

Blast Injury / Incident

History

- Type of exposure (heat, gas, chemical)
- Inhalation injury
- Time of Injury
- Past medical history / Medications
- Other trauma
- Loss of Consciousness
- Tetanus/Immunization status

Signs and Symptoms

- Burns, pain, swelling
- Dizziness
- Loss of consciousness
- Hypotension/shock
- Airway compromise/distress could be indicated by hoarseness/ wheezing / Hypotension

Differential

- Superficial (1st Degree) red - painful (Don't include in TBSA)
- Partial Thickness (2nd Degree) blistering
- Full Thickness (3rd Degree) painless/charred or leathery skin
- Thermal injury
- Chemical – Electrical injury
- Radiation injury
- Blast injury

Nature of Device: Agent / Amount. Industrial Explosion. Terrorist Incident. Improvised Explosive Device.

Method of Delivery: Incendiary / Explosive

Nature of Environment: Open / Closed.

Distance from Device: Intervening protective barrier. Other environmental hazards,

Evaluate for: Blunt Trauma / Crush Injury / Compartment Syndrome / Traumatic Brain Injury / Concussion / Tympanic Membrane Rupture / Abdominal hemorrhage or Evisceration, Blast Lung Injury and Penetrating Trauma.

Scene Safety / Quantify and Triage Patients / Load and Go with Assessment / Treatment Enroute

Accidental / Intentional Explosions
(See PEARLS)

Triage Protocol UP 2 <i>as indicated</i>	
Age Appropriate Airway Protocol(s) AR 1, 2, 3, 5, 6 <i>as indicated</i>	
Multiple Trauma Protocol TB 6 <i>if indicated</i>	
A	IV Procedure If Indicated
P	IO Procedure If Indicated
P	Cardiac Monitor <i>if indicated</i>
Thermal Burn Protocol TB 9 Chemical and Electrical Burn Protocol TB 2 <i>if indicated</i>	
Crush Injury Protocol TB 3 <i>if indicated</i>	
Radiation Incident Protocol TB 7 <i>if indicated</i>	



Blast Lung Injury

YES

Age Appropriate
Airway Protocol(s) AR 4, 7
as indicated

NO

Decontamination Procedure <i>if indicated</i>	
Pain Control Protocol UP 11 <i>if indicated</i>	
Rapid Transport to appropriate destination using Trauma and Burn: EMS Triage and Destination Plan	

	Notify Destination or Contact Medical Control	
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Trauma and Burn Protocol Section

TB 1 (ROBESON)

This protocol has been altered from the original NCCEP Protocol by the local EMS Medical Director

Blast Injury / Incident

Pearls

- **Types of Blast Injury:**

Primary Blast Injury: From pressure wave.
Secondary Blast Injury: Impaled objects. Debris which becomes missiles / shrapnel.
Tertiary Blast Injury: Patient falling or being thrown / pinned by debris.
Most Common Cause of Death: Secondary Blast Injuries.

- **Triage of Blast Injury patients:**

Blast Injury Patients with Burn Injuries Must be Triageed using the Thermal / Chemical / Electrical Burn Destination Guidelines for Critical / Serious / Minor Trauma and Burns
Patients may be hard of hearing due to tympanic membrane rupture.

- **Care of Blast Injury Patients:**

Patients may suffer multi-system injuries including blunt and penetrating trauma, shrapnel, barotrauma, burns, and toxic chemical exposure.
Consider airway burns which should prompt early and aggressive airway management.
Cover open chest wounds with semi-occlusive dressing.
Use Lactated Ringers (if available) for all Critical or Serious Burns.
Minimize IV fluids resuscitation in patients with no sign of shock or poor perfusion.

- **Blast Lung Injury:**

Blast Lung Injury is characterized by respiratory difficulty and hypoxia. Can occur (rarely) in patients without external thoracic trauma. More likely in enclosed space or in close proximity to explosion.
Symptoms: Dyspnea, hemoptysis, cough, chest pain, wheezing and hemodynamic instability.
Signs: Apnea, tachypnea, hypopnea, hypoxia, cyanosis and diminished breath sounds.
Air embolism should be considered and patient transported prone and in slight left-lateral decubitus position.
Blast Lung Injury patients may require early intubation but positive pressure ventilation may exacerbate the injury, avoid hyperventilation.
Air transport may worsen lung injury as well and close observation is mandated. Tension pneumothorax may occur requiring chest decompression. Be judicious with fluids as volume overload may worsen lung injury.

- **Accidental Explosions or Intentional Explosions:**

All explosions or blasts should be considered intentional until determined otherwise.
Attempt to determine source of the blast to include any potential threat for aerosolization of hazardous materials.
Evaluate scene safety to include the source of the blast that may continue to spill explosive liquids or gases.
Consider structural collapse / Environmental hazards / Fire.
Conditions that led to the initial explosion may be returning and lead to a second explosion.
Greatest concern is potential threat for a secondary device.

Patients who can, typically will attempt to move as far away from the explosive source as they safely can.
Evaluate surroundings for suspicious items; unattended back packs or packages, or unattended vehicles.

If patient is unconscious or there is(are) fatality(fatalities) and you are evaluating patient(s) for signs of life:

Before moving, note if there are wires coming from the patient(s), or it appears the patient(s) is(are) lying on a package/package, or bulky item, do not move the patient(s). Back Away quickly and immediately notify a law enforcement officer.

If there are no indications the patient is connected to a triggering mechanism for a secondary device, expeditiously remove the patient(s) from the scene and begin transport to the hospital.

Protect the airway and cervical spine, however, beyond the primary survey, care and a more detailed assessment should be deferred until the patient is in the ambulance.

If there are signs the patient was carrying the source of the blast, notify law enforcement immediately and most likely, a law enforcement officer will accompany your patient to the hospital.

Chemical and Electrical Burn

History

- Type of exposure (heat, gas, chemical)
- Inhalation injury
- Time of Injury
- Past medical history / Medications
- Other trauma
- Loss of Consciousness
- Tetanus/Immunization status

Signs and Symptoms

- Burns, pain, swelling
- Dizziness
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Differential

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- Thermal injury
- Chemical – Electrical injury
- Radiation injury
- Blast injury





Assure Chemical Source is NOT Hazardous to Responders.
Assure Electrical Source is NO longer in contact with patient before touching patient.

