/kg IV TBW
- Onset: 60-90 sec
- Duration: 15-30 min

- Use: not usually recommended for RSI, some practitioners use low doses of midazolam and fentanyl for RSI of shocked patients
- Drawbacks: respiratory depression, apnea, hypotension, paradoxical agitation, slow onset, variable response

v. Etomidate

- 0.3mg/kg IV
- onset: 10-15 seconds
- Use: suitable for most situations including haemodynamically unstable, other than sepsis or seizures
- Drawbacks: adrenal suppression, myoclonus, pain on injection

a. Paralysis

**Paralytic agents**

Suxamethonium (aka succinylcholine)

- Dose: 1.5 mg/kg IV (2 mg/kg IV if myasthenia gravis) and 4 mg/kg IM (in extremis)
- Onset: 45-60 seconds
- Duration: 6-10 minutes
- Use: widely used unless contra-indicated; ideal if need to extubate rapidly following an elective procedure or to assess neurology in an intubated patient
- Drawbacks: numerous contra-indications (hyperkalemia, malignant hyperthermia, >5d after burns/ crush injury/ neuromuscular disorder), bradycardia (esp after repeat doses), hyperkalemia, fasciculations, elevated intra-ocular pressure, will not wear off fast enough to prevent harm in CICV situations

Rocuronium

- Dose: 1.2 mg/kg IV IBW

- Onset: 60 seconds
- Use: can be used for any RSI unless contra-indication or require rapid recovery for extubation after elective procedure or neurological assessment; ensures persistent ideal conditions in CICV situation (i.e. immobile patient for cricothyroidotomy) – can be reversed by sugammadex
- Drawbacks: allergy (rare)

#### Cisatracurium

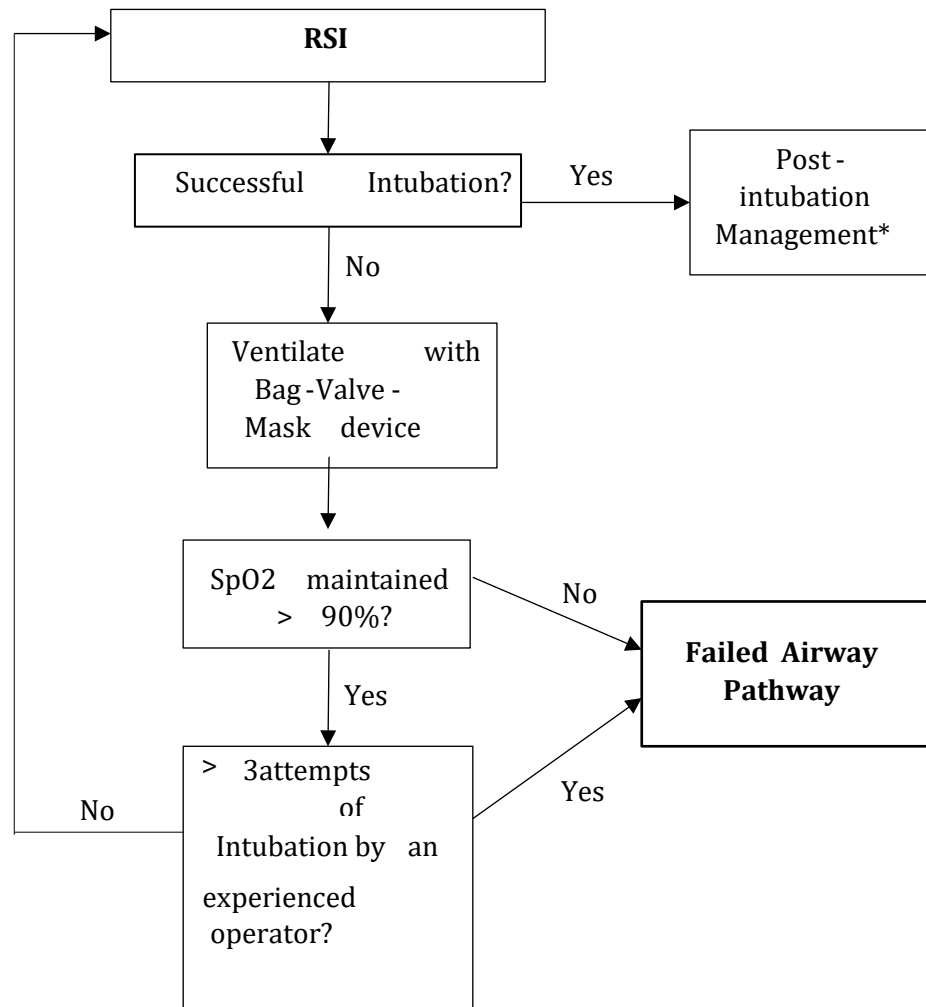
- Dose: 0.15-0.2 mg/kg IV
- Onset: 90-120 seconds
- Duration: 55-61 minutes
- Use: not recommended for RSI, unless no suxamethonium or rocuronium cannot be used
- Drawbacks: allergy (rare)

#### 6. Placement with confirmation

#### 7. Post-intubation management

- a. Secure tube
- b. Re-secure cervical collar
- c. Sedation: Midazolam (0.2 mg/kg) or Propofol infusion (initial dose 0.3 mg/kg/hour)
- d. Paralysis: Rocuronium (0.4-1 mg/kg) or Cisatracurium (0.03 mg/kg)
- e. Orogastric/Nasogastric tube
- f. Chest x-ray

