Anaesthesia for Emergency and Trauma cases

Dr. Ahmad Arraqap
Anesthesia dept.
Faculty of Medicine
University of Jordan

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OUTLINE

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- Definitions
- Types
- Preparation
- Intra-operative management
- Post-operative management
- Examples:
  - ATLS
  - Cesarean Section
  - BURN

INTRODUCTION

- Patients undergoing emergency surgery have a 10-fold increased risk of adverse events compared to Those having planned or elective surgery.
- Although each of the surgeries mentioned have unique requirements for their sub-specialties, there are some basic common principles.
- The objective of emergency anaesthesia is to allow correction of the surgical pathology with minimum risk to the patient.
- Risks can be reduced by careful consideration of the patient's history, clinical examination and special investigations

Definitions of Surgical Timing

Timing	Definition
Emergency	Immediate threat to life or limb without surgical intervention, where there is very limited or no time for preoperative clinical evaluation, typically <2 h.
Urgent	Threat to life or limb without surgical intervention, where there may be time for preoperative clinical evaluation to allow interventions that could reduce risk of MACE or other postoperative complications, typically ≥2 to <24 h.
Time-sensitive	surgery may be delayed up to 3 months to allow for preoperative evaluation and management without negatively impacting outcomes.(cancer surgey)
Elective	The surgical procedure can be delayed to permit a complete preoperative evaluation and appropriate management.

Types

- Traumatic

or

- Non-traumatic:
  - Obstetrical
  - Neurological
  - Vascular
  - Burns
  - Genito-Urinary
  - Gastrointestinal … etc…

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General surgery

Appendicectomy
Incision and drainage of an abscess
Laparotomy for small or large bowel obstruction
Strangulated hernia
Acute upper or lower gastro-intestinal bleed
Trauma (blunt or penetrating)

Gynaecological surgery

Ruptured ectopic pregnancy
Evacuation of retained products of conception

Obstetrics

Caesarean section for a variety of indications

Orthopaedic surgery

Open fracture debridement
Poly-trauma

Vascular surgery

Ruptured abdominal aortic aneurysm
Amputation

Neurosurgery

Intracranial haemorrhage with raised intracranial pressure or falling Glasgow coma scale (GCS)

Otorhinolaryngology (ENT)

Epistaxis
Tonsillar abscess

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PREOPERATIVE PREPARATION

Factors increasing peri-operative risk

- ✓ Limited time to assess and prepare patient
- ✓ Uncertain diagnoses, e.g. laparotomy for 'acute abdomen
- ✓ Risk of aspiration
- ✓ Body fluid, electrolyte and acid base derangements
- ✓ Anaemia and coagulation abnormalities
- ✓ Coexisting diseases and poorly controlled chronic medical problems
- ✓ Pain and its pathophysiological effects
- ✓ After-hours surgery and anaesthesia with junior and/or inexperienced staff

Pre-operative evaluation

- Pre-operative evaluation is used to assess anaesthetic risks
- Decide on an anaesthetic technique (general, regional, or a combination) and
- Plan the postoperative placement and care of each patient.
- Pay particular attention to the patient's fluid status, metabolic derangements and risk of aspiration.

Pre-operative evaluation

- Resuscitation is initiated, if needed, at any time
- Consent for anesthesia , blood transfusions and advice that intraoperative awareness may occur during emergency surgery.
- Discussions should be documented in the patient's record.

Pre-operative evaluation

- History, aspiration risks and review of notes and charts
- Time limitations with emergency surgery.
- pertinent medical-, surgical- and drug- history should be elicited;
- emphasis on cardio-respiratory symptoms
- Last oral intake
- Remember to ask about vomiting and diarrhoea, which affect fluid status

Risk of aspiration

- Inadequate fasting time
- Head & neck trauma
- Unable to protect airway [head or spinal injury ,vocal cord injury]
- Pregnancy
- Intestinal obstruction
- Pain
- Intra abdominal mass
- Obesity

Prevention of aspiration ASA Fasting Guidelines

Clear fluid	**2 hours**	Water , Fruit juice without pulp,
Milk		
Human	**4 hours**	
Infant formula	**6 hours**	
Light Foods	**6 hours**	Fruits , juice with pulp, Vegetables
Heavy foods	**8 hours**	Fatty meals , meats

Pre-operative evaluation

Examination and airway assessment

- Focus on the cardio-respiratory systems, aiming to identify potential difficulties during anaesthesia.
- An airway evaluation must always be performed.
- Assessment of intravascular volume and extracellular volume status is difficult.
- Intravascular volume depletion may be masked by compensatory mechanisms in young patients and not present in elderly patients due to poor baroreceptor reflex responses.

- Always check the vital signs: Blood pressure (BP), heart rate (HR), respiratory rate (RR) and temperature

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Clinical indices: Extent of blood loss				
Class of hypovolaemia	**1 Minimal**	**2 Mild**	**3 Moderate**	**4 Severe**
% blood loss	10 %	20 %	30 %	> 40 %
Volume loss ml	500	1 000	1 500	> 2 000
Heart rate beats min^{-1}	normal	100 - 120	120 - 140	> 140
Arterial pressure mm"Hg"	normal	Orthostatic hypotension	SBP < 100	SBP < 80
Urinary output ml hr^{-1}	1 ml kg^{-1} hr^{-1}	20 - 30	10 - 20	Nil
Level of consciousness	Normal	Normal	Restless	Impaired
State of peripheral circulation	Normal	Cool and pale	Cold and pale slow capillary refill	Cold & clammy peripheral cyanosis

Clinical indices: Extracellular fluid loss		
% body weight lost as water	**ml of fluid lost per 70 kg**	**Clinical presentation**
> 4 %	> 2 500	Thirst, reduced skin elasticity, decreased intraocular pressure, dry tongue, reduced sweating
> 6 % *(mild)*	> 4 200	Orthostatic hypotension, reduced filling of peripheral veins, oliguria, nausea, dry axillae + groins, ↓ CVP, apathy, haemoconcentration *(higher than expected Hb)*
> 8 % *(moderate)*	> 5 600	Hypotension, thready pulse with cool peripheries.
10 - 15 % *(severe)*	7 000 - 10 000	Coma, then shock followed by death

- Lab investigations if possible … usually done as resuscitation is carried on

- Prepare to manage any uncontrolled co-morbidities
  - Ex. D.M, HTN, ASTHMA

Conduct of anesthesia for emergency surgery

- There are few patients whose clinical state is so life threatening that they need immediate surgery
- The majority of patients benefit from the correction of hypovolaemia and electrolyte abnormalities, stabilisation of medical problems and waiting for the stomach to empty.
- General anaesthesia is the most common type of anaesthetic for emergency surgery,
- Regional or sedation techniques are also employed

O.R

- The operating room should be as warm as practical.
- Intravenous fluid warmers and rapid infusion devices should be prepared and ready for use..
- Patients arriving for trauma surgery **should be presumed to have full stomachs with increased risk for aspiration** of gastric contents.
- The presence of a C-collar for cervical spine stabilization may increase intubation difficulty.
- **Alternative airway devices (eg, fiberoptic bronchoscope, videolaryngoscope)** and robust suction equipment must be immediately available and ready for use.