Assess Burn / Concomitant Injury Severity



< 5% TBSA 2nd/3rd Degree Burn
 No inhalation injury, Not Intubated,
 Normotensive
 GCS 14 or Greater
 Minor Burn

5-15% TBSA 2nd/3rd Degree Burn
 Suspected inhalation injury or requiring
 intubation for airway stabilization
 Hypotension or GCS 13 or Less
 (When reasonably accessible,
 transport to a Burn Center)
 Serious Burn

>15% TBSA 2nd/3rd Degree Burn
 Burns with Multiple Trauma
 Burns with definitive airway
 compromise
 (When reasonably accessible,
 transport to a Burn Center)
 Critical Burn

	Age Appropriate Airway Protocol(s) AR 1, 2, 3, 4, 5, 6, 7 <i>if indicated</i>
	Identify Contact Points
	<u>Eye Involvement</u> Irrigate Involved Eye(s) with Normal Saline for 15 – 30 minutes May repeat as needed
	<u>Chemical Exposure / Burn</u> Flush Contact Area with Normal Saline for 15 minutes
	Decontamination Procedure <i>if indicated</i>
	Age Appropriate Cardiac Protocol(s) <i>if indicated</i>
	Thermal Burn Protocol TB 9

Rapid Transport to appropriate destination using
Trauma and Burn:
EMS Triage and Destination Plan

 **Notify Destination or
Contact Medical Control** 

Trauma and Burn Protocol Section

Chemical and Electrical Burn

Pearls

- **Recommended Exam: Mental Status, HEENT, Neck, Heart, Lungs, Abdomen, Extremities, Back, and Neuro**
- **Green, Yellow and Red In burn severity do not apply to Triage systems.**
- **Refer to Rule of Nines: Remember the extent of the obvious external burn from an electrical source does not always reflect more extensive internal damage not seen.**
- **Chemical Burns:**
 - Refer to Decontamination Procedure.
 - Normal Saline or Sterile Water is preferred, however if not available, do not delay irrigation and use tap water.
 - Other water sources may be used based on availability.
 - Flush the area as soon as possible with the cleanest readily available water or saline solution using copious amounts of fluids.
- **Electrical Burns:**
 - DO NOT contact patient until you are certain the source of the electrical shock is disconnected.
 - Attempt to locate contact points (generally there will be two or more.) A point where the patient contacted the source and a point(s) where the patient is grounded.
 - Sites will generally be full thickness.
 - Do not refer to as entry and exit sites or wounds.**
 - Cardiac Monitor: Anticipate ventricular or atrial irregularity including VT, VF, atrial fibrillation and / or heart blocks.
 - Attempt to identify the nature of the electrical source (AC / DC), the amount of voltage and the amperage the patient may have been exposed to during the electrical shock.

Crush Syndrome Trauma

History

- Entrapped and crushed under heavy load > 30 minutes
- Extremity / body crushed
- Building collapse, trench collapse, industrial accident, pinned under heavy equipment

Signs and Symptoms

- Hypotension
- Hypothermia
- Abnormal ECG findings
- Pain
- Anxiety

Differential

- Entrapment without crush syndrome
- Vascular injury with perfusion deficit
- Compartment syndrome
- Altered mental status

Age Appropriate Airway Protocol(s) AR 1, 2, 3, 4, 5, 6, 7 <i>as indicated</i>	
B	12 Lead ECG Procedure
A	IV Procedure
P	IO Procedure
P	Cardiac Monitor
Multiple Trauma Protocol TB 6 <i>if indicated</i>	
Thermal Burn Protocol TB 9 Chemical and Electrical Burn Protocol TB 2 <i>if indicated</i>	
Pain Control Protocol UP 11 <i>as indicated</i>	

P Consider
Fentanyl 50-75 mcg IV / IO
Maximum 150 mcg
Ped: 1 mcg / kg IV / IO / IM
or
Midazolam 0.5 – 2 mg IV / IO / IM
Maximum 5 mg
Ped: 0.1 – 0.2 mg / kg
IV / IO / IM
Ped: Maximum 2 mg
Over 2 – 3 minutes as needed

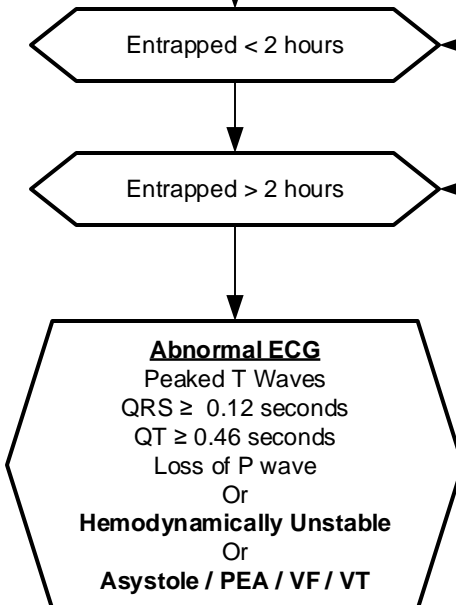
A Normal Saline Infusion
1 Liter per hour IV or
IO (if Paramedic)
Pediatric:
3 x maintenance fluid rate
See Pearls for dosing instructions

A Decrease Normal Saline Infusion
500 mL per hour IV or
IO (if Paramedic)
Pediatric:
Maintenance fluid rate
See Pearls for dosing instructions

P Sodium Bicarbonate
50 mEq IV / IO
May repeat X 1
Pediatric: 1 mEq / kg IV / IO

P Calcium Chloride 1 g IV / IO
Pediatric: 20 mg / kg IV / IO
Over 2- 3 minutes

P Albuterol Nebulizer
2.5 – 5 mg
May repeat x 3



Rapid Transport to appropriate destination using
Trauma and Burn:
EMS Triage and Destination Plan

**Notify Destination or
Contact Medical Control**

Exit to
Age Appropriate
Cardiac Arrest
Protocol AC 3 / PC 4
Arrhythmia Protocol(s)
if indicated