### 4.4 RSI emergency airway algorithm



#### 4.5 Difficult airway algorithm

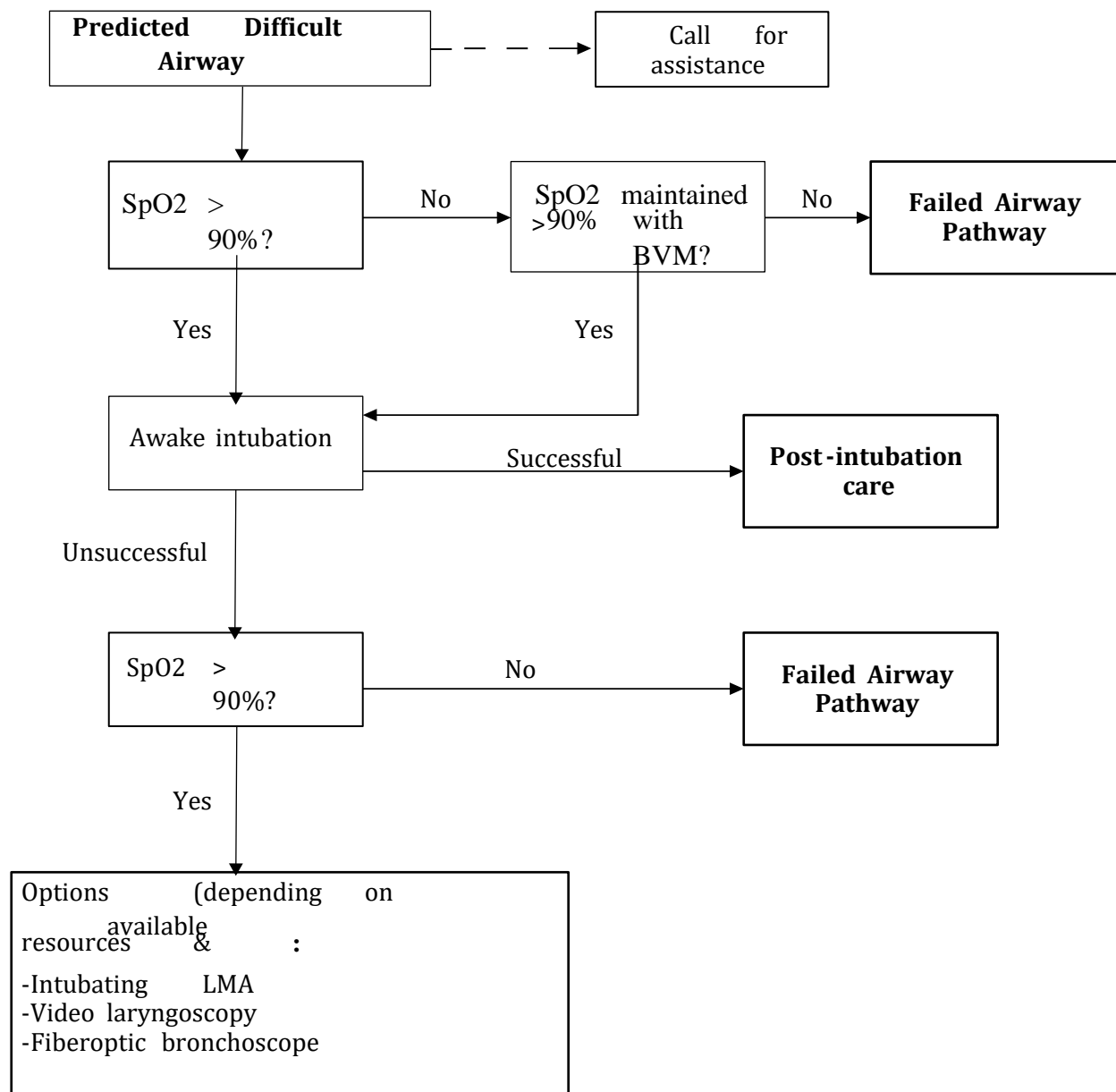
Trauma Management Protocol

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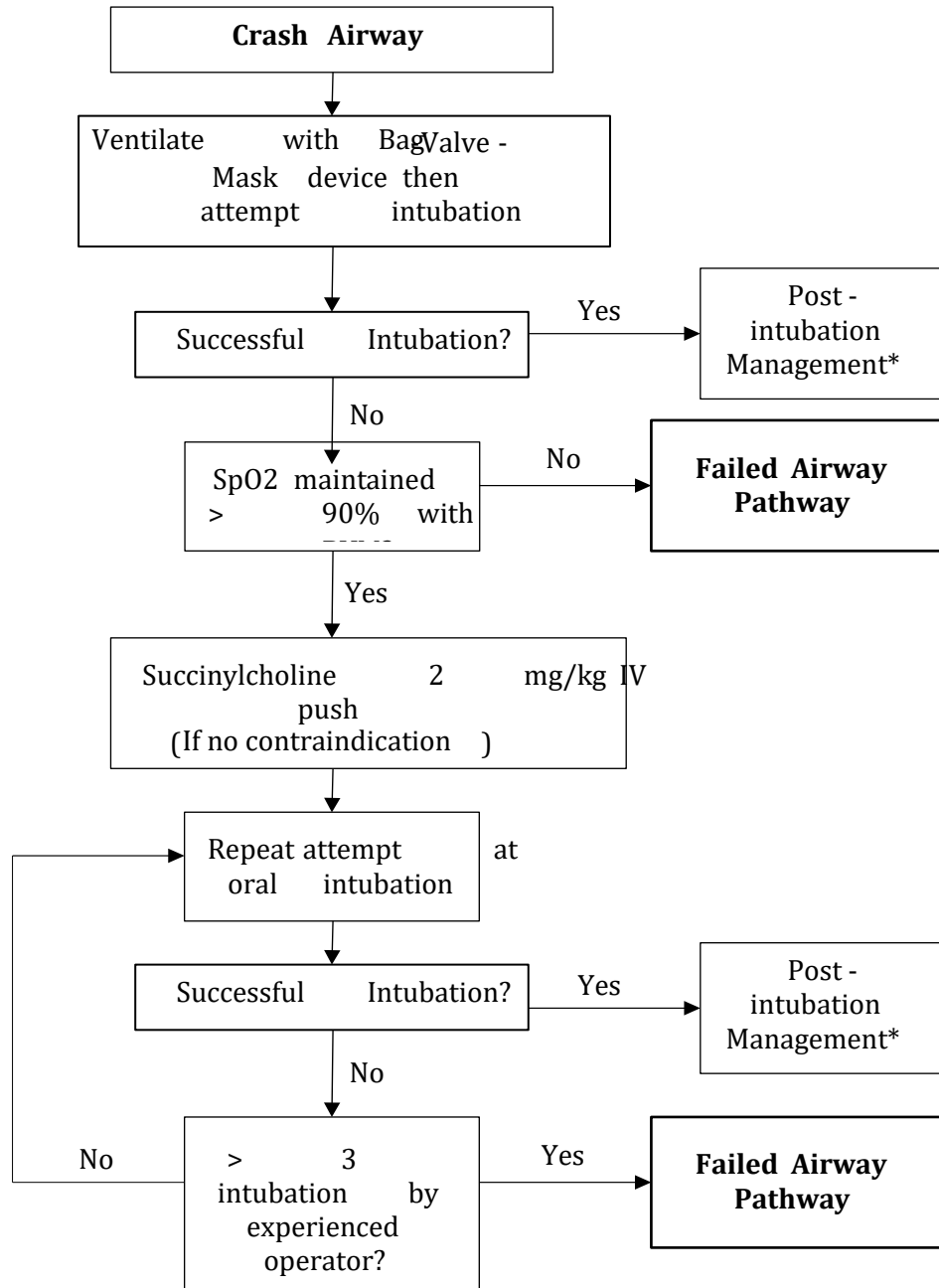
II. If the patient has predictors for a difficult airway, follow this algorithm:



\* Done with light sedation and local anesthesia of airway. Can be performed using direct or video laryngoscopy or using fiberoptic scope.

