Burn Care Management 2015

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Objectives

At the end of this presentation the EMS provider should be able to discuss:

- Initial assessment and management of burns
- Different types of burns including chemical/electrical
- Fluid resuscitation in burns >20% TBSA
- Management of inhalational burns
- Disaster triage: who needs the burn center?

SNGH Burn Statistics 2014

- Total patients: 174
  - Admitted: 90
  - Discharged: 80
  - Transferred to CHKD: 4
- Brought in by EMS or NTG: 141
- Age: 16-65
- Males accounted for 117
- Burns referred from outside facilities: 53

SNGH Burn Statistics 2014

- Mechanism:
  - Flame/Scald/Grease: 152
  - Chemical: 7
  - Electrical: 2
  - Inhalation: 6
  - Other: 7
- TBSA:
  - <10%: 132
  - 10%-39%: 31

National Burn Statistics

- 2013 Fact Sheet published by American Burn Association
  - 450,000 burns sought treatment
  - Deaths (burn/inhalation) 3400
  - Hospitalized burns 40,000
    - 30,000 at burn center

  - http://www.ameriburn.org/resources_factsheet.php

EMS Role

- Eyes and ears of the scene
- Reports to hospital providers initial patient presentation
- Reports associated trauma
- Start the resuscitation process if warranted
- May be transporting patients between facilities

Initial Evaluation

- Scene safety
- DO NOT GET DISTRACTED BY WHAT YOU SEE!!!
- Primary survey
  - Airway
  - Breathing
  - Circulation
  - Disability
  - Exposure
- Secondary survey
  - Determine initial TBSA
  - PMH/med list

Airway

- Chin lift/jaw thrust
- Oral pharyngeal airway/nasal trumpet
- ASSESS NEED FOR INTUBATION QUICKLY
  - Intubate early if suspicious for airway component
- C-SPINE immobilization if mechanism warrants

Breathing

- Assess respiratory status
- Verify breath sounds
- High flow oxygen
- Issues:
  - Circumferential full thickness chest burns
- If breathing is an issue check for other causes
  - Could be trauma related (pneumothorax)
  - Could be related to medical condition

Circulation

- BP, HR
- Start two large bore IVs
- Assess circulation in distal extremities
  - Pulses
  - Sensation
  - Cap refill
- 5 P’s: pain, pallor, pulselessness, parathesias, paralysis- all signs of compartment syndrome

Disability, Neuro

- AVPU

- Alterations in mental status:
  - Other trauma
  - CO poisoning
  - Drug/alcohol use
  - Hypoxia
  - Other medical conditions

Exposure/Environment

- Remove all clothing and jewelry
  - STOP the burning process
  - Remove contact lenses
- DO NOT USE ICE
- Cool water for 3-5 minutes is preferable
- Maintain body temperature
- Keep ambulance warm, warm fluids