Crush Syndrome Trauma

Pearls

- **Recommended exam:** Mental Status, Musculoskeletal, Neuro
- Scene safety is of paramount importance as typical scenes pose hazards to rescuers. Call for appropriate resources.
- **Lowest blood pressure by age:** < 31 days: > 60 mmHg. 31 days to 1 year: > 70 mmHg. Greater than 1 year: 70 + 2 x age in years.
- **Pediatric IV Fluid maintenance rate:** 4 mL per first 10 kg of weight + 2 mL per second 10 kg of weight + 1 mL for every additional kg in weight.
- Crush syndrome typically manifests after 2 – 4 hours of crush injury, but may present in < 1 hour.
- **Fluid resuscitation:**
 - If access to patient and initiation of IV fluids occurs after 2 hours, give 2 liters of IV fluids in adults and 20 mL/kg of IV fluids in pediatrics and then begin > 2 hour dosing regimen.
- Consider all possible causes of shock and treat per appropriate protocol. Majority of decompensation in pediatrics is airway related.
- Decreasing heart rate and hypotension occur late in children and are signs of imminent cardiac arrest.
- Shock may be present with a normal blood pressure initially.
- Shock often is present with normal vital signs and may develop insidiously. Tachycardia may be the only manifestation.
- Consider all possible causes of shock and treat per appropriate protocol.
- Patients may become hypothermic even in warm environments.
- Hyperkalemia from crush syndrome can produce ECG changes described in protocol, but may also be a bizarre, wide complex rhythm. Wide complex rhythms should also be treated using the VF/Pulseless VT Protocol.

TB 3 (ROBESON)

This protocol has been altered from the original NCCEP Protocol by the local EMS Medical Director

Extremity Trauma

History






- Type of injury
- Mechanism: crush / penetrating / amputation
- Time of injury
- Open vs. closed wound / fracture
- Wound contamination
- Medical history
- Medications

Signs and Symptoms

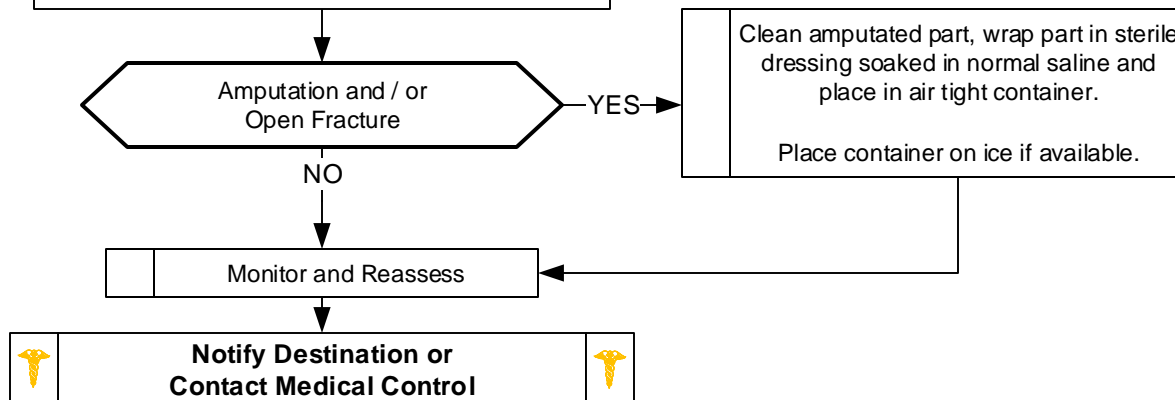
- Pain, swelling
- Deformity
- Altered sensation / motor function
- Diminished pulse / capillary refill
- Decreased extremity temperature

Differential

- Abrasion
- Contusion
- Laceration
- Sprain
- Dislocation
- Fracture
- Amputation

	Wound care Control Hemorrhage with Direct Pressure Splinting as indicated	
	Consider Topical Hemostatic Agent / Dressing <i>if available</i>	
	Wound Care - Tourniquet Procedure <i>if indicated</i>	
A	IV Procedure If indicated	P IO Procedure If indicated
	Age Appropriate Airway Protocol(s) AR 1, 2, 3, 4, 5, 6, 7 <i>if indicated</i>	
	Multiple Trauma Protocol TB 6 <i>if indicated</i>	
	Age Appropriate Hypotension / Shock Protocol AM 5 / PM 3 <i>if indicated</i>	
	Pain Protocol UP 11 <i>if indicated</i>	
	Crush Syndrome Protocol TB 3 <i>as indicated</i>	

P	Consider TXA for severe trauma with ongoing hemorrhage or hemorrhagic shock 1g in 100 ml NSL over 10 minutes IV / IO
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Pearls

- **Recommended Exam: Mental Status, Extremity, Neuro**
- Peripheral neurovascular status is important
- **In amputations, time is critical.** Transport and notify Medical Control immediately, so that the appropriate destination can be determined.
- Hip dislocations and knee and elbow fracture / dislocations have a high incidence of vascular compromise.
- Urgently transport any injury with vascular compromise.
- Blood loss may be concealed or not apparent with extremity injuries.
- Lacerations must be evaluated for repair within 6 hours from the time of injury.
- **Multiple casualty incident: Tourniquet Procedure may be considered first instead of direct pressure.**

Head Trauma

History

- Time of injury
- Mechanism (blunt vs. penetrating)
- Loss of consciousness
- Bleeding
- Past medical history
- Medications
- Evidence for multi-trauma

Signs and Symptoms

- Pain, swelling, bleeding
- Altered mental status
- Unconscious
- Respiratory distress / failure
- Vomiting
- Major traumatic mechanism of injury
- Seizure

Differential



- Skull fracture
- Brain injury (Concussion, Contusion, Hemorrhage or Laceration)
- Epidural hematoma
- Subdural hematoma
- Subarachnoid hemorrhage
- Spinal injury
- Abuse