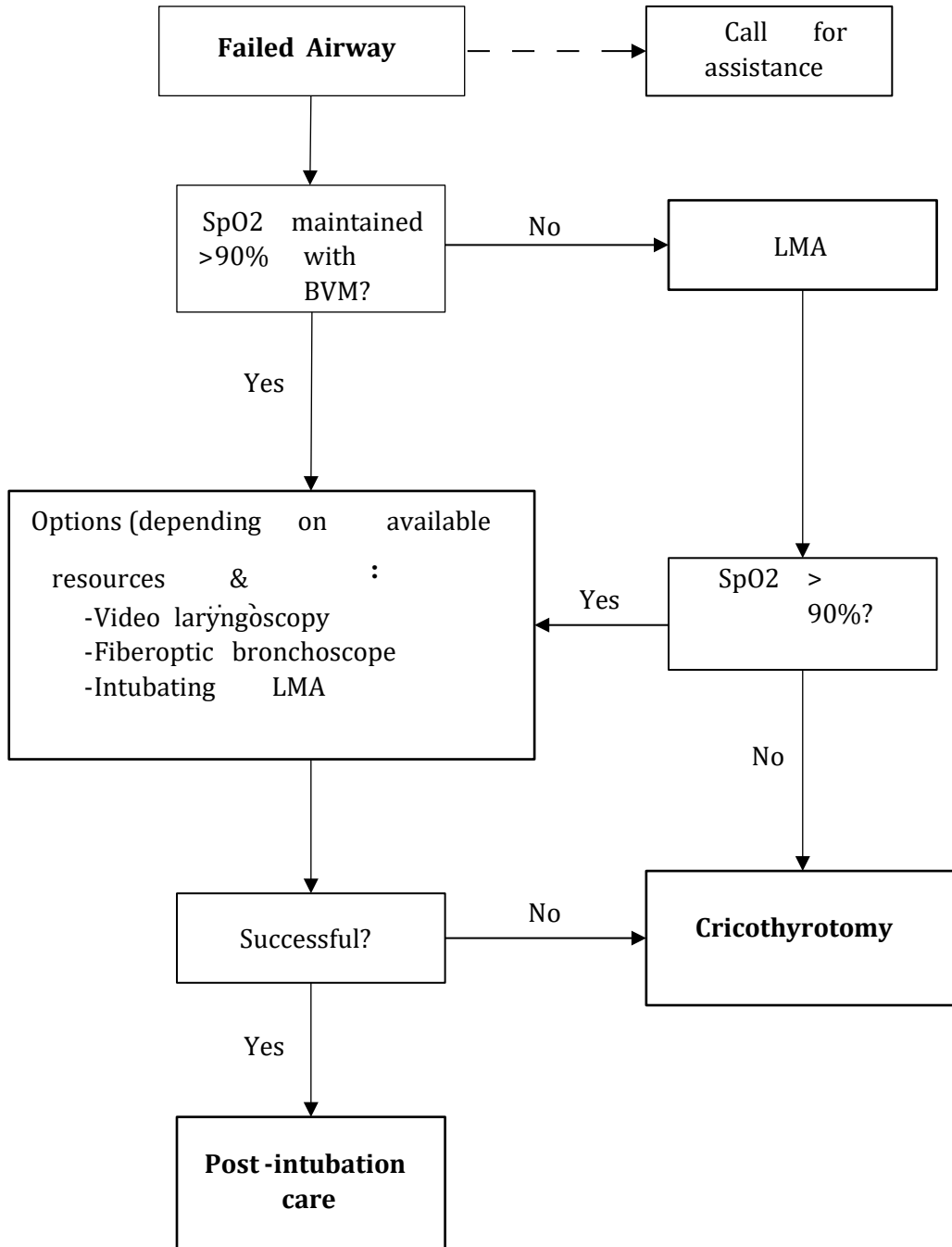
## 4.6 Crash airway algorithm

III. If the patient is unconscious, unreactive or near death, follow the below algorithm:



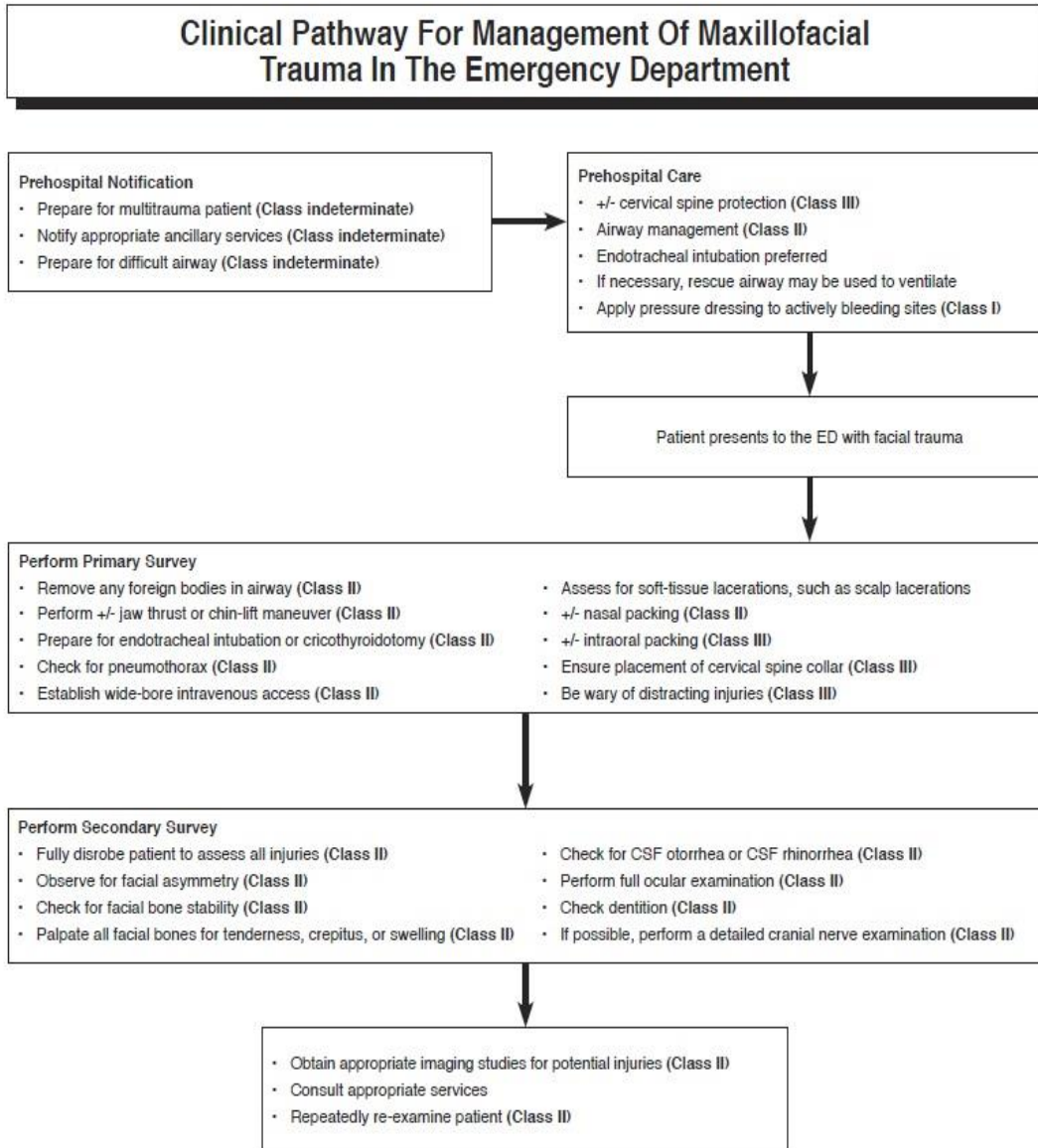
## 4.7 Failed airway algorithm

IV. If any of the previous algorithms fail then follow this algorithm:



## Appendix 5 Maxillofacial injury

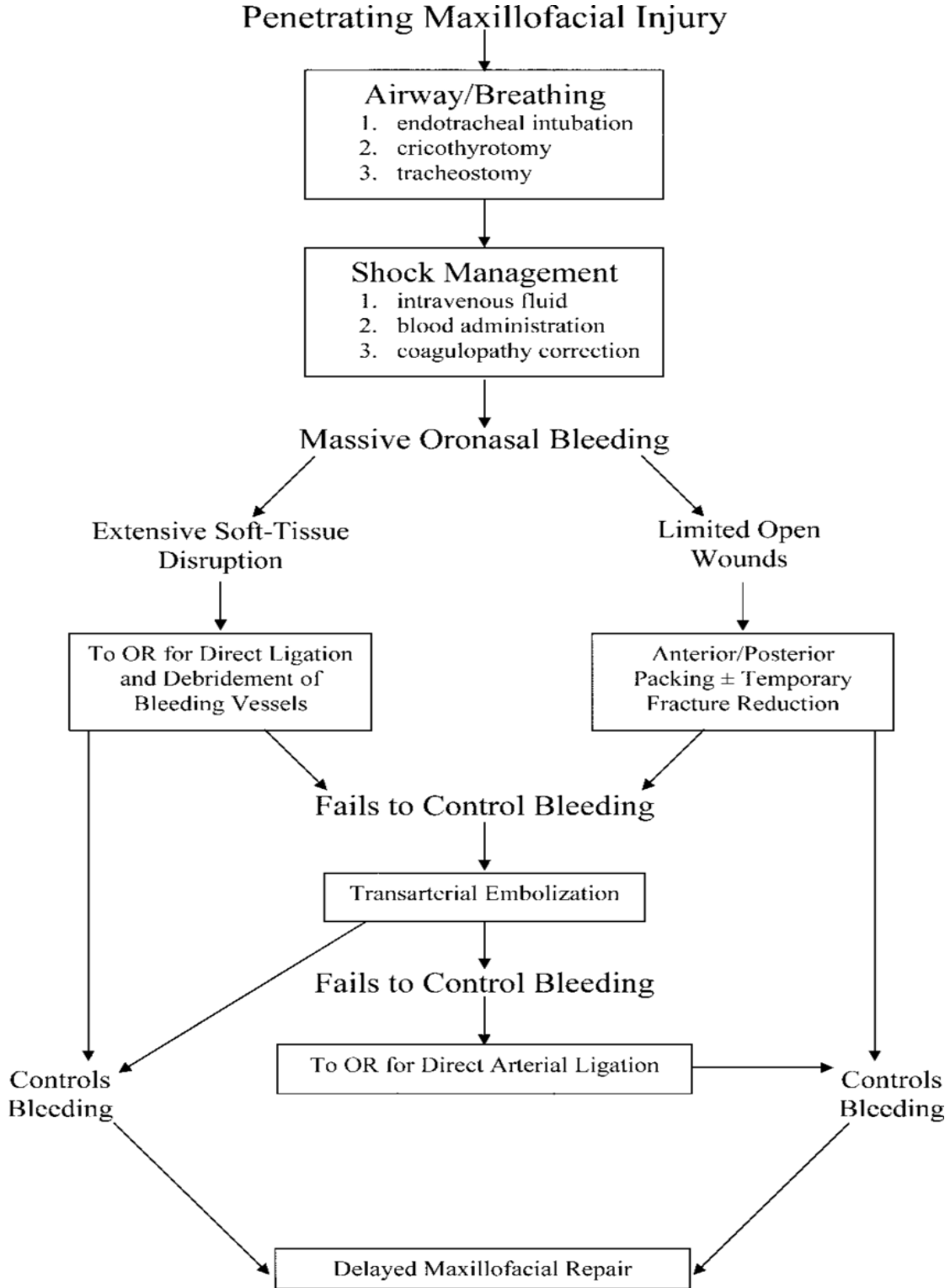
### 5.1. Clinical pathway for management of maxillofacial trauma in ED



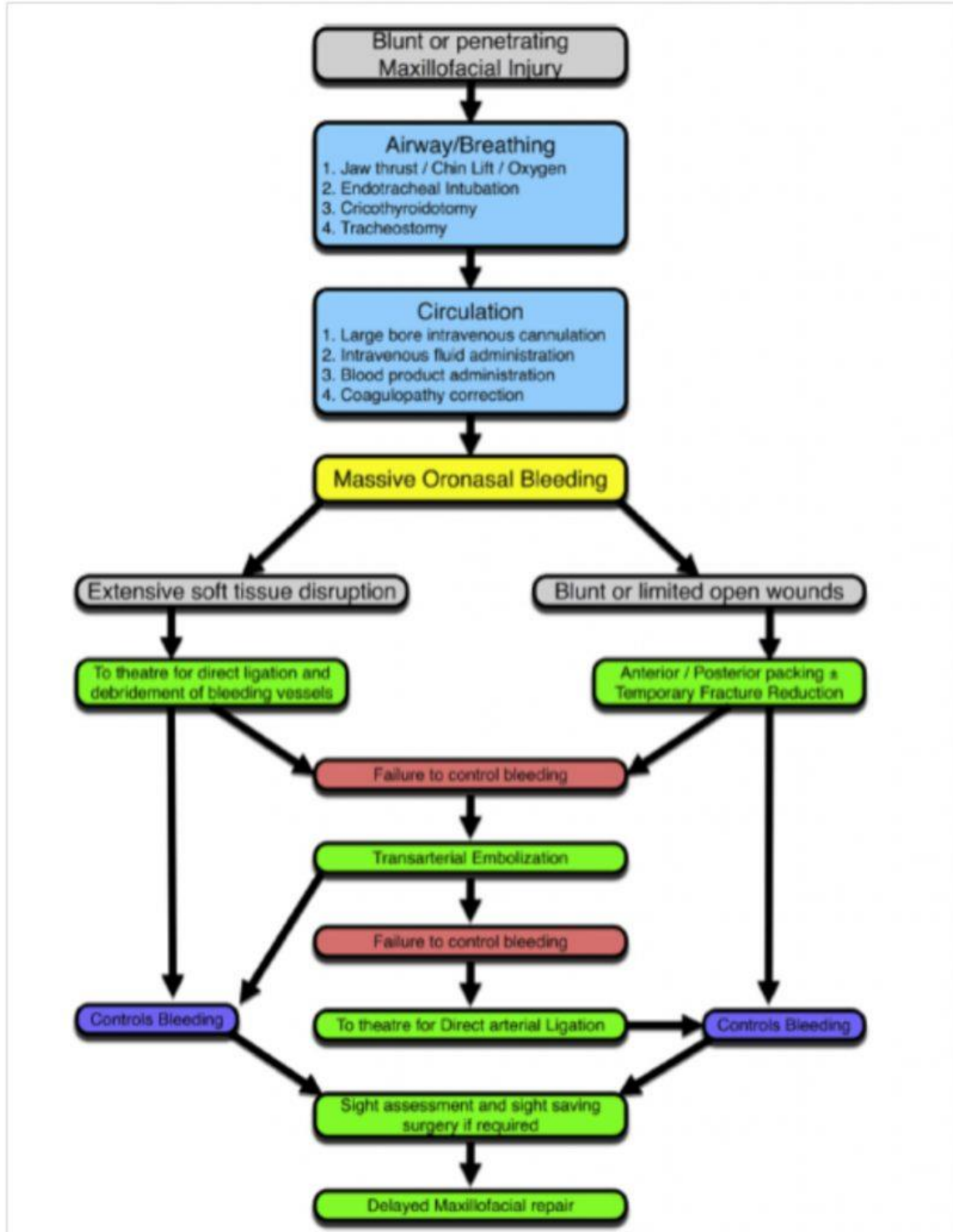
Abbreviations: CSF, cerebrospinal fluid; ED, emergency department.