Intravenous access

- Intravenous access is usually established in the prehospital setting or emergency department.
- If the existing peripheral intravenous lines are of sufficient caliber and quality for infusing blood under pressure (eg , from a rapid infusion device), a central line may not be necessary for the initial surgical intervention.

- The **subclavian vein** *is often preferred for central venous access for profoundly hypotensive patients due to its position between the clavicle and first rib, which tends to stent the subclavian vein open even in profound hypovolemia.

- The availability of **ultrasound** devices in anesthesia practice may allow safe placement of large- bore or central venous catheters in jugular veins using ultrasound guidance, even in the presence of profound hypovolemia.

Intraosseous access

- An intraosseous device placed with the use of a small bone drill in **the proximal tibia** or humerus provides direct access to venous complexes through the bone marrow.
- Use of intraosseous access requires that the bone proximal and distal to the insertion site be intact, otherwise extravasation of infused fluids will occur due to the fluid taking the path of least resistance (the fracture site).
- Intraosseous infusions **require pressure**, not gravity, for infusions to overcome the resistance to flow originating in the bone marrow.

Choice of anaesthetic agents

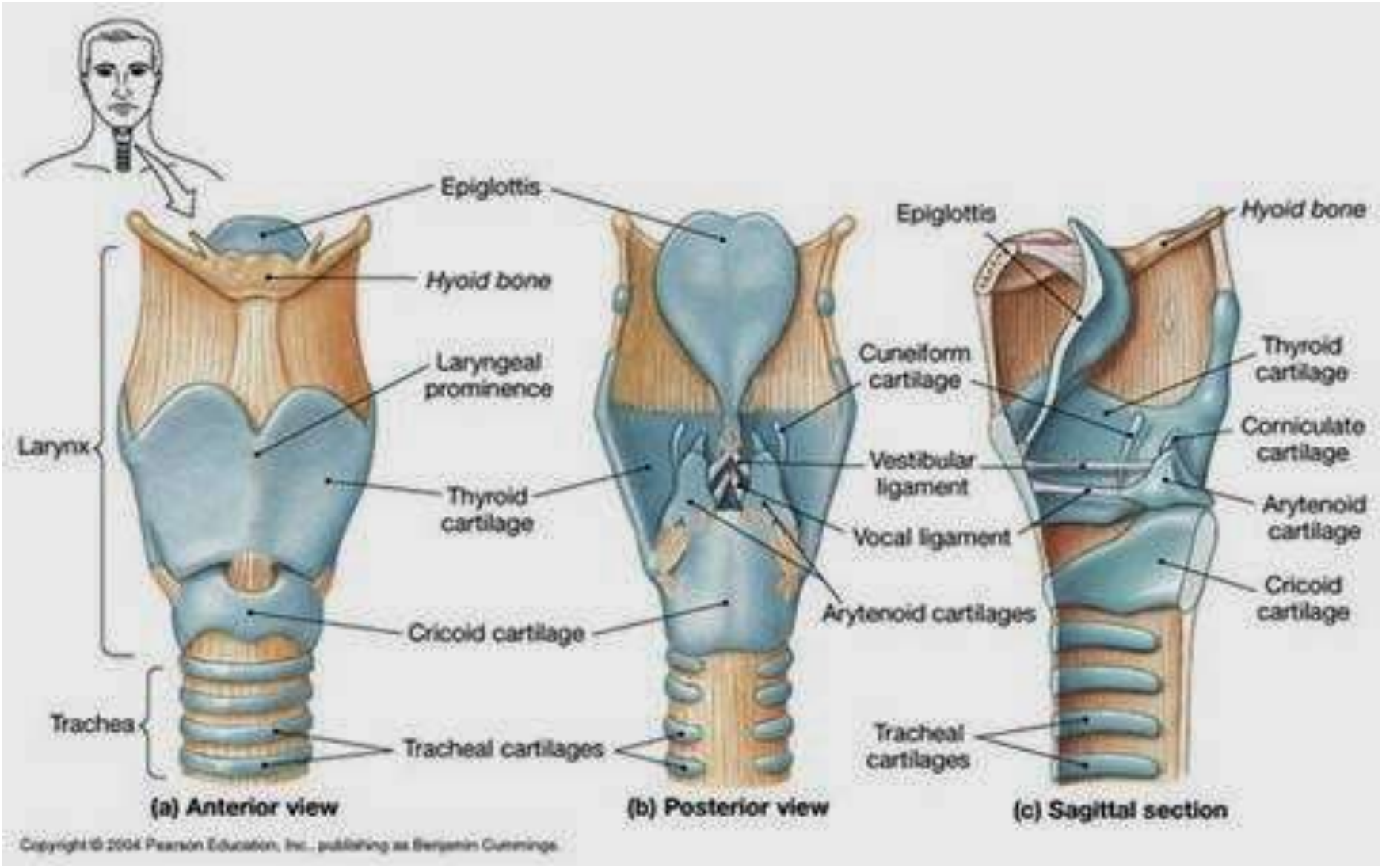
- Propofol is associated with significant haemodynamic changes and is not advised in the emergency setting.
- Etomidate and ketamine are all cardiovascularly more stable agents and better choices.
- Co-induction with a short-acting opioid, e.g. fentanyl may reduce the dose of the induction agent due to its synergistic effect.
- If the patient is shocked , all drug doses should be reduced
- In the, extremely unstable shocked patient, a preferred technique is the use of high-dose short-acting opiates
- The volatile agent of choice would be iso-, sevo- or des-flurane as they are the most cardiovascularly stable.

Rapid sequence induction (RSI)

The aim is to minimizes the risk of aspiration

- The availability of suction must be confirmed before induction.
- Preoxygenation with 100% oxygen for 3-5 minutes or 4 vital breaths.
- Predetermined rapid IV induction agent.
- Followed by rapid acting muscle relaxant (suxcamethonium or rocuronium) without waiting to assess the effect of induction agent.
- Combined (with or without) **cricoid pressure** to reduce the risk of aspiration.*
- DO NOT MASK VENTILATE
- Insertion of NG tube after endotracheal intubation for stomach emptying.*

Why Cricoid Cartilage?



Intra-operative management

- Emergency or trauma surgery may be fraught with complications.
- Be vigilant during the case.
- Close monitoring of the patient's

✓ haemodynamic status,

✓ urine output,

✓ haemoglobin and

✓ acid base status with

✓ arterial blood gases (ABGs)

- it is prudent to insert invasive monitoring in the form of an arterial line prior to induction and a central line after induction if necessary.