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	Obtain and Record GCS	
B	Supplemental oxygen Maintain SpO2 ≥ 90% Preferably ≥ 94%	
	Prevent Oxygen desaturation events < 90% Maintain EtCO2 35 – 45 mmHg	
	Blood Glucose Analysis Procedure	
A	IV Procedure	P IO Procedure If Indicated
P	Cardiac Monitor	
<div><div></div><div></div><div></div><div></div><div></div><div></div></div>	Altered Mental Status Protocol UP 4 <i>if indicated</i>	
<div><div></div><div></div><div></div><div></div><div></div><div></div></div>	Multiple Trauma Protocol TB 6 <i>if indicated</i>	
<div><div></div><div></div><div></div><div></div><div></div><div></div></div>	Age Appropriate Hypotension / Shock Protocol AM 5 / PM 3 <i>if indicated</i>	
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	Monitor and Reassess	



Rapid Transport to appropriate destination
 using
Trauma and Burn:
EMS Triage and Destination Plan



 **Notify Destination or
Contact Medical Control** 

**DO NOT ROUTINELY
HYPERVENTILATE**

Evidence of Brain Herniation:

Unilateral or Bilateral Dilation of
Pupils / Posturing

Hyperventilate to maintain
EtCO2 30 – 35 mmHg
See Pearls

Head Trauma

Eye Opening Response	Verbal Response	Motor Response
4 = Spontaneous	5 = Oriented	6 = Obeys commands
3 = To verbal stimuli	4 = Confused	5 = Localizes pain
2 = To pain	3 = Inappropriate words	4 = Withdraws from pain
1 = None	2 = Incoherent	3 = Flexion to pain or decorticate
	1 = None	2 = Extension to pain or decerebrate
		1 = None

Pearls

- **Recommended Exam: Mental Status, HEENT, Heart, Lungs, Abdomen, Extremities, Back, Neuro**
- **GCS is a key performance measure used in the EMS Acute Trauma Care Toolkit.**
- **A single episode of hypoxia and / or hypotension can significantly increase morbidity and mortality with head injury.**
- **Hyperventilation in head injury:**
 - Hyperventilation lowers CO₂ and causes vasoconstriction leading to increased intracranial pressure (ICP) and should not be done routinely.**
 - Use in patient with evidence of herniation (blown pupil, decorticate / decerebrate posturing, bradycardia, decreasing GCS).**
 - If hyperventilation is needed, ventilate at 14 – 18 / minute to maintain EtCO₂ between 30 - 35 mmHg.**
 - Short term option only used for severe head injury typically GCS ≤ 8 or unresponsive.**
- **Do not place in Trendelenburg position as this may increase ICP and worsen blood pressure.**
- **Poorly fitted cervical collars may also increase ICP when applied too tightly.**
- **In areas with short transport times, Drug Assisted Airway protocol is not recommended for patients who are spontaneously breathing and who have oxygen saturations of ≥ 90% with supplemental oxygen including BIAD / BVM.**
- **Hypotension:**
 - Limit IV fluids unless patient is hypotensive.**
 - Increased intracranial pressure (ICP) may cause hypertension and bradycardia (Cushing's Response).**
 - Usually indicates injury or shock unrelated to the head injury and should be aggressively treated.**
 - Fluid resuscitation should be titrated to maintain at least a systolic BP of > 70 + 2 x the age in years.**
 - Lowest blood pressure by age: < 31 days: > 60 mmHg. 31 days to 1 year: > 70 mmHg. Greater than 1 year: 70 + 2 x age in years.**
- **An important item to monitor and document is a change in the level of consciousness by serial examination.**
- **Consider Restraints if necessary for patient's and/or personnel's protection per the Restraint Procedure.**
- **Concussions:**
 - Traumatic brain injuries involving any of a number of symptoms including confusion, LOC, vomiting, or headache.**
 - Any prolonged confusion or mental status abnormality which does not return to normal within 15 minutes or any documented loss of consciousness should be evaluated by a physician ASAP.**
 - EMS Providers should not make return-to-play decisions when evaluating an athlete with suspected concussion. This is outside the scope of practice.**

Multiple Trauma

History

- Time and mechanism of injury
- Damage to structure or vehicle
- Location in structure or vehicle
- Others injured or dead
- Speed and details of MVC
- Restraints / protective equipment
- Past medical history
- Medications

Signs and Symptoms

- Pain, swelling
- Deformity, lesions, bleeding
- Altered mental status or unconscious
- Hypotension or shock
- Arrest

Differential (Life threatening)

- Chest: Tension pneumothorax
Flail chest
Pericardial tamponade
Open chest wound
Hemothorax
- Intra-abdominal bleeding
- Pelvis / Femur fracture
- Spine fracture / Cord injury
- Head injury (see Head Trauma)
- Extremity fracture / Dislocation
- HEENT (Airway obstruction)
- Hypothermia

Air Transport

**Should Be Primary in
These Patients**

Age Appropriate Airway Protocol(s) AR 1, 2, 3, 5, 6 <i>if indicated</i>	
Control External Hemorrhage Consider Pelvic Binding Splint Suspected Fractures	
P	Chest Decompression-Needle Procedure <i>if indicated</i>
Obtain and Record GCS	
A	IV Procedure
P	IO Procedure
P	Cardiac Monitor
Head Injury Protocol TB 5 <i>if indicated</i>	
Altered Mental Status Protocol UP 4 <i>if indicated</i>	
Spinal Motion Restriction Procedure / Protocol TB 8 <i>if indicated</i>	
Pain Control Protocol UP 11 <i>if indicated</i>	

Normal

VS / Perfusion / GCS

Abnormal

Repeat Assessment Adult Procedure
Monitor and Reassess

Age Appropriate Hypotension / Shock
Protocol AM 5 / PM 3
if indicated

P

**TXA 1 gm in 100 ml NSL over 10
minutes IV / IO
*if indicated***

Monitor and Reassess

Rapid Transport to appropriate destination using
Trauma and Burn:
EMS Triage and Destination Plan
Limit Scene Time ≤ 10 minutes
Provide Early Notification