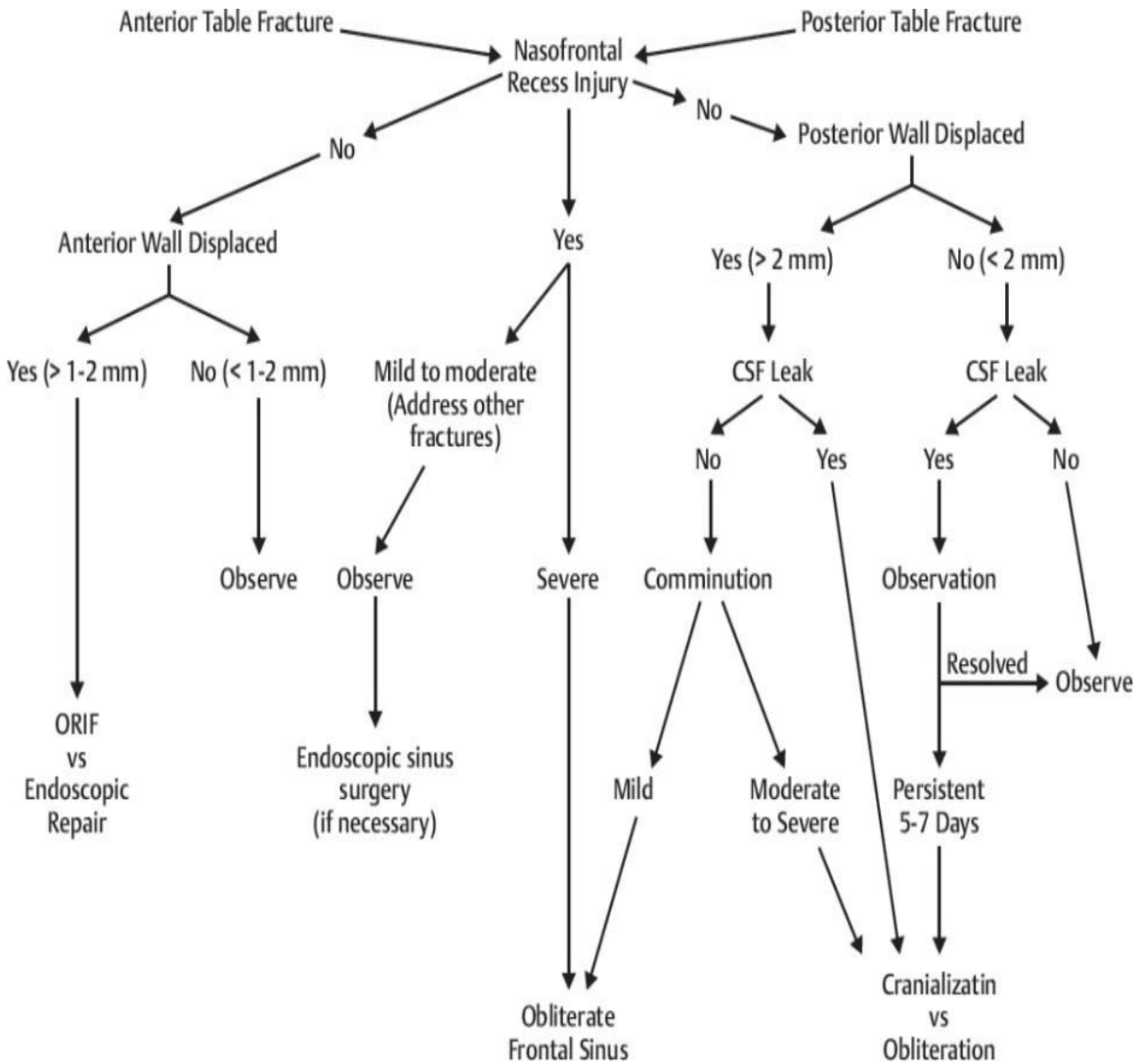
## 5.2 .A Penetrating Maxillofacial injury



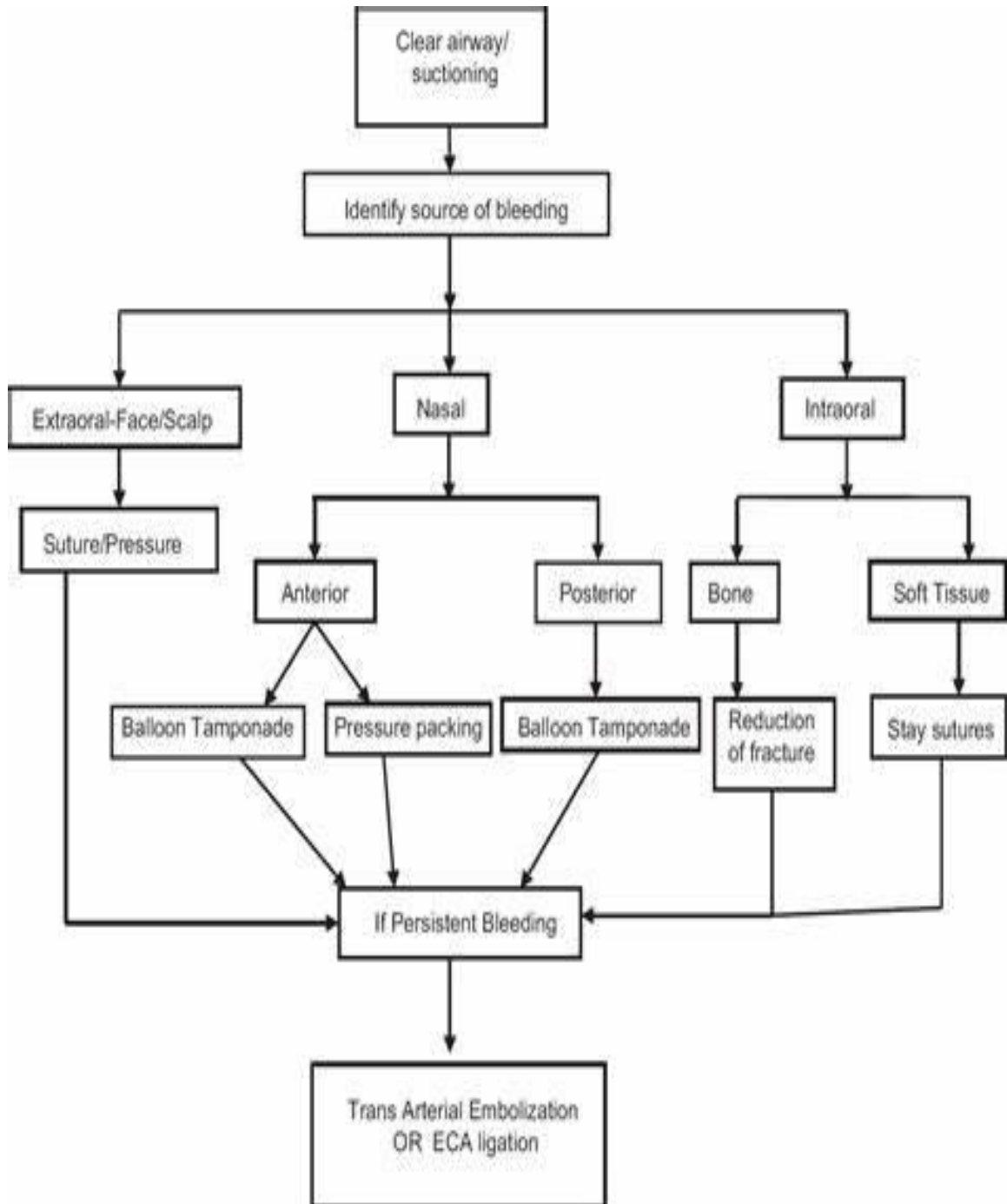
## 5.2. B Penetrating Maxillofacial injury