Secondary Survey

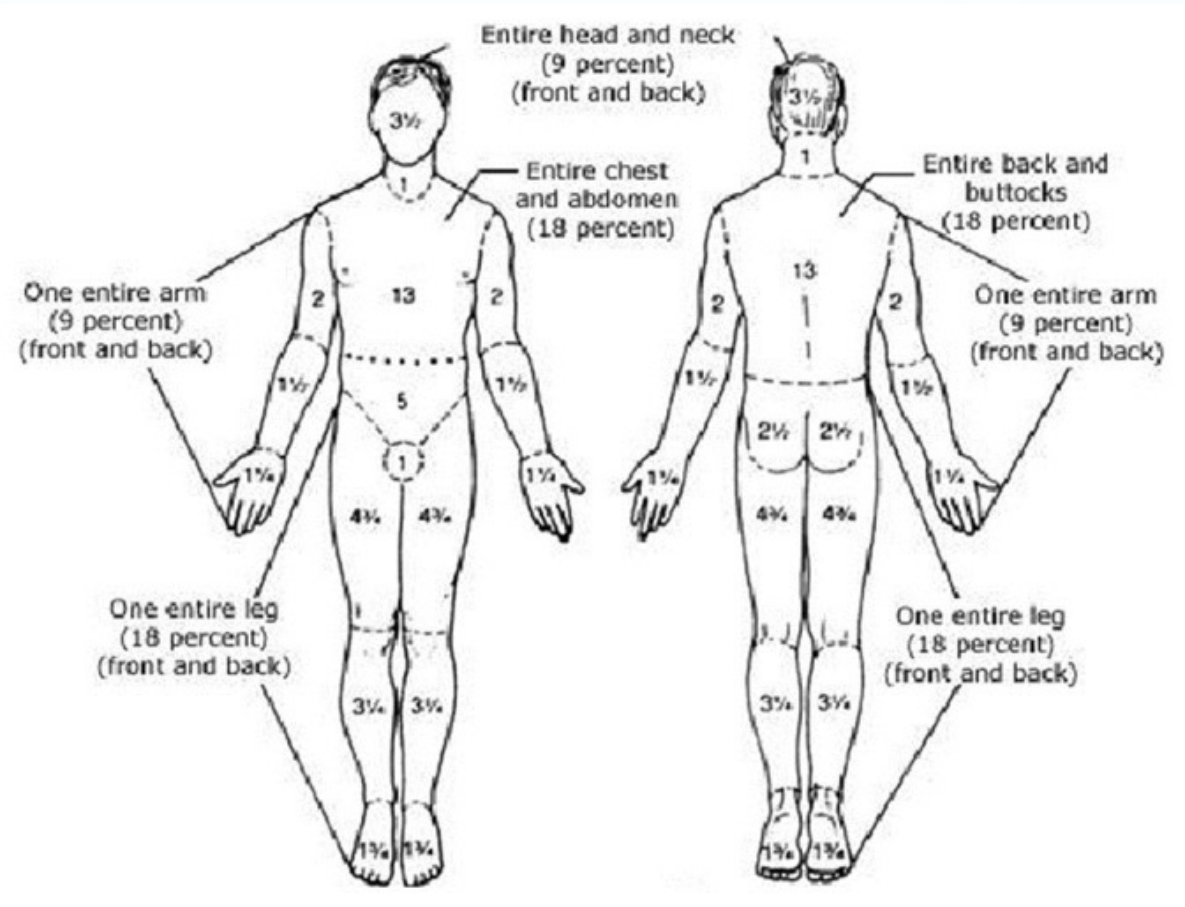
- What happened???
- Obtain medical history
- Complete head to toe examination
- Determine initial severity of the burn
- Management decisions/issues take place here
  - Fluid resuscitation
  - Repeat breathing evaluations
  - Pain management

Total Body Surface Area (TBSA)

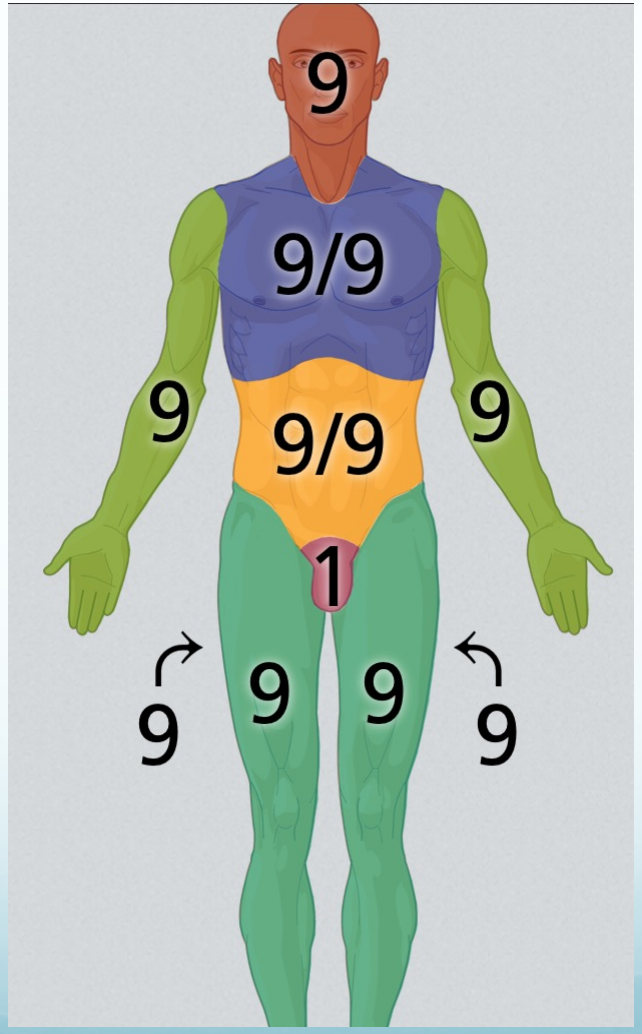
- Lund & Browder
- Rule of Nines
- Patient's palm =1%

- Make mental note: Sunburns do NOT count in TBSA

Lund & Browder



Rule of Nines



For EMS why does TBSA matter?