**Notify Destination or
Contact Medical Control**

Trauma and Burn Protocol Section

Multiple Trauma

Pearls

- **Recommended Exam:** Mental Status, Skin, HEENT, Heart, Lung, Abdomen, Extremities, Back, Neuro
- **Items in Red Text are key performance measures used in the EMS Acute Trauma Care Toolkit**
- **Transport Destination is chosen based on the EMS System Trauma Plan with EMS pre-arrival notification.**
- **Scene times should not be delayed for procedures. These should be performed en route when possible.**
Rapid transport of the unstable trauma patient to the appropriate facility is the goal.
- **Control external hemorrhage and prevent hypothermia by keeping patient warm.**
- **Consider Chest Decompression with signs of shock and injury to torso and evidence of tension pneumothorax.**
- **Trauma Triad of Death:**
Metabolic acidosis / Coagulopathy / Hypothermia
Appropriate resuscitation measures and keeping patient warm regardless of ambient temperature helps to mitigate metabolic acidosis, coagulopathy, and hypothermia.
- **Bag valve mask is an acceptable method of managing the airway if pulse oximetry can be maintained $\geq 90\%$**
- **Tranexamic Acid (TXA):**
- **Mix 1 gram in 100 ml of NSL and infuse over 10 minutes.**
Trauma in Pregnancy:
Providing optimal care for the mother = optimal care for the fetus. After 20 weeks gestation (fundus at or above umbilicus) transport patient on left side with 10 – 20° of elevation.
- **Pediatric Trauma:**
Age specific blood pressure 0 – 28 days > 60 mmHg, 1 month - 1 year > 70 mmHg, 1 - 10 years > 70 + (2 x age)mmHg and 11 years and older > 90 mmHg.
- **Geriatric Trauma:**
Evaluate with a high index of suspicion.
Often occult injuries are more difficult to recognize and patients can decompensate unexpectedly with little warning.
Risk of death with trauma increases after age 55.
SBP < 110 may represent shock / poor perfusion in patients over age 65.
Low impact mechanisms, such as ground level falls might result in severe injury especially in age over 65.
- See Regional Trauma Guidelines when declaring Trauma Activation.
- Severe bleeding from an extremity not rapidly controlled with direct pressure may necessitate the application of a tourniquet.
- Maintain high-index of suspicion for domestic violence or abuse, pediatric non-accidental trauma, or geriatric abuse.

Radiation Incident

History

- Type of exposure (heat, gas, chemical)
- Inhalation injury
- Time of Injury
- Past medical history / Medications
- Other trauma
- Loss of Consciousness
- Tetanus/Immunization status

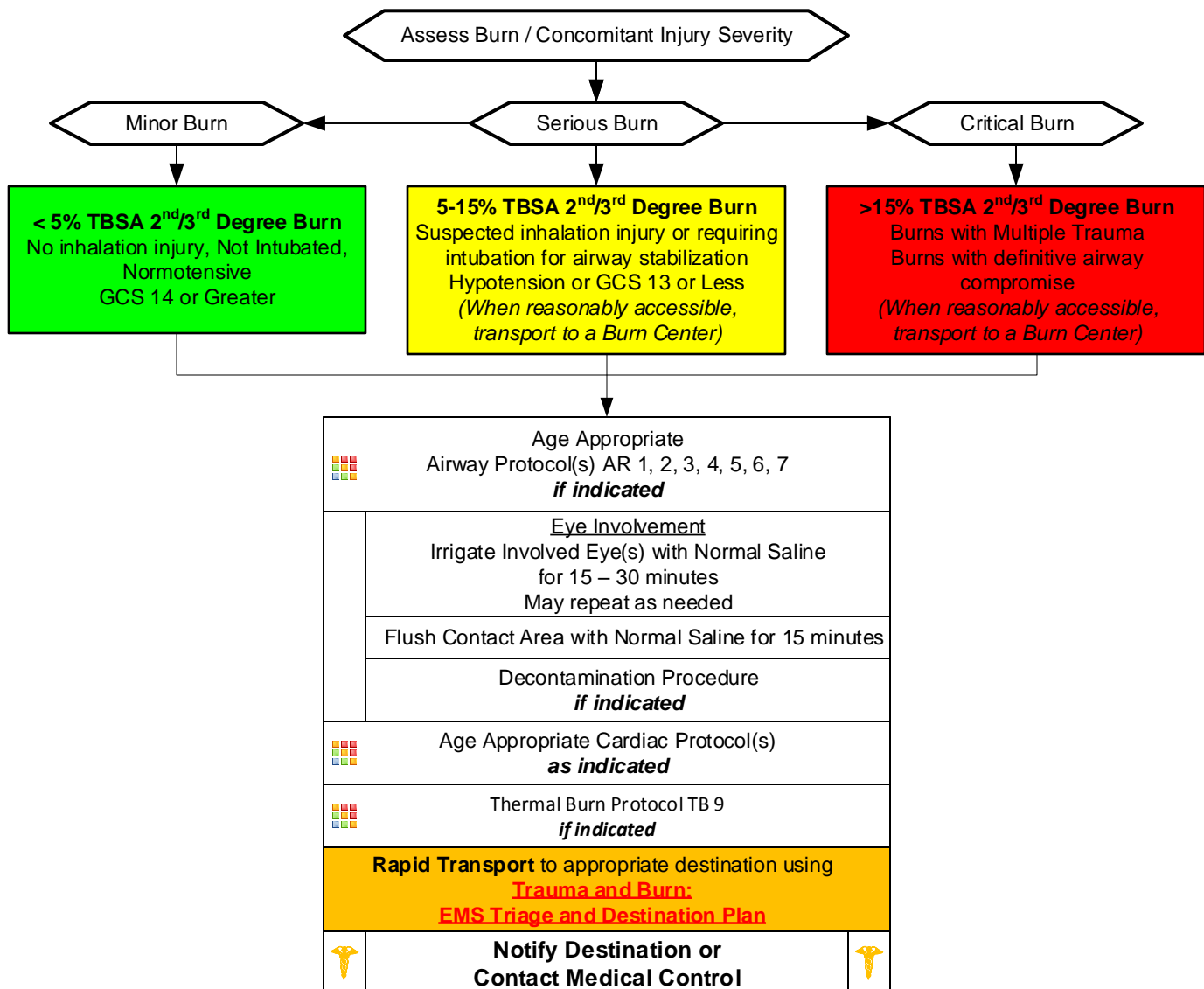
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Differential

- Superficial (1st Degree) red - painful (Don't include in TBSA)
- Partial Thickness (2nd Degree) blistering
- Full Thickness (3rd Degree) painless/charred or leathery skin
- Thermal injury
- Chemical – Electrical injury
- Radiation injury
- Blast injury

Scene Safety / Quantify and Triage Patients / Load and Go with Assessment / Treatment Enroute



Trauma and Burn Protocol Section

Collateral Injury: Most all injuries immediately seen will be a result of collateral injury, such as heat from the blast, trauma from concussion, treat collateral injury based on typical care for the type of injury displayed.