## 6.A Frontal sinus and Naso orbito ethmoidal fractures



## 6.B Craniomaxillofacial injury with facial bleed



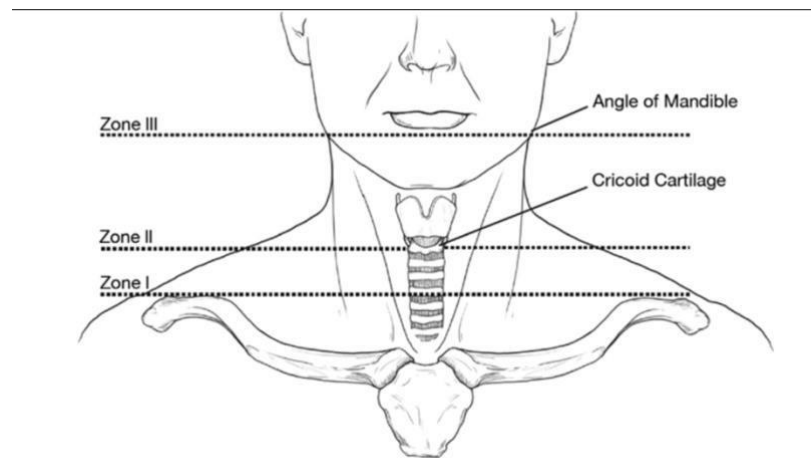
## 7.A Penetrating Neck Trauma

### Zones:

Zone 1: clavicle to cricoid

Zone 2: cricoid to angle of mandible

Zone 3: above angle of mandible



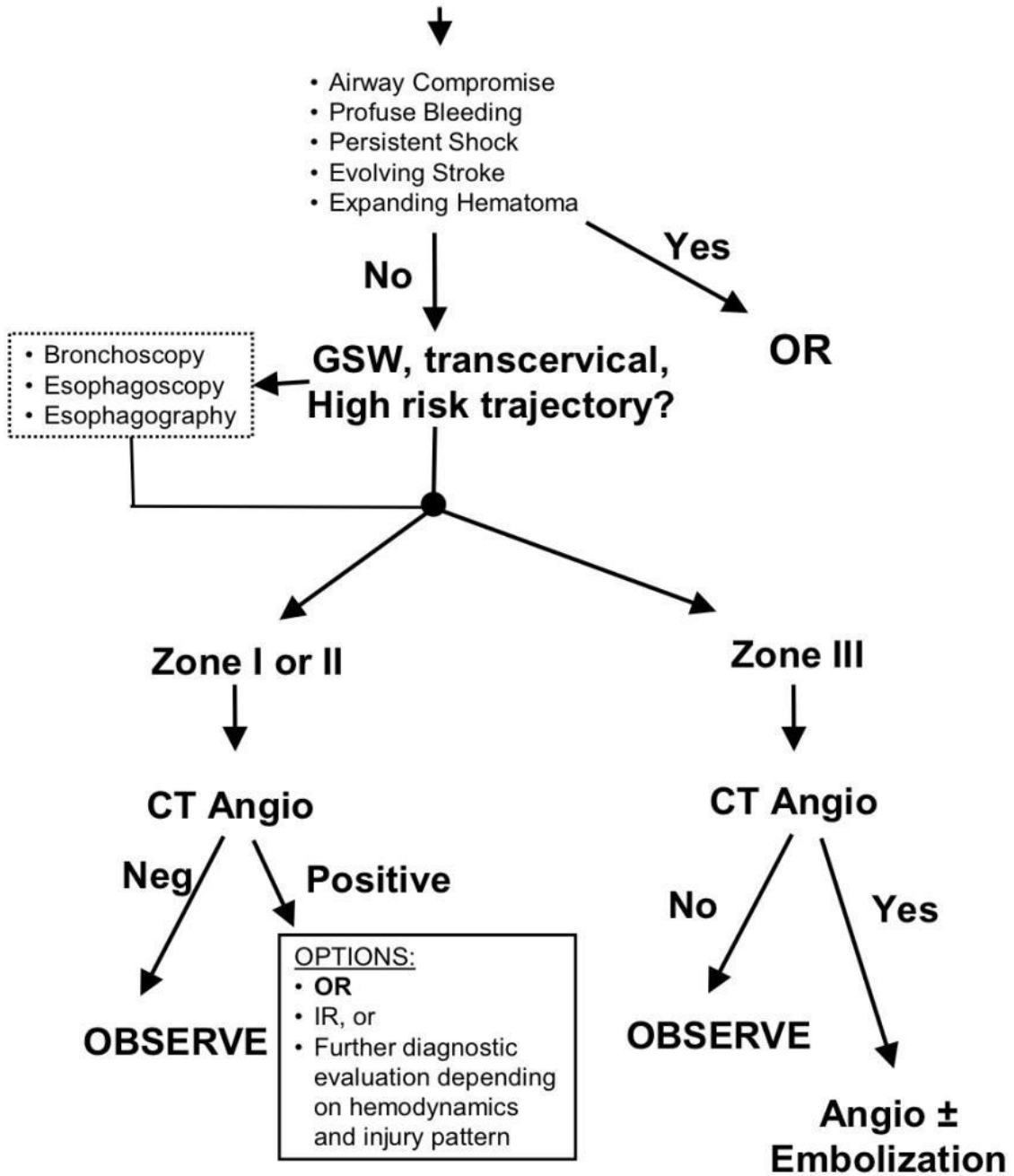
### Exam Findings:

- Active bleeding; Hypotension; Large or expanding hematoma; pulse deficits (carotid, brachial/radial), bruit
- Hemoptysis/hematemesis; Subcutaneous Emphysema; Hoarseness; Dysphagia
- Localizing Signs: Pupils, Limbs, CN's
- Cranial Nerves:
  - Facial, Glossopharyngeal (midline position of soft palate)
  - Recurrent Laryngeal (hoarseness, ineffective cough)
  - Accessory (shoulder lift)
  - Hypoglossal (midline position of tongue)
- Horner's: Myosis, Ptosis
- Brachial Plexus:
  - ✓ Median (fist) o Radial (wrist extension)
  - ✓ Ulnar (abduction/adduction of fingers)

- ✓ Musculocutaneous (forearm flexion)
- ✓ Axillary (arm abduction)

### **7.B. Penetrating Neck Trauma**

# Penetrating Neck Injury



## 8.A. Hemothorax

## BACKGROUND:

- Thoracic injuries are very common occurring in up to 60% of poly-trauma patients and represent 25% of all trauma deaths.
- Hemothorax is found in approximately 300,000 trauma patients per year.
- Most hemothoraces can be treated with simple chest tube drainage with a larger bore CT (32 French).
- Complications from hemothoraces include empyema and retained hemothorax (rHTX). Patients with rHTX have a higher likelihood of empyema.
- If a hemothorax is not drained well by a single chest tube placement, early VATS is now preferred over placement of a second chest tube.
- For high risk operative candidates or if the volume of retained hemothorax is small, alternative treatment with intrapleural thrombolytics (see TPA protocol below) is an alternative to try to avoid VATS.
- The ideal timing for VATS is between first 3-7 days which reduces the likelihood of conversion to thoracotomy.

## TPA Protocol:

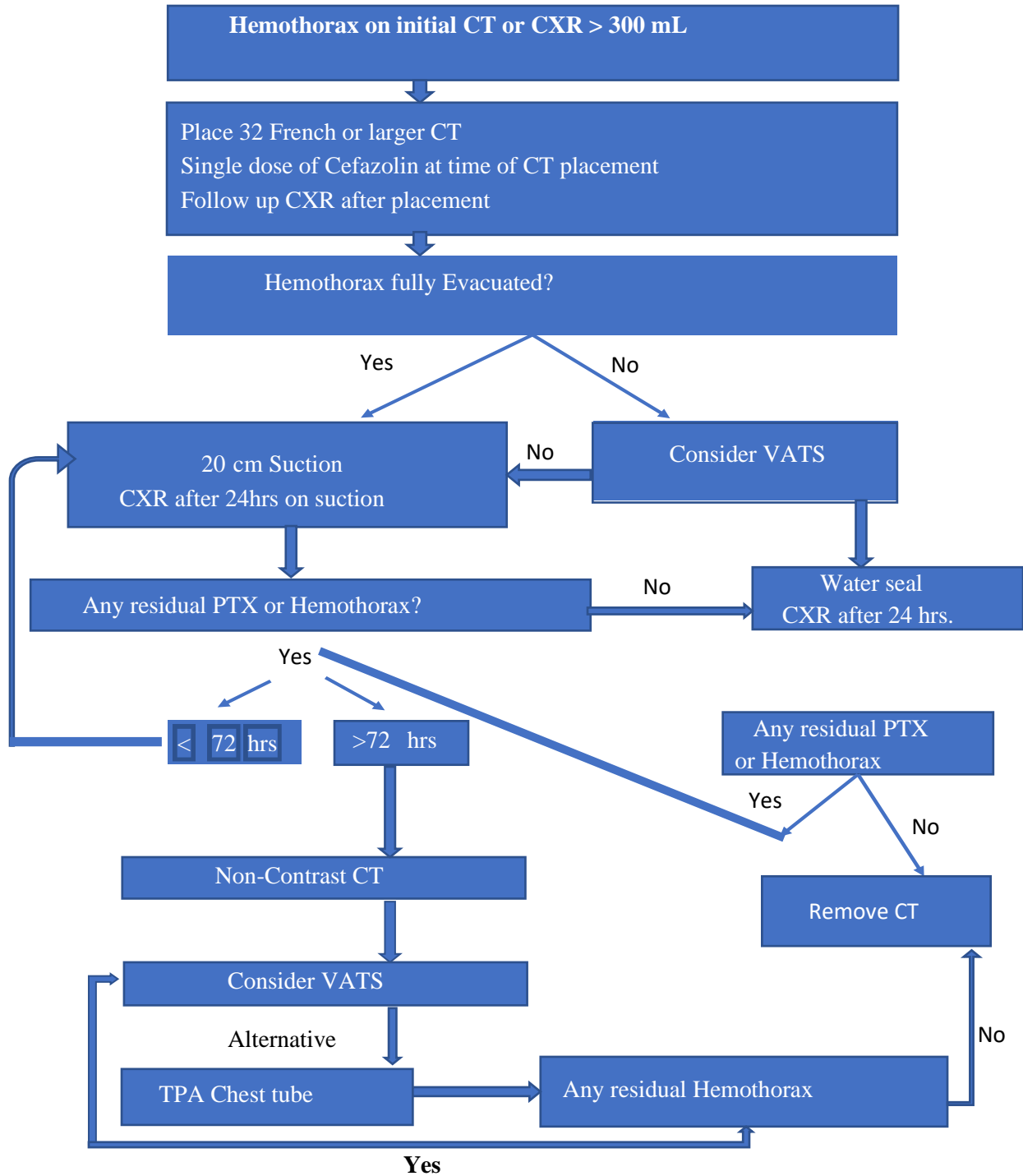
- TPA 6 mg mixed in 50 mL NS infused under sterile conditions into the CT. Clamp CT for 30 minutes and drain.
- If necessary, can be repeated Q8 hours x 3 doses.