Invasive monitoring

- An **arterial line is very helpful** in the initial resuscitation of the trauma victim.
- Even with the assistance of ultrasonography, cannulating an artery in the presence of profound hypotension may prove difficult.
- Attempts at placing invasive monitors can continue as the patient is prepared for incision, to include gowning and gloving the person attempting arterial line placement on the surgical side .
- Although arterial line placement may be a challenge, surgical incision cannot be delayed.
- placement can resume, and are more likely to be successful, as blood pressure improves from operative hemostasis and resuscitative transfusion.

Fluid management

- Fluid management in major trauma resuscitations emphasizes blood products rather than crystalloid fluids.
- All fluids should be warmed, except for platelets. When blood products are rapidly infused, ionized calcium quickly declines and must be replaced.
- **Vasopressors should not be used, if possible, until the source of bleeding is controlled**. Studies suggest that raising the blood pressure with vasopressors during hemorrhage disrupts fresh clots, resulting in more bleeding.

Fluid management

- An Massive Transefusion Protocol should be requested and followed, with the blood immediately available upon the arrival of the patient to the operating room.
- The *assessment of blood consumption* (ABC) score is an attempt to predict which patients are likely to require an MTP

Fluid management

- TheABC score assigns 1 point for the presence of eachof four possible variables:

- penetrating injury
- systolic blood pressure less than 90 mmHg
- heart rate greater than 120 beats per minute
- Positive results of a *focused assessment with sonography for trauma* (FAST) evaluation.

- Patients with ABC scores of 2 or higher are likely to require massive transfusion.

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POST-OPERATIVE MANAGEMENT

Postoperative management

- Post-operatively, patients will need
- ✓ Analgesia,
- ✓ Fluids and/or
- ✓ Blood products.
- Decisions on where to place the patient are made based on the patient's pre-operative condition, intra-operative events and available facilities.

- Atropine and neostigmine are given and patient will breathe in 100% oxygen.*

- Because of the risk of aspiration, extubation is performed only when there is **recovery of airway reflexes**. (when the patient is fully awake).

- Decision for extubation depends on patient's haemodynamic status

- In stable patient, before extubation Direct laryngoscopy is performed and secretion or debris are removed*. If nasogastric tube is in situ, it is aspirated.

Postoperative management

- Patients to consider for post-operative ventilatory support or intensive care are those with:

- Prolonged shock or hypoperfusion of any cause
- Requiring inotropes
- Hypothermia (core temp <34° C)
- Massive sepsis
- Intra-abdominal packs
- Severe ischaemic heart disease
- Respiratory failure Extrerne obesity

Pain Management

- Relief of pain / anxiety as appropriate
- Administer intravenously
- Careful monitoring is essential
- No NSAIDS for hypovolemic patients
- Regional Anaesthesia (Hemodynamic instability, Coagulopathy)

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ATLS

- Trauma is a leading cause of morbidity and mortality in all age groups
- Surgical correction of hemorrhage is of no utility
- in a poorly resuscitated patient, and an elegant resuscitation in a patient inwhom bleeding is not controlled is equally useless.
- The role of the anesthesiologist in trauma is to guide the resuscitation of the trauma patient inthe operating room

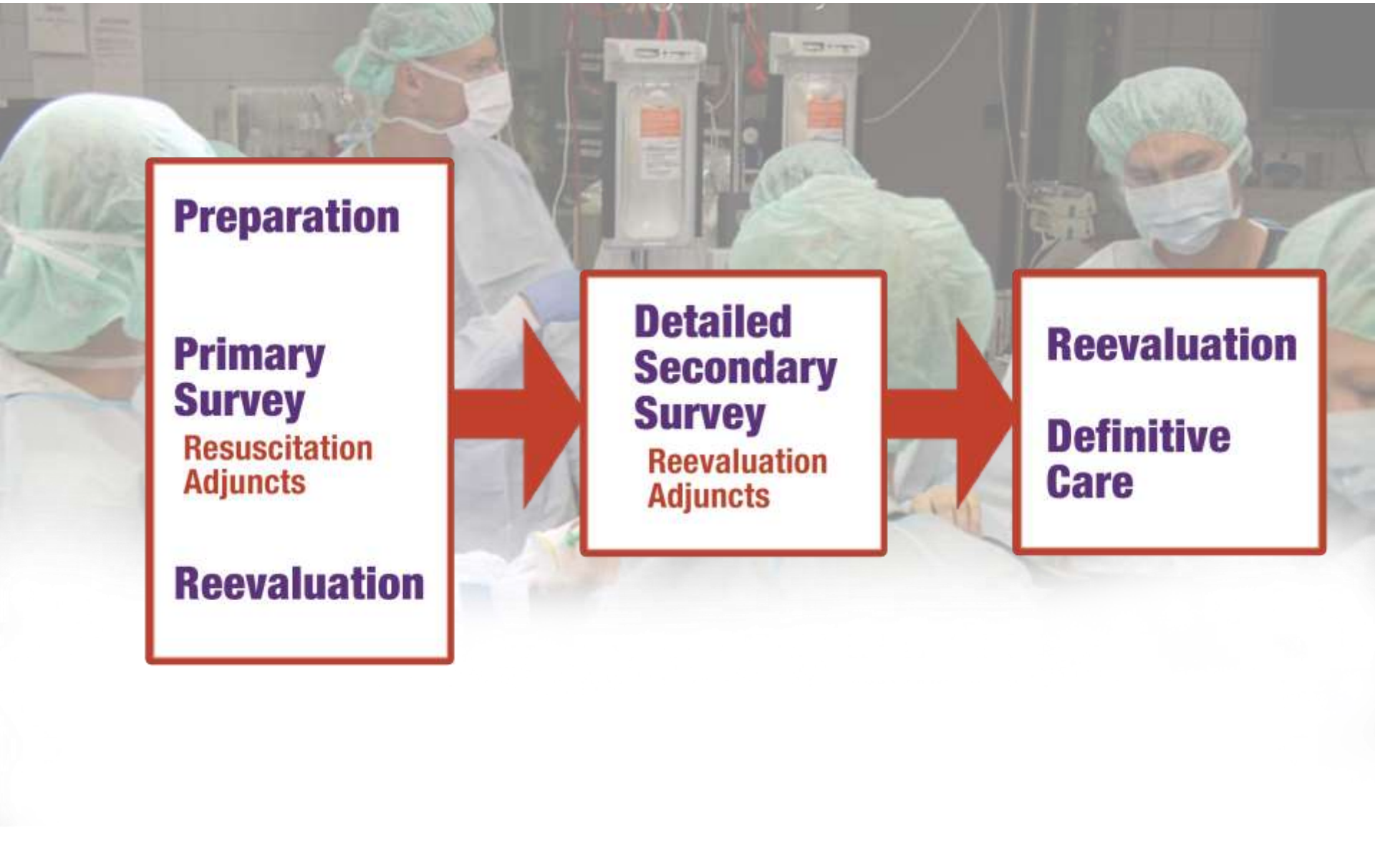
ATLS

- INITIAL SURVEY
- PRIMARY SURVEY
- SECONDARY SURVEY
- RESUSCITATION
- DEFINITIVE TRAUMA INTERVENTIONS

Initial Assessment

Primary survey and resuscitation of vital functions are done simultaneously using a team approach.