Qualify: Determine exposure type; external irradiation, external contamination with radioactive material, internal contamination with radioactive material.

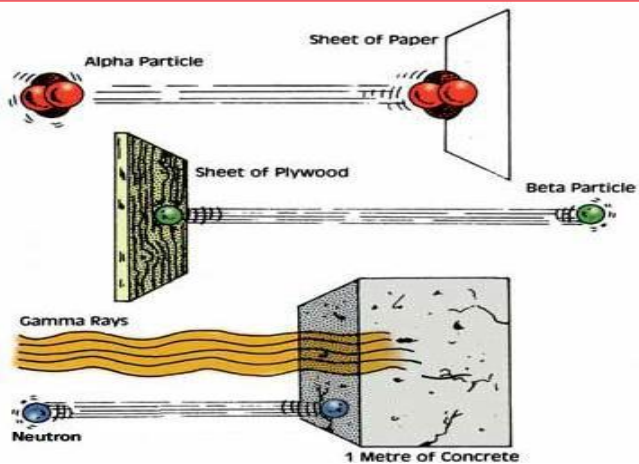
Quantify: Determine exposure (generally measured in Grays/Gy). Information may be available from those on site who have monitoring equipment, do not delay transport to acquire this information.

TB 7

Revised
01/01/2017

This protocol has been altered from the original NCEP Protocol by the local EMS Medical Director

Radiation Incident



Time Phases of Radiation Injury
(Exposure Dose vs Clinical Outcome)

Exposure Dose (Gy)	Prodrome Severity	Manifest Illness - Symptom Severity			Prognosis
		Hematologic	Gastrointestinal	Neurologic	
0.5 to 1.0	+	+	0	0	Survival almost certain
1.0 to 2.0	+/++	+	0	0	Survival >90 percent
2.0 to 3.5	++	++	0	0	Probable survival
3.5 to 5.5	+++	+++	+	0	Death in 50% at 3.5 to 6 wks
5.5 to 7.5	+++	+++	++	0	Death probable in 2-3 wks
7.5 to 10	+++	+++	+++	0*	Death probable in 1-2.5 wks
10 to 20	+++	+++	+++	+++	Death certain in 5-12 days
> 20	+++	+++	+++	+++**	Death certain in 2-5 days

Abbreviations: Gy: dose in Grey;
0: no effects; +: mild; ++: moderate; +++: severe or marked

* Hypotension

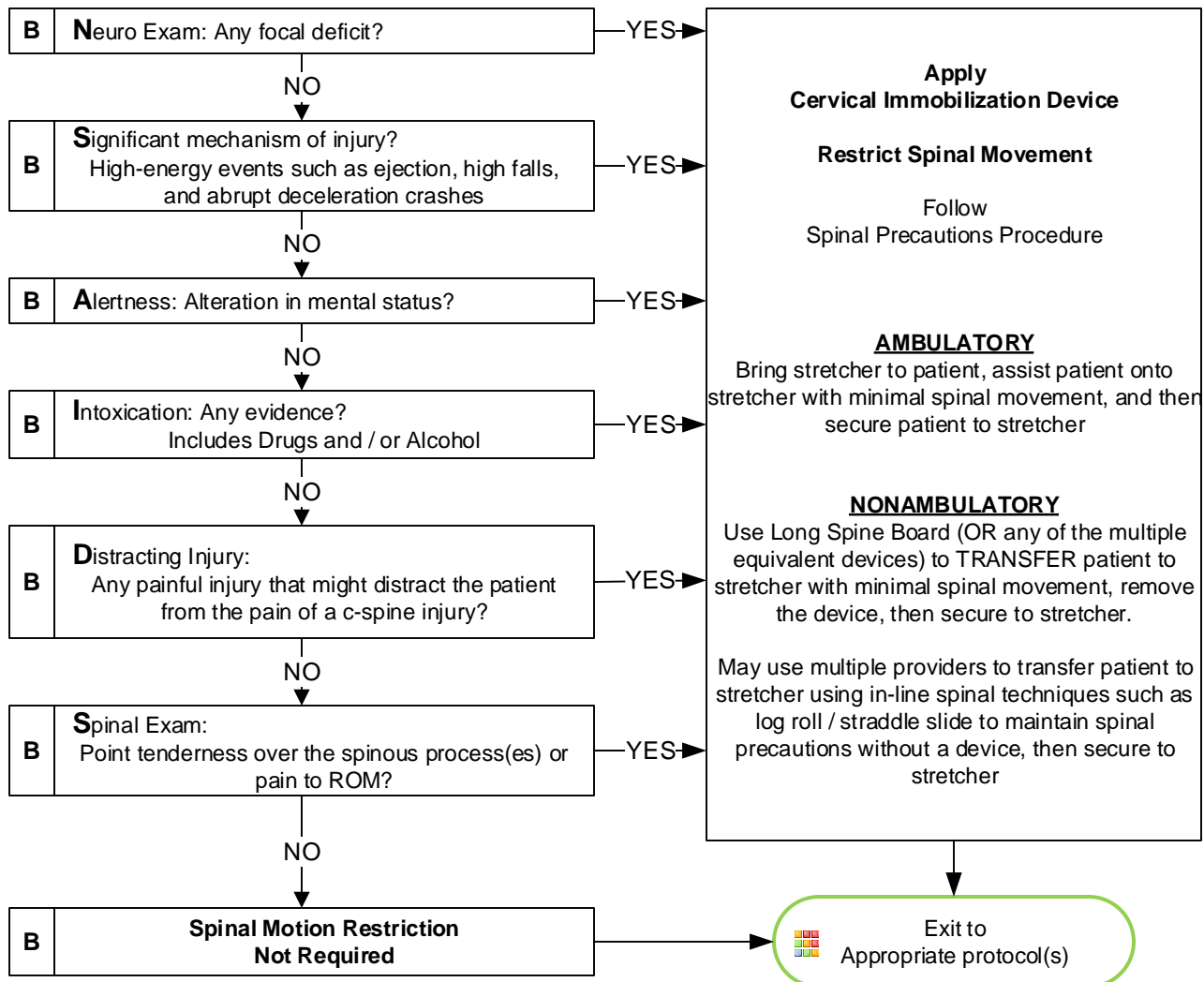
** Also cardiovascular collapse, fever, shock