## **8.B. Hemothorax**



### 8.C. Rib Fracture

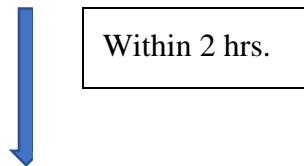
BACKGROUND:



- Multiple rib fractures (more than 4 ribs) in patients >45 years have been associated with increased morbidity
- Patients > 65 years who sustain blunt chest trauma with 2 or more rib fractures have twice the mortality and thoracic morbidity of younger patients with similar injuries.
  - The cornerstone of rib fracture management is early and adequate pain control to avoid complications from splinting (atelectasis, retained secretions, pneumonia)

### **Multiple Rib fracture**

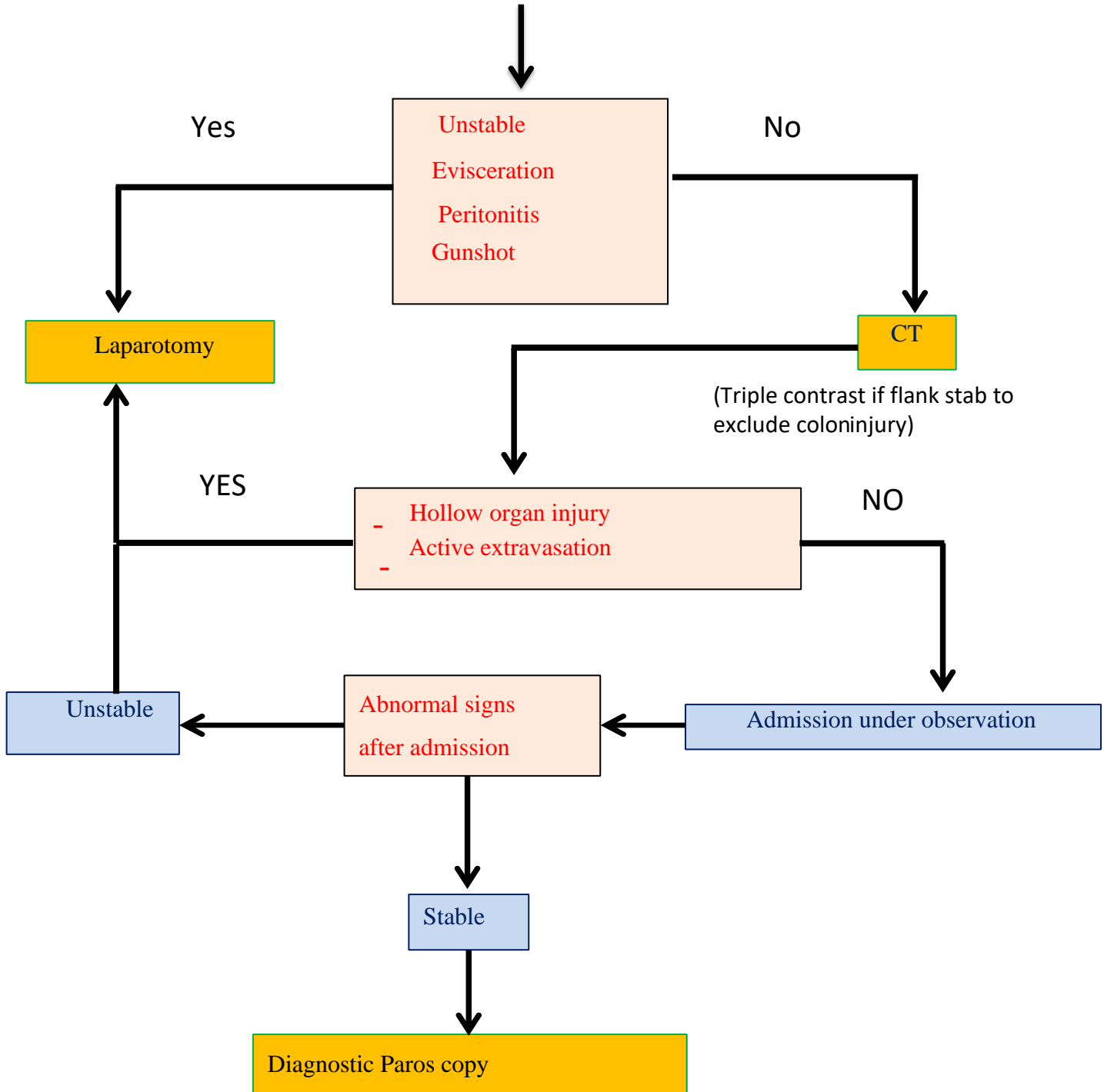
- Patients > 45 years with 4 or more rib fractures
- Patients > 65 years with 2 or more rib fractures



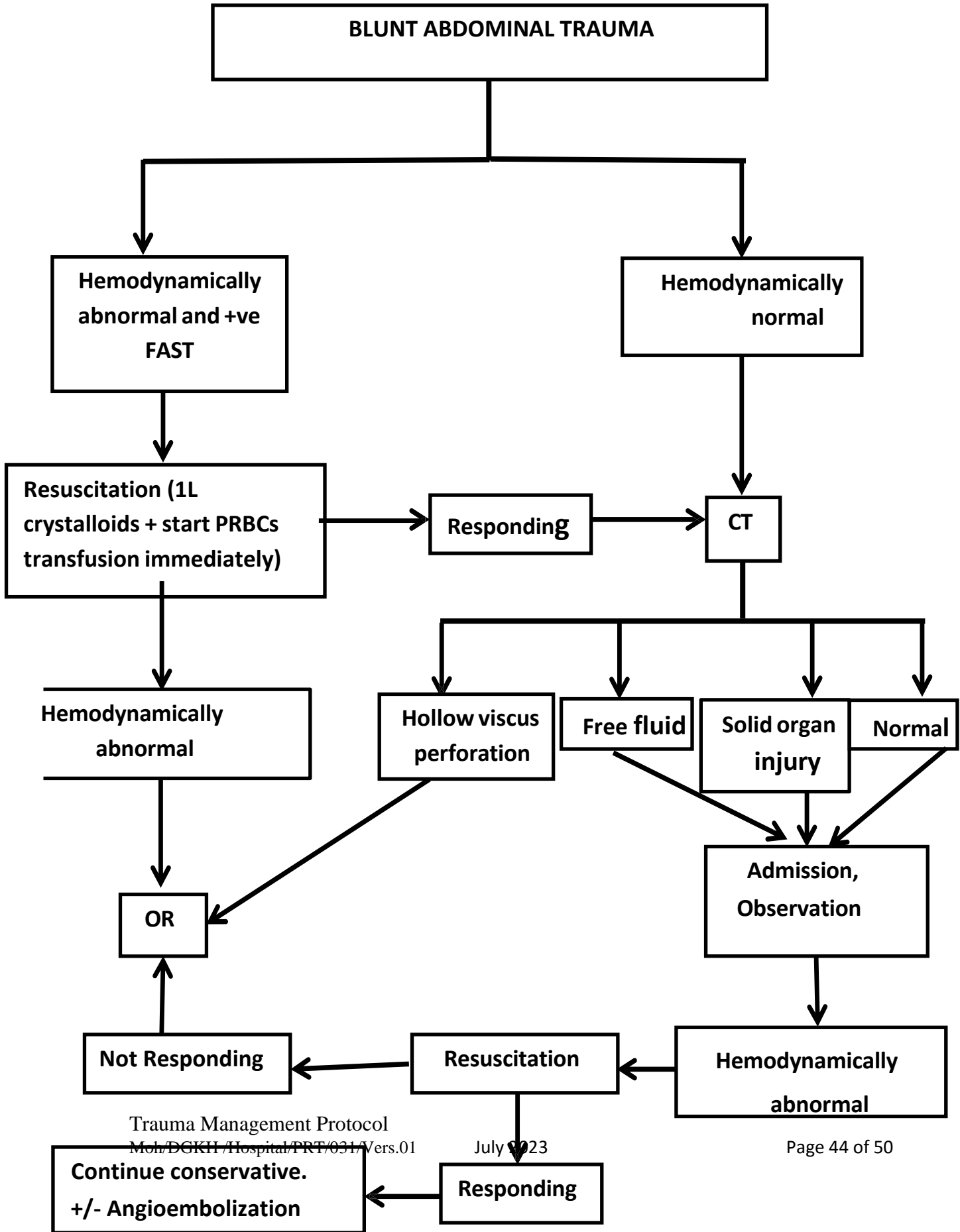
- Admit for pain control
- Consider ICU admission for any patient with 4+ rib fractures.
- Recommended ICU admission for age>65 years old & >2 ribs fracture for first 24 hours
- Aggressive early and adequate pain control
- PCA fentanyl preferable, fentanyl batch as alternative
- Coach patient on coughing and breathing
- Aggressive use of incentive spirometer
- Encourage patient ambulation
- Suctioning when necessary