Concepts of Initial Assessment



Primary Survey

Airway with c-spine protection

Breathing and ventilation

Circulation with hemorrhage control

Disability: Neuro status

Exposure / **E**nvironmental control

PRIMARY SURVEY

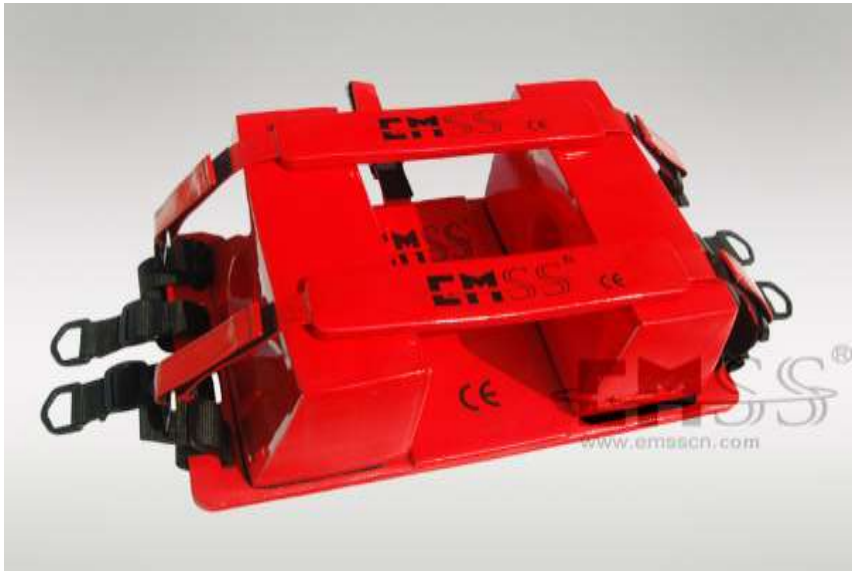
- A….. Airways, It is rather an Ac
- B…..Breathing
- C…..Circulation
- D…..neurological Dysfunction
- E….. Exposure

Primary Survey

Airway

- Establish patent airway
- protect c-spine
- BLS

- Occult airway injury
- Progressive loss of airway
- Equipment failure
- Inability to intubate


www.emsscn.com

Primary Survey

Breathing and Ventilation

Assess and ensure adequate oxygenation and ventilation

- Respiratory rate
- Chest movement
- Air entry
- Oxygen saturation

Primary Survey

Breathing and Ventilation

Airway versus ventilation problem?

Iatrogenic pneumothorax or tension pneumothorax?

Primary Survey

Circulation
(including hemorrhage control)

Assess for organ perfusion

- Level of consciousness
- Skin color and temperature
- Pulse rate and character
- URINE OUTPUT
- CAPILLARY REFILL

Primary Survey

Circulatory Management

- Control hemorrhage
- Restore volume
- Reassess patient

Pitfalls

- Elderly
- Children
- Athletes
- Medications

Primary Survey

Disability

- Baseline neurologic evaluation
- Glasgow Coma Scale score
- Pupillary response

Observe for neurologic deterioration

Primary Survey

Exposure / Environment

Completely undress the patient

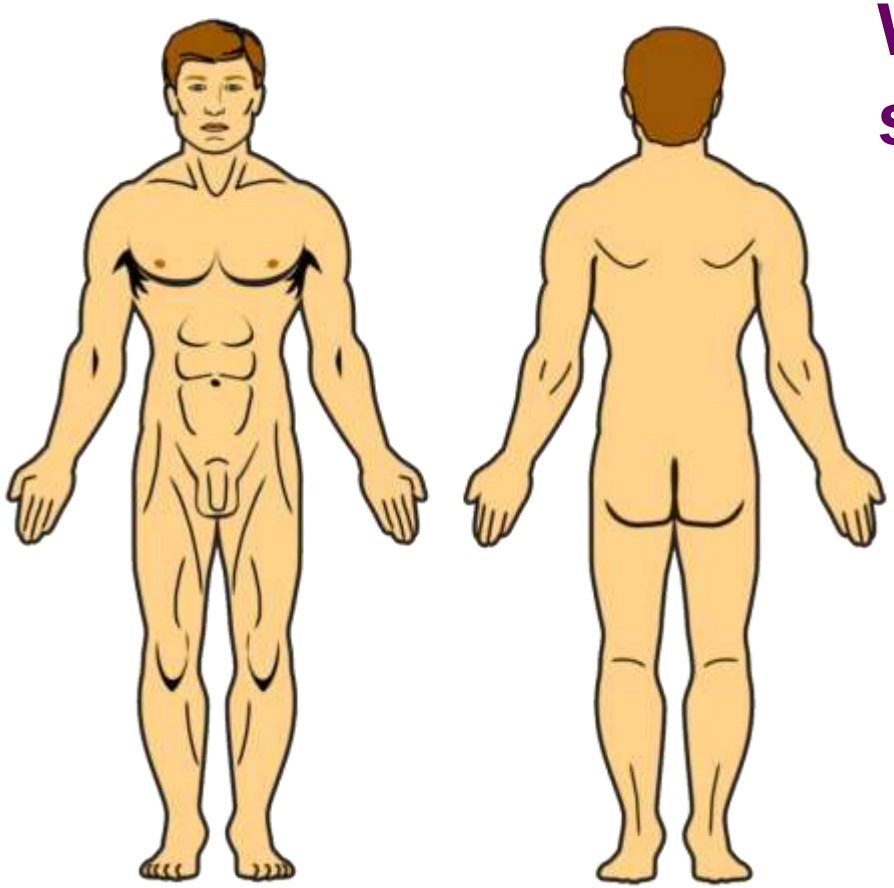
Caution

Prevent hypothermia

Pitfalls

Missed injuries

Secondary Survey



What is the secondary survey?

The complete history and physical examination

Secondary Survey

When do I start the secondary survey?

After

- **Primary survey is completed**
- **ABCDEs are reassessed**
- **Vital functions are returning to normal**

Secondary Survey

Components of the secondary survey

- History
- Physical exam: Head to toe
- Complete neurologic exam
- Special diagnostic tests
- Reevaluation

Secondary Survey

History

Allergies

Medications

Past illnesses / Pregnancy

Last meal

Events / Environment / Mechanism

Secondary Survey

Mechanisms of Injury

SECONDARY SURVEY

- Head to Toe Examination
- Scalp .. Face .. Ears .. Neck
- Chest
- Abdomen .. Pelvis
- Extremities

Adjuncts to Secondary Survey

Special Diagnostic Tests as Indicated

Pitfalls

- Patient deterioration
- Delay of transfer
- Deterioration during transfer
- Poor communication

Damage Control Surgery

- if a trauma patient requires emergent laparotomy for intraabdominal hemorrhage, the trauma surgeon will perform an abbreviated procedure termed damage control surgery (DCS).