Modified from: Waselenko, JK, MacVittie, TJ, Blakely, WF, et al. Medical management of the acute radiation syndrome: Recommendations of the strategic national stockpile radiation working group. Ann Int Med 2004; 140:1039.

Pearls

- Dealing with a patient with a radiation exposure can be a frightening experience. Do not ignore the ABC's, a dead but decontaminated patient is not a good outcome. Refer to the Decontamination Procedure for more information.
- Normal Saline or Sterile Water is preferred, however if not available, do not delay irrigation using tap water. Other water sources may be used based on availability. Flush the area as soon as possible with the cleanest readily available water or saline solution using copious amounts of fluids.
- Three methods of exposure:**
 - External irradiation
 - External contamination
 - Internal contamination
- Two classes of radiation:**
 - Ionizing radiation (greater energy) is the most dangerous and is generally in one of three states: Alpha Particles, Beta Particles and Gamma Rays.
 - Non-ionizing (lower energy) examples include microwaves, radios, lasers and visible light.
- Radiation burns with early presentation are unlikely, it is more likely this is a combination event with either thermal or chemical burn being presented as well as a radiation exposure. Where the burn is from a radiation source, it indicates the patient has been exposed to a significant source, (> 250 rem).
- Patients experiencing radiation poisoning are not contagious. Cross contamination is only a threat with external and internal contamination.
- Typical ionizing radiation sources in the civilian setting include soil density probes used with roadway builders and medical uses such as x-ray sources as well as radiation therapy. Sources used in the production of nuclear energy and spent fuel are rarely exposure threats as is military sources used in weaponry. Nevertheless, these sources are generally highly radioactive and in the unlikely event they are the source, consequences could be significant and the patient's outcome could be grave.
- The three primary methods of protection from radiation sources:**
 - Limiting time of exposure
 - Distance from
 - Shielding from the source
- Dirty bombs ingredients generally include previously used radioactive material and combined with a conventional explosive device to spread and distribute the contaminated material.
- Refer to Decontamination Procedure / WMD / Nerve Agent Protocol for dirty contamination events.
- If there is a time lag between the time of exposure and the encounter with EMS, key clinical symptom evaluation includes: Nausea/ Vomiting, hypothermia/hyperthermia, diarrhea, neurological/cognitive deficits, headache and hypotension.
- This event may require an activation of the National Radiation Injury Treatment Network, RITN. UNC Hospitals, Wake Forest-Baptist and Duke are the NC hospitals, with burns managed at UNC and Wake Forest.

Selective Spinal Motion Restriction



Pearls

- **Recommended Exam: Mental Status, Skin, Neck, Heart, Lungs, Abdomen, Back, Extremities, Neuro**
- **Patients meeting all the above criteria do not require spinal motion restriction. However, patients who fail one or more criteria above require spinal motion restriction, but does NOT require use of the long spine board for immobilization.**
- **Long spine boards are NOT considered standard of care in most cases of potential spinal injury. Spinal motion restriction with cervical collar and securing patient to cot, while padding all void areas is appropriate.**
- **True spinal immobilization is not possible. Spine protection and spinal motion restriction do not equal long spine board.**
- **Spinal motion restriction is always utilized in at-risk patients. These include cervical collar, securing to stretcher, minimizing movement / transfers and maintenance of in-line spine stabilization during any necessary movement / transfers. This includes the elderly or others with body or spine habitus preventing them from lying flat.**
- **Consider spinal motion restriction in patients with arthritis, cancer, dialysis, underlying spine or bone disease.**
- **Range of motion (ROM) is tested by touching chin to chest (look down), extending neck (look up), and turning head from side to side (shoulder to shoulder) without posterior cervical mid-line pain. ROM should NOT be assessed if patient has midline spinal tenderness. Patient's range of motion should not be assisted.**
- **Immobilization on a long spine board is not necessary where:**
 - Penetrating trauma to the head, neck or torso with no signs / symptoms of spinal injury.
- **Concerning mechanisms that may result in spinal column injury: Consider full spinal immobilization**
 - Fall from ≥ 3 feet and/or ≥ 5 stairs or steps
 - MVC ≥ 30 mph, rollover, and/or ejection
 - Motorcycle, bicycle, other mobile device, or pedestrian-vehicle crash
 - Diving or axial load to spine
 - Electric shock
 - Impending cardiac arrest
 - Air Transport
 - Patient movement / extrication purposes

Thermal Burn

History

- Type of exposure (heat, gas, chemical)
- Inhalation injury
- Time of Injury
- Past medical history and Medications
- Other trauma
- Loss of Consciousness
- Tetanus/Immunization status

Signs and Symptoms

- Burns, pain, swelling
- Dizziness
- Loss of consciousness
- Hypotension/shock
- Airway compromise/distress could be indicated by hoarseness/wheezing

Differential







- Superficial (1st Degree) red - painful (Don't include in TBSA)
- Partial Thickness (2nd Degree) blistering
- Full Thickness (3rd Degree) painless/charred or leathery skin
- Thermal injury
- Chemical – Electrical injury
- Radiation injury
- Blast injury

Assess Burn / Concomitant Injury Severity

< 5% TBSA 2nd/3rd Degree Burn
No inhalation injury, Not Intubated,
Normotensive
GCS 14 or Greater
Minor Burn