## **9. ABDOMINAL TRAUMA**

## 9.1. PENETRATING ABDOMINAL TRAUMA



9.2. BLUNT ABDOMINAL TRAUMA



## 10.A. Pelvic Fracture

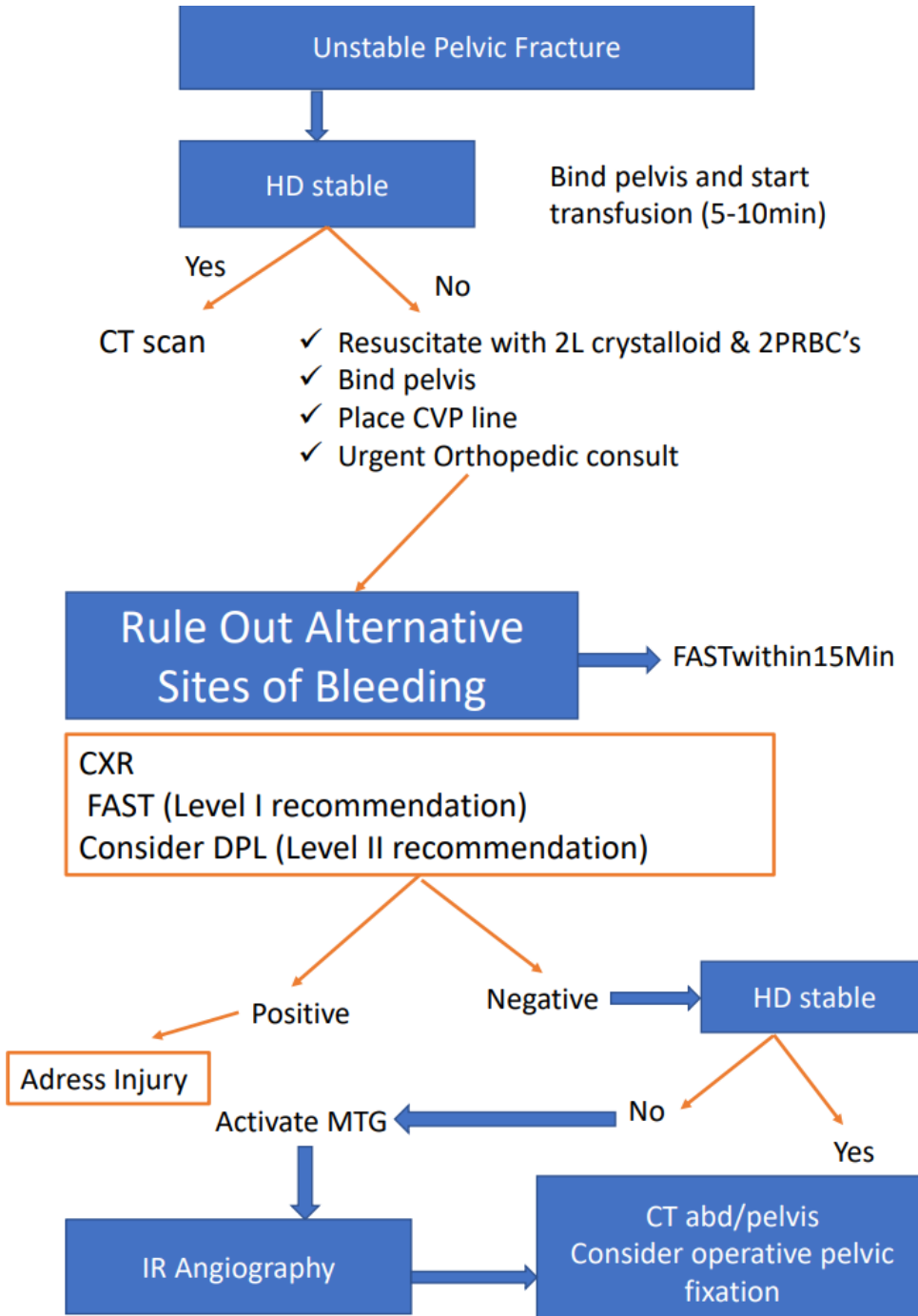
### BACKGROUND:

- Force required to fracture pelvis is substantial
- Can get large amount of bleeding
- Consider if patient in shock without other source of bleeding
- Consider lower GU trauma in all patients with displacement of pubic bone/pelvic ring toward bladder or with gross hematuria

### PRINCIPLES OF MANAGEMENT:

- Reduce pelvic volume: wrap pelvis, external fixation
- Control hemorrhage via IR techniques
- Level I recommendations:
  - ✓ Hemodynamically unstable with pelvis fracture after other causes excluded by FAST or DPL
  - ✓ HD stable patients with evidence of arterial hemorrhage on CT scan
- Level II recommendations:
  - ✓ Pts > 60 yo with major (open book, butterfly segment, or vertical shear) pelvic fractures irrespective of HD status
  - ✓ If repeat HD instability or continued hemoglobin drop following angiography with or without embolization, repeat angiography should be considered after other causes have been excluded
- FAST is good for ruling in bleeding in the presence of pelvic fracture but it is NOT good enough for ruling out bleeding with pelvis fractures in HD stable patients (Level I recommendation).
- CT abdomen/pelvis is mandatory in HD stable patients with major pelvis fracture or acetabular fractures (Level II recommendation).