- Surgical intervention is intended to stop hemorrhage and limit gastrointestinal contamination of the abdominal compartment.

- Definitive repair of complex injuries is not part of DCS.

- Identification of injured blood vessels and solid organs, as well as inspection of injuries in areas relatively inaccessible to midline approaches but potentially addressed by interventional radiology techniques (eg, deep liver lacerations, retroperitoneal hemorrhage), occurs during DCS.

- Communication among the entire trauma team is essential during DCS.

…Damage Control Surgery

- Pausing surgery results in the surgeon compressing or packing an area of bleeding during times of profound hypotension until transfusion restores acceptable systolic blood pressure (80-90 mm Hg).

- If this interruption of surgery is unsuccessful in improving blood pressure, the surgeon can directly compress the aorta.
- A brief episode of bradycardia/asystole may accompany direct aortic compression.
- When transfusions are ineffective maintaining perfusion, the operation should be interrupted, the bleeding areas packed
- CONSIDER interventional radiology IF possible .
- A key component of DCS is planned re-operation once the patient is more stable.

Goals for Resuscitation of The Trauma Patient

PARAMETER	GOAL
Blood pressure	Systolic 80 mmHg, mean 50-60mmHg
Heart rate	< 120 bpm
Oxygenation	SaO2 > 95%
Urine output	0.5ml/kg/h
Mental status	Following commands
Lactate level	<1.6mmol/l
Base deficit	> -5
Haemoglobin	>8.0g/dl

Problems Associated with Trauma Patient

- Risk of aspiration
- Inadequate fasting time
- Pregnancy
- Pain
- Potential difficult airway
- Co-existing disease
- Coagulopathy
- Massive blood loss
- Dilutional coagulopathy

Trauma-Induced Coagulopathy

- Common following major trauma
- Trauma-induced coagulopathy is an independent risk factor for death
- Acute traumatic coagulopathy is only related to severe metabolic acidosis (base deficit ≥6 mEq/L)

Thrombin is generated primarily via the 'extrinsic' pathway with multiple feed-forward loops. When thrombomodulin (TM) is presented by the endothelium, it complexes thrombin which is no longer available to cleave fibrinogen. This anticoagulent thrombin activates protein C which reduces further thrombin generation through inhibition of cofactors V and VIII.

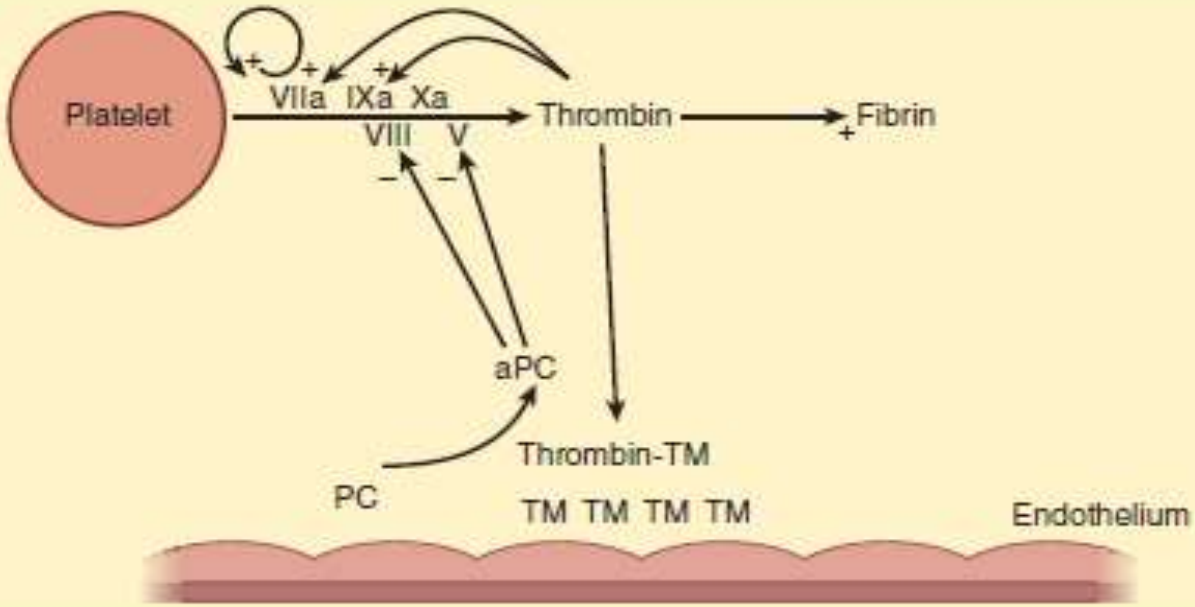


FIGURE 39–2 Mechanism of trauma-induced coagulopathy. During periods of tissue hypoperfusion, thrombomodulin (TM) released by the endothelium complexes with thrombin. The thrombin–TM complexes prevent cleavage of fibrinogen to fibrin and also activate protein C (PC), reducing further thrombin generation through cofactors V and VIII. (Reproduced, with permission, from Brohi K, Cohen MJ, Davenport RA: Acute coagulopathy of trauma: mechanism, identification and effect. Curr Opin Crit Care 2007;13:680.)

Complications of Coagulopathy

- Uncontrolled bleeding
- Hemorrhagic shock
- Death

Haemostatic Resuscitation

- Damage control resuscitation
- Blood products in equal portions early in resuscitation has become an accepted approach
- PRBCs : FFP: PLATELETs in (1 : 1 : 1) ratio
- O-negative ... type-specific ...cross matched

CAESAREAN SECTION

Special Precautions

- Supine Hypotensive Syndrome
- Pregnancy Induced (Associated) Hypertension
- Fetal Hypoxia
- Acidic Resting Stomach Juice
- Regurgitation

- C/S rate 14-15% at US *(as emergency)
- Anesthesia: 3-12% maternal death
- Majority during G/A: failed intubation, ventilation, oxygenation and pulmonary aspiration of gastric content

- Risk factors:
  - Obesity
  - Hypertensive disorder of pregnancy
  - Emergently performed procedure