5-15% TBSA 2nd/3rd Degree Burn
Suspected inhalation injury or requiring
intubation for airway stabilization
Hypotension or GCS 13 or Less
(When reasonably accessible,
transport to a Burn Center)
Serious Burn

>15% TBSA 2nd/3rd Degree Burn
Burns with Multiple Trauma
Burns with definitive airway
compromise
(When reasonably accessible,
transport to a Burn Center)
Critical Burn

 <div>Airway Protocol(s) AR 1, 2, 3, 5, 6 <i>as indicated</i></div>		
 <div>Multiple Trauma Protocol TB 6 <i>if indicated</i></div>		
<div>A</div>	Remove Rings, Bracelets / Constricting Items	
	Dry Clean Sheet or Dressings	
	IV Procedure	<div>P</div> IO Procedure
	Consider 2 IV sites if greater than 15 % TBSA	
	<div>Normal Saline</div> <div>0.25 mL / kg (x % TBSA) / hr</div> <div>for up to the first 8 hours.</div> <div>(More info below)</div> <div>Lactated Ringers if available</div>	
 <div>Pain Control Protocol UP 11 <i>if indicated</i></div>		
 <div>Carbon Monoxide / Cyanide Protocol TE 2 <i>if indicated</i></div>		
	Monitor and Reassess	
<div>Rapid Transport to appropriate destination using</div> <div>Trauma and Burn:</div> <div>EMS Triage and Destination Plan</div>		
<div>↓</div>		
	<div>Notify Destination or</div> <div>Contact Medical Control</div>	

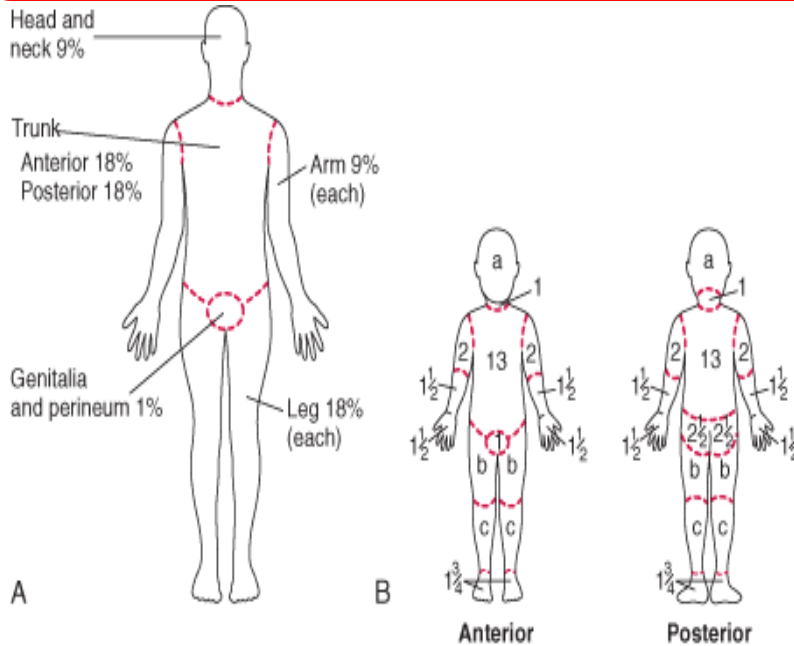
Air Transport
Should Be
Considered
Primary

1. Lactated Ringers preferred over Normal Saline. Use if available, if not change over once available.
2. Formula example; an 80 kg (196 lbs.) patient with 50% TBSA will need 1000 cc of fluid per hour.

TB 9 (ROBESON)

This protocol has been altered from the original NCEP Protocol by the local EMS Medical Director

Thermal Burn



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

Rule of Nines

- Seldom do you find a complete isolated body part that is injured as described in the Rule of Nines.
- More likely, it will be portions of one area, portions of another, and an approximation will be needed.
- For the purpose of determining the extent of serious injury, differentiate the area with minimal or 1st degree burn from those of partial (2nd) or full (3rd) thickness burns.
- For the purpose of determining Total Body Surface Area (TBSA) of burn, include only Partial and Full Thickness burns. Report the observation of other superficial (1st degree) burns but do not include those burns in your TBSA estimate.
- Some texts will refer to 4th, 5th and 6th degree burns. There is significant debate regarding the actual value of identifying a burn injury beyond that of the superficial, partial and full thickness burn at least at the level of emergent and primary care. For our work, all are included in Full Thickness burns.
- Other burn classifications in general include:
 - 4th referring to a burn that destroys the dermis and involves muscle tissue.
 - 5th referring to a burn that destroys dermis, penetrates muscle tissue, and involves tissue around the bone.
 - 6th referring to a burn that destroys dermis, destroys muscle tissue, and penetrates or destroys bone tissue.

Estimate spotty areas of burn by using the size of the patient's palm as 1 %

Pearls

- Recommended Exam: Mental Status, HEENT, Neck, Heart, Lungs, Abdomen, Extremities, Back, and Neuro**
- Green, Yellow and Red in burn severity do not apply to the Start / JumpStart Triage System.**
- Critical or Serious Burns:**
 - > 5-15% total body surface area (TBSA) 2nd or 3rd degree burns, or
 - 3rd degree burns > 5% TBSA for any age group, or
 - circumferential burns of extremities, or
 - electrical or lightning injuries, or
 - suspicion of abuse or neglect, or
 - inhalation injury, or
 - chemical burns, or
 - burns of face, hands, perineum, or feet
- Require direct transport to a Burn Center. Local facility should be utilized only if distance to Burn Center is excessive or critical interventions such as airway management are not available in the field.
- Burn patients are trauma patients, evaluate for multisystem trauma.
- Assure whatever has caused the burn is no longer contacting the injury. (Stop the burning process!)
- Early intubation is required when the patient experiences significant inhalation injuries – Consider RSI Procedure**
- Circumferential burns to extremities are dangerous due to potential vascular compromise secondary to soft tissue swelling.
- Burn patients are prone to hypothermia - never apply ice or cool the burn, must maintain normal body temperature.
- Evaluate the possibility of geriatric abuse with burn injuries in the elderly.
- Never administer IM pain injections to a burn patient.

TB 9 (ROBESON)

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