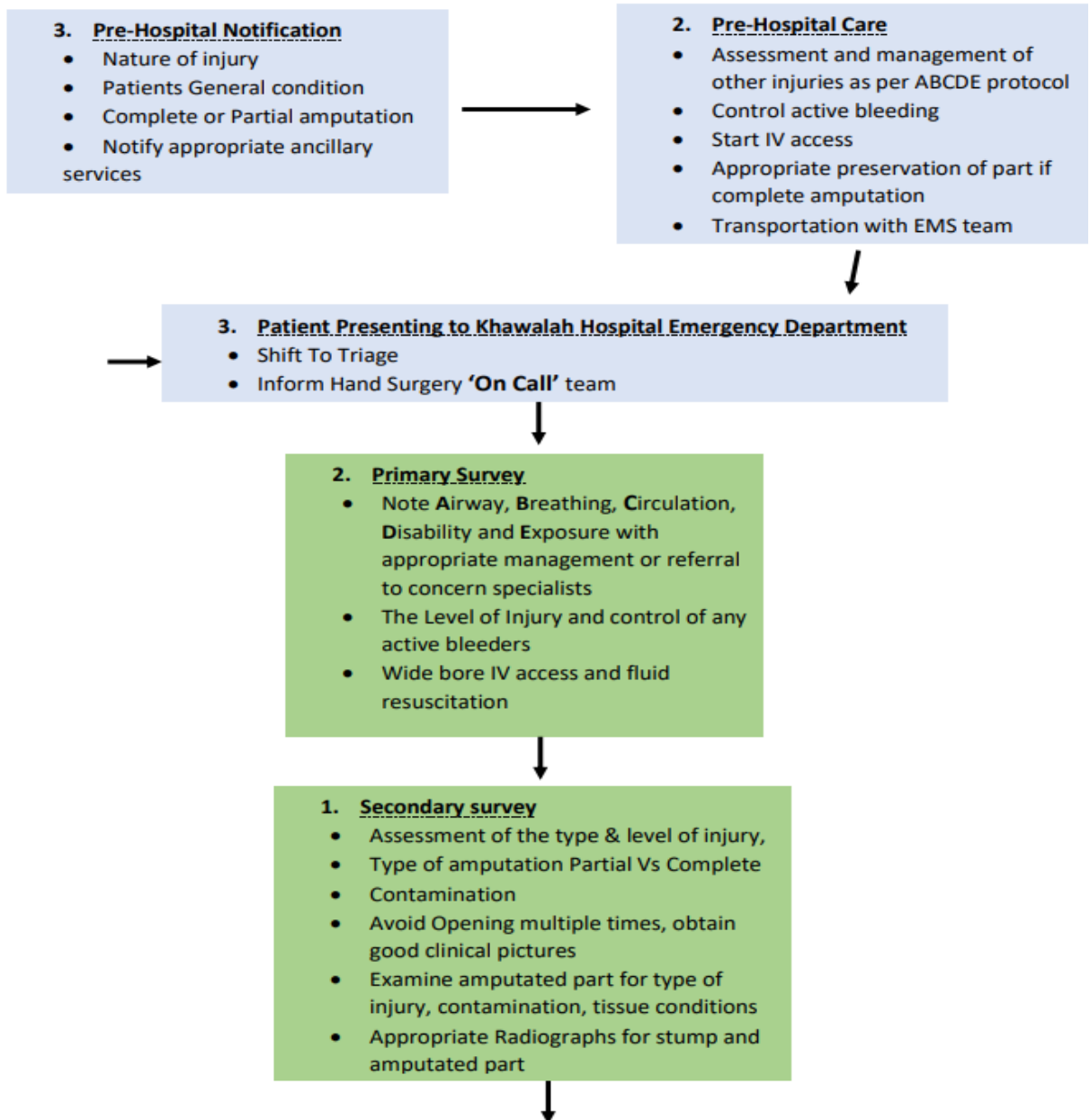
• 10.B. Pelvic Fracture



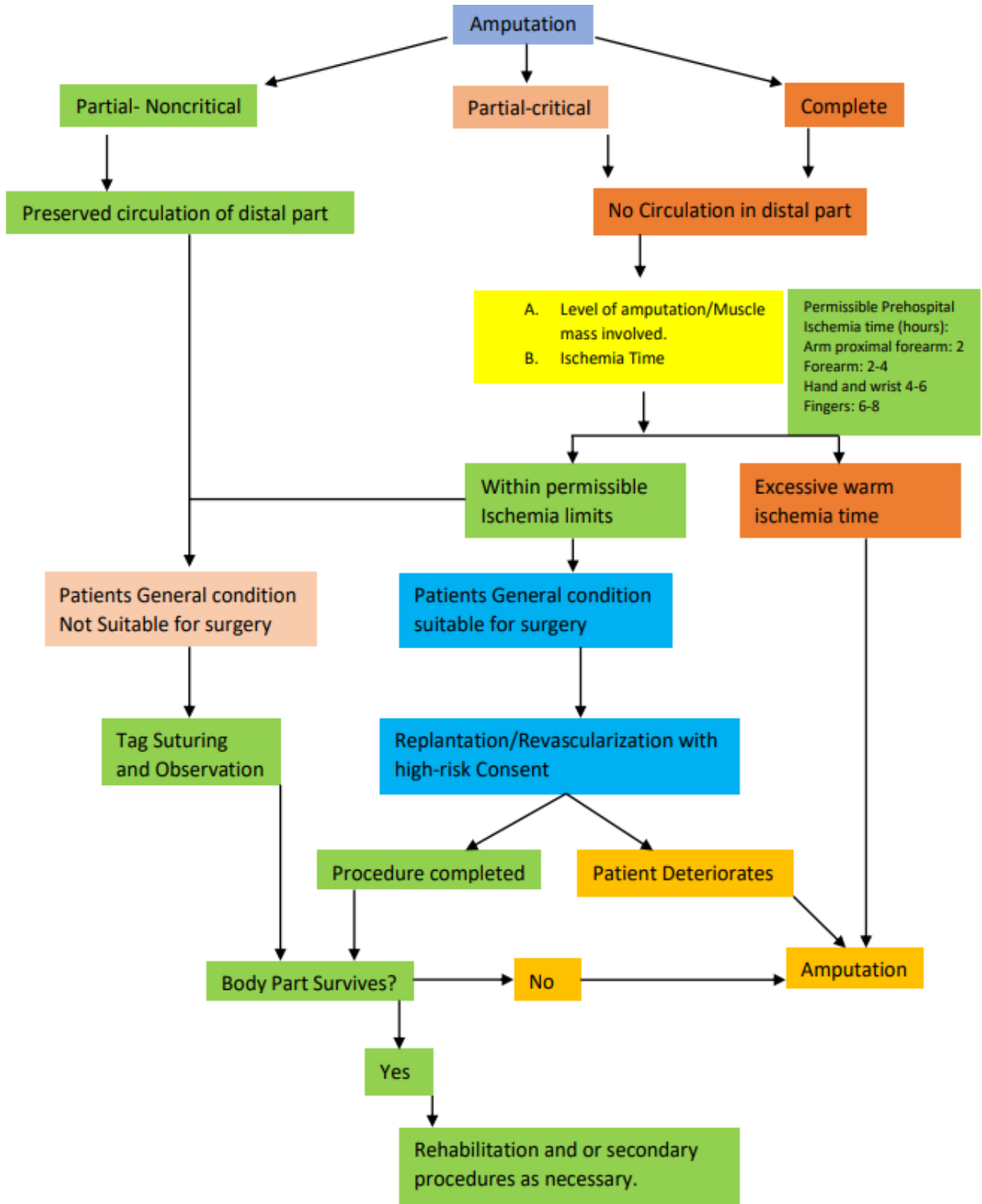
## 11. Hand Surgery

### Department Of Hand and Microvascular Surgery

#### :- Guidelines for traumatic Upper Limb amputations: -

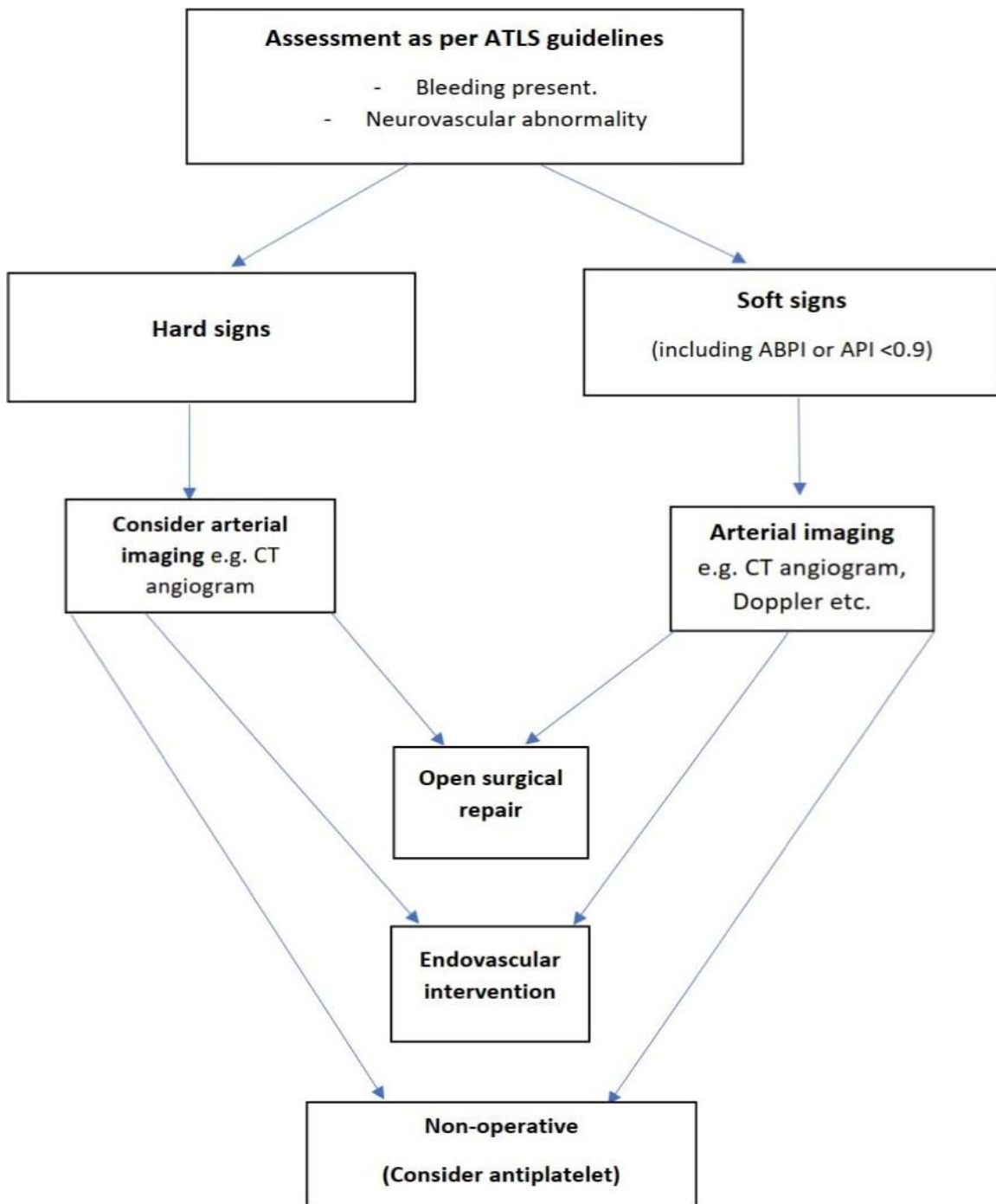


### 11.1. Traumatic Amputation Management





## 12. Management of Vascular injury



### 13. Management of Burn