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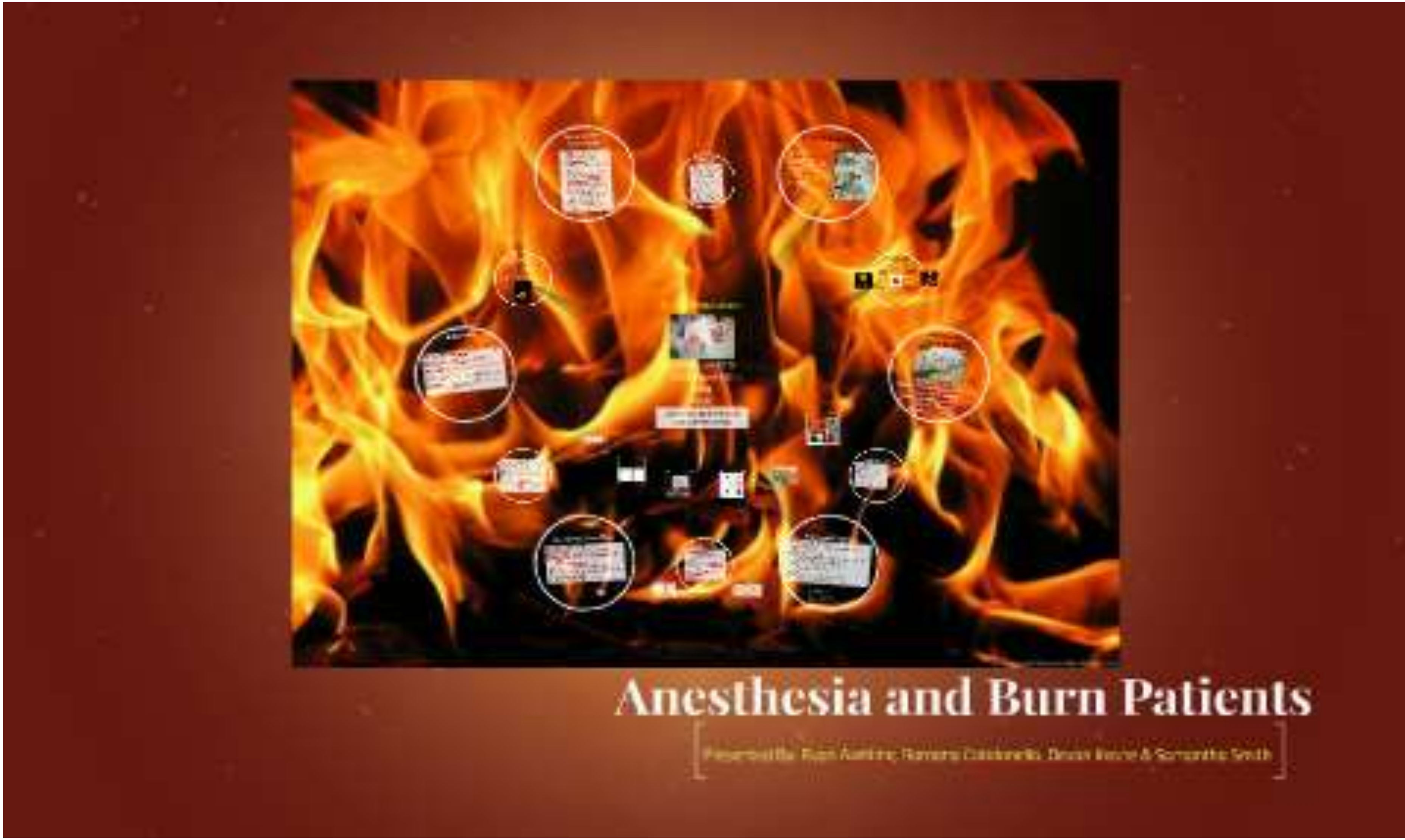


- Burns are second only to motor vehicle accidents as the leading source of accidental death.

- Three risk factors predictive of increased mortality from burns include age greater than 60 years, more than 40% total body surface area (TBSA) burns, and inhalation injury.

- Children, due to an increased body surface area to body mass ratio, and the elderly, due to thinner skin, are both at greater risk for major burn injuries.

- Temperature and duration of heat contact determine the extent of burn injury.

- The pathophysiological and hemodynamic responses to burn injuries are unique and warrant specialized burn care that can be optimally provided only at burn treatment centers

- A basic understanding of burn pathophysiology and of resuscitation requirements, especially **early initiation of therapies** such as oxygen administration and aggressive fluid resuscitation will improve patient survival.

Thermal burns	• Full-thickness burns • Partial-thickness ≥10% TBSA • Any deep partial- or full-thickness burns involving the face, hands, genitalia, feet, perineum or over any joints • Patients with burns and other comorbidities • Patients with concomitant traumatic injuries • Poorly controlled pain
Inhalation injury	• All patients with suspected inhalation injury
Paediatrics <14 y or <30 kg	• All paediatric burns may benefit from burn centre referral due to pain, dressing change needs, rehabilitation, patient/caregiver needs or nonaccidental trauma
Chemical injuries	• All chemical injuries
Electrical injuries	• All high-voltage (≥1000 V) electrical injuries • Lightning injury

e 1. Classifications of Burns Requiring Consideration for Transfer to Specialised Burn Centre. TBSA indicates total body surface area

CLASSIFICATION

FIRST DEGREE

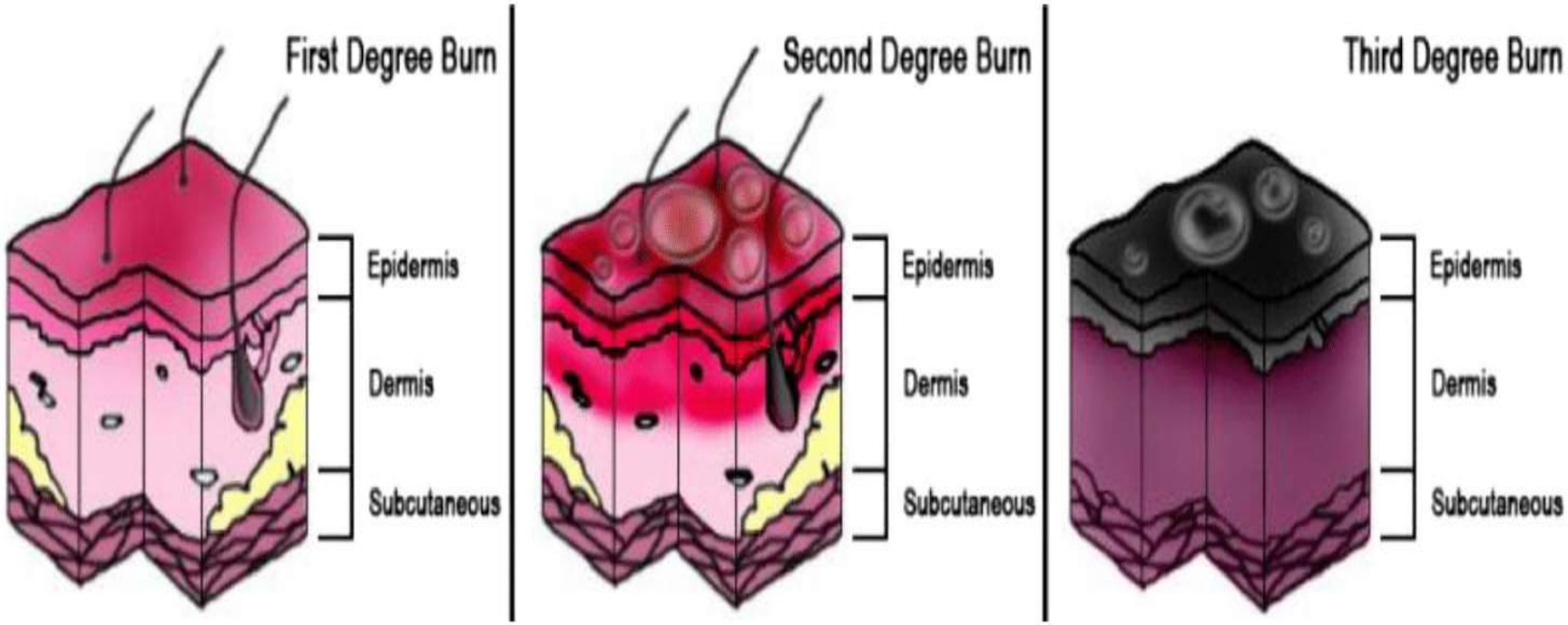
- burns are injuries that do not penetrate the epidermis
- Fluid replacement for these burns is not necessary,

Seconnd degree

- a partial- thickness injuries (superficial or deep) that penetrate the epidermis, extend into the dermis and are associated with blistering
- Fluid replacement therapy is indicated for patients more than 20% of total body surface area (TBSA) is involved.

Third degree

- burns are those in which the thermal injury penetrates the full thickness of the dermis
- . Nerves, blood vessels, lymphatic channels, and other deep structures may have been destroyed,
- Severe, but insensate, wound (although surrounding tissue may be very painful).


First Degree Burn
Epidermis
Dermis
Subcutaneous
Second Degree Burn
Epidermis
Dermis
Subcutaneous
Third Degree Burn
Epidermis
Dermis
Subcutaneous

The rule of nine:- adults vs pediatrics

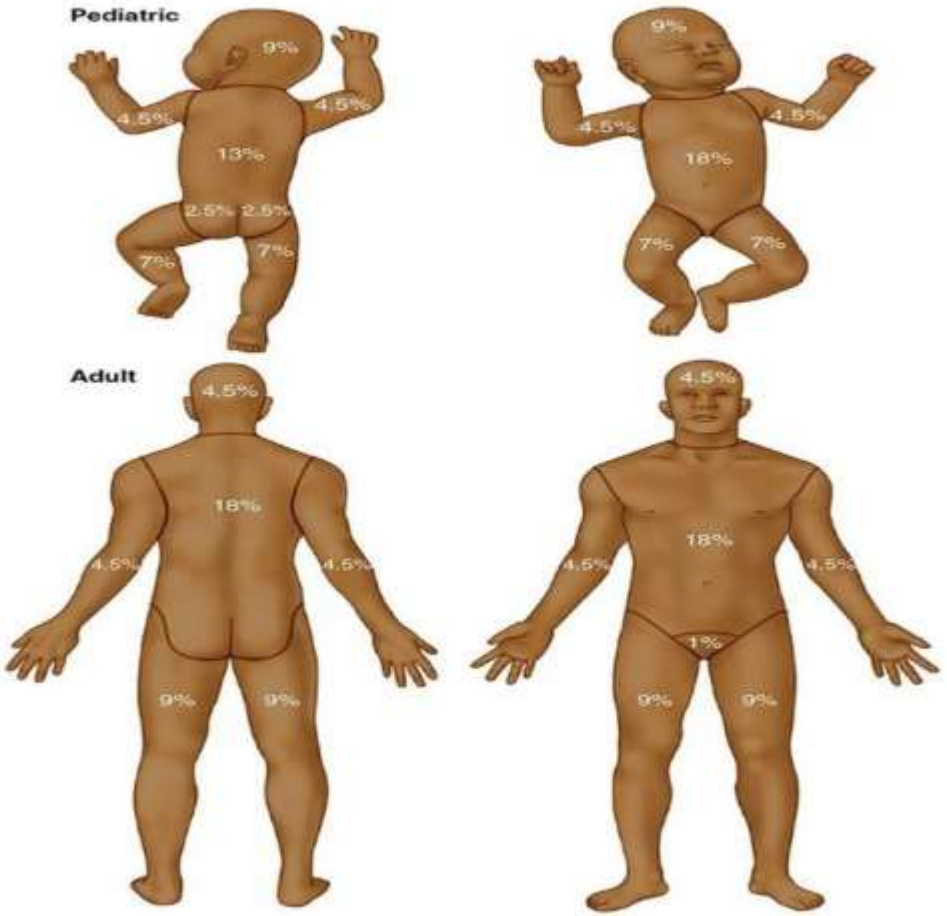
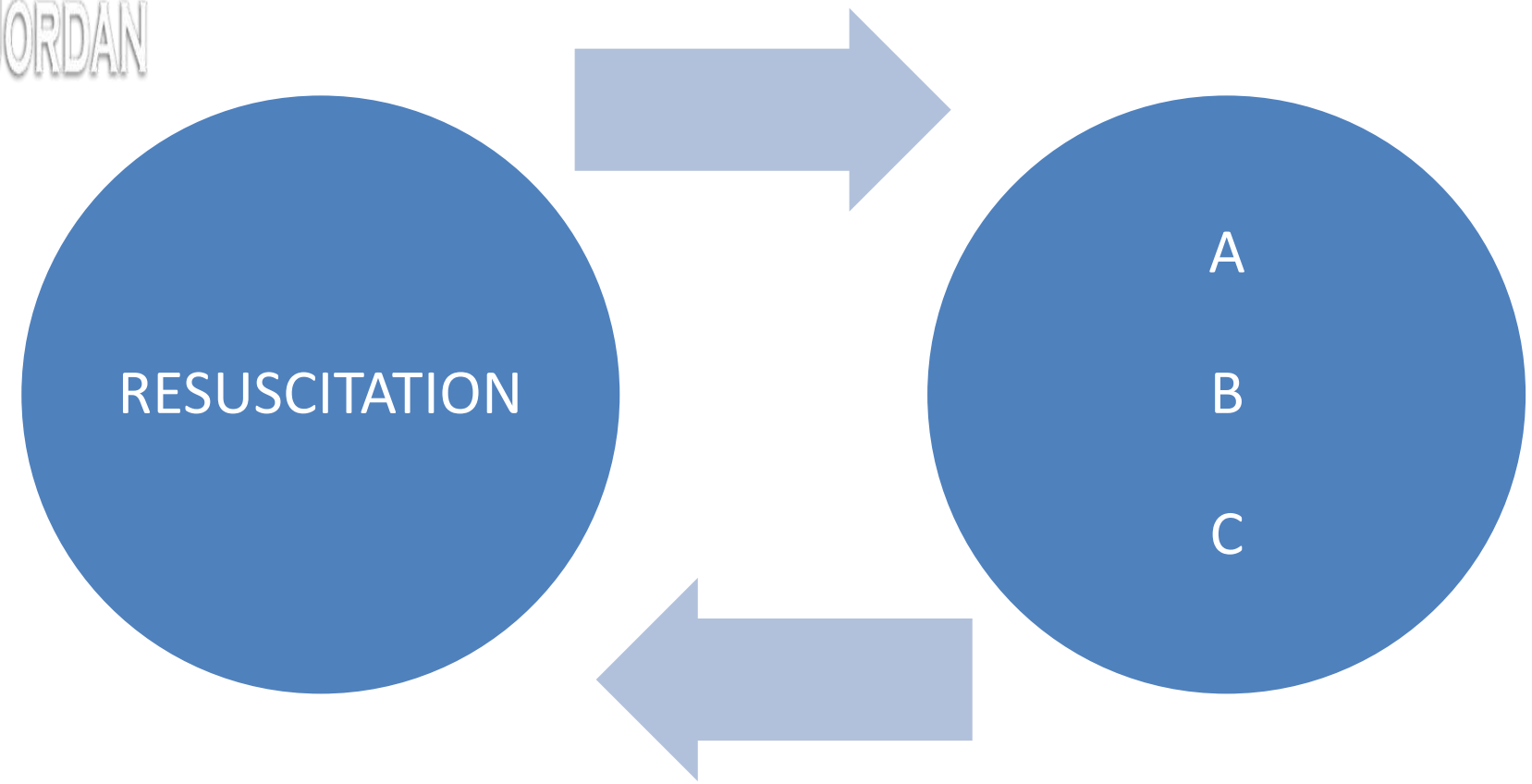


FIGURE 39–6 The Rule of Nines, utilized to estimate burned surface area as a percentage of total body surface area (TBSA). (Reproduced with permission from American College of Surgeons. *ATLS: Advanced Trauma Life Support for Doctors (Student Course Manual)*. 9th ed. Chicago, IL: ACS; 2012.)


RESUSCITATION
A
B
C

A-AIRWAY

- Patients with a major burn injury often require immediate airway management, which can be challenging.

- Airway management can be complicated by limitation in mouth opening, airway and facial edema and difficulties interpreting airway anatomy.

- A need to secure airway devices with suturing, as tape or ties may not adhere to inflamed tissues or may interfere with burned areas that will require ongoing surgical management.

A-AIRWAY

- The role of early intubation in patients with burn injury has been recently questioned.
- Current guidelines from the International Society for Burn Injury suggest the only indication for intubation or tracheostomy should be for cases of current or evolving impairment of airway patency.
- Clinical signs include airway swelling, soot contamination of airway secretions, increasing work of breathing, hoarseness, stridor, dysphagia or increased salivation.

B-breathing

- Pulmonary complications, such as pulmonary oedema, remain a major cause of mortality after severe or inhalational burn injury.

- Pulmonary oedema after burn injury can arise from 2 mechanisms: ***direct irritation*** by heat, smoke or chemicals or as part of ***a stereotypical lung*** response to severe injury, through systemic inflammation ***(SIRS).***

- Patients with signs of inhalation injury or compromised pulmonary function may require oxygen therapy, continuous positive airway pressure or intubation and controlled ventilation.

C-CIRCULATION/FLUID RESUSCITATION

- Bleeding from wounds, evaporative losses and systemic responses involving vasoactive and inflammatory mediators can lead to impaired organ perfusion after burn injury.
- The phenomenon, known as ‘burn shock’, presents as marked hypoperfusion and hypovolemia occurring within the first 24 hours after a major burn and necessitating aggressive fluid resuscitation.
- Inadequate fluid resuscitation results in worsening burn injury and higher mortality.
- Burn shock remains the most common cause of death from severe burn injury in the first week.

C-CIRCULATION/FLUID RESUSCITATION

- Crystalloid is an accepted form of therapy for volume loss after burn injury
- It may be more appropriate to transfuse colloid when intravascular volume levels are critical as part of a restrictive fluid strategy.
- Various formulas have been devised to provide estimates of both rate and volume of fluid resuscitation.
- DIC…

	20% TBSA	40% TBSA	60% TBSA	80% TBSA	Formula
Parkland	4800 mL	9600 mL	14 400 mL	19,200 mL	4 mL/kg/% TBSA, Hartmann's
Brooke	2400 mL	4800 mL	7700 mL	9600 mL	2 mL/kg/% TBSA, Hartmann's
Rule of 10	4800 mL	9600 mL	14,400 mL	19,200 mL	%TBSA × 10 mL/h

Table 2. Commonly Used Fluid Resuscitation Formulas for a 60-kg Person Over 24 hours. Half of the total calculated volume should be administered in the first 8 hours in both the Parkland and Brooke formula. TBSA indicates total body surface area

Burn management considerations

- Abdominal Compartment Abdominal Syndrome. (circumferential abdominal burns, and patients receiving intravenous fluid volumes greater than 6 mL/kg/% TBSA)
- Pulmonary complications.
- Carbon monoxide and cyanide poisoning. (shifts the O 2 –Hb dissociation curve to the left)

Anesthetic Considerations for Burn Therapy

- A primary characteristic of all burn patients is an inability to regulate temperature.

- The resuscitation environment must be maintained near body temperature through the use of a radiant warning, forced air warming devices, and fluid warming devices.

- All burn care environments must be maintained near 40’C.

PHARMACOLOGIC CONSIDERATIONS

- Patients with significant burn injuries have altered pharmacodynamic responses as well as alterations in pharmacokinetic parameters.

- These pathophysiological changes mean that careful titration and monitoring of commonly used anaesthetic drugs may be require.

PHARMACOLOGIC CONSIDERATIONS

- Burn injury–related changes cause proliferation of extrajunctional acetylcholine receptors that release more potassium into the extracellular space.
- This predisposing to life-threatening hyperkalaemia when suxamethonium is used.

- This risk appears to be greatest in patients more than 48 hours after and for up to 2 years postinjury.

PHARMACOLOGIC CONSIDERATIONS

- Plasma protein concentration and binding capabilities may be drastically altered after severe burn injury.
- Significant hypoalbuminemia can occur. *(Drugs bound to albumin may be present in a higher free concentration*)
- alpha 1-acid glycoprotein(AAG)concentrations can increase.(*Drugs bound to AAG may be present in a lower free concentration eg. LA, alfentanyl)*

Analgesia

- Analgesia for burn patients is challenging.
- Considerations and concerns regarding opioid tolerance and psychosocial complications of burn therapy are commonplace.
- **Multimodal approaches** are often advantageous.
- Regionl analgesia may provide benefit(masking effect)

Take Home Messages

Systematic patient assessment

- Primary survey
- Secondary survey
- Rapid sequence intubation
- Reduce risk of aspiration
- Continuous hemodynamic assessment of patient intraoperatively

COMUNICATION

Thank You

for listening