- If grossly underestimated it prevents the patient from being transported to a burn center
- If overestimated may be an unnecessary transfer
- Under-resuscitation can be fatal
- Over-resuscitation has its own issues/complications

Types of Burns

- Thermal (flame or heat)
- Scald (hot water or fluid)
  - Grease
- Inhalation
- Chemical
- Electrical

Inhalational Injuries

- Three types
  - Carbon monoxide poisoning
  - Inhalational injury above the glottis
    - Above the vocal cords
  - Inhalational injury below the glottis
    - Below the vocal cords

Carbon Monoxide Poisoning

- Cause of most fire scene fatalities
- CO binds to hemoglobin 200X more than oxygen
- Brain is one of the most hypoxia sensitive organs
- Levels:
  - 50-70- often fatal
  - 40-60- LOC/obtunded
  - 15-40- CNS dysfunction
  - 5-10- can be normal for smokers, those who live in heavy traffic areas

CO Poisoning

- Many patients will have NO obvious symptoms
  - Cherry red lips often thought of as the hallmark sign
- OXYGEN SATURATION IS NORMAL!!!!
- Treatment is to move the patient to an open air environment and start 100% oxygen
- Half life for CO is ~4 hours

Injury Above the Glottis

- Often thermal or chemical in nature
- Often may cause airway compromise or obstruction
- Often undetected until fluid resuscitation is underway and edema occurs
  - This can completely obstruct airway and make intubation difficult, if not impossible

Injury Below the Glottis

- Most always chemical in nature
  - Changes that occur to the respiratory system
    - Hypersecretion
    - Erythema
    - Edema
    - Ulceration
    - Bronchi/bronchiole spasms
- Usually unable to tell full extent early
- Severe spasms/wheezing can occur early or later (hours)

Inhalational Injury

- Grading system I-IV
- Lung dysfunction typically worsens in 24-72 hours
- Causes ventilation-perfusion mismatch
- Poor gas exchange
- Pulmonary edema
- Patient can develop
  - Acute lung injury
  - ARDS
  - Pneumonia

When Should You Intubate?

- If TBSA is >40%
- Extensive facial burns
- Burns noted inside oral cavity
- Signs of airway obstruction
- Hoarseness
- Stridor
- Inability to protect the airway

- Transport these patients to closest burn center

Cyanide Toxicity

- Seen in smoke inhalation victims
  - Residential and industrial
- Cyanide disrupts the ability to utilize oxygen
- High concentrations are fatal very quickly (often within minutes)
- Signs/Symptoms
  - AMS
  - Personality changes
  - Parkinson’s type symptoms

Cyanide kits

- Cyanokit.com
- Administer in smoke inhalation victims with obvious soot in mouth, nose, airway issues, AMS
- Pregnancy category C
- 5g initial dose, can repeat for total dose 10g
  - Infuse over 15 min
- Can cause severe HTN
  - Systolic >180
  - Diastolic >110

Burn Depth

- First, Second, Third degree
- Superficial
- Partial thickness
  - Superficial
  - Deep
- Full thickness

Superficial

- Involve only the epidermis
- Skin will be red and super sensitive
- Equivalent to a sunburn
- NOT calculated as part of the TBSA
- Heals in a few days

Picture from ABA ABLS instructor slides

Superficial Partial Thickness

- Epidermis and part of the dermis
- Red, blistered, swollen
- Extreme pain as some of the nerves could be

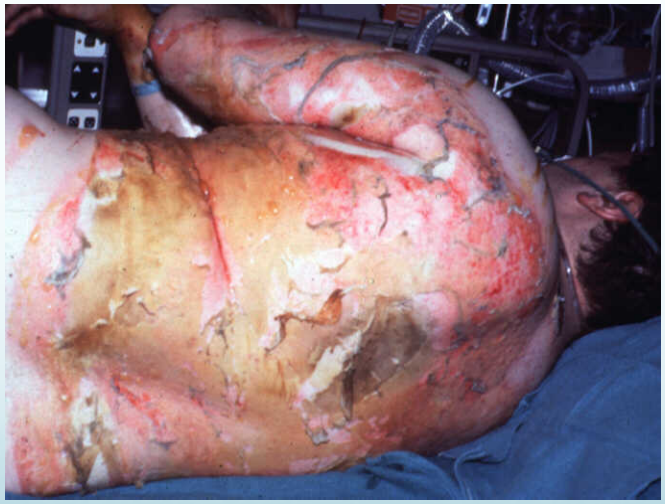
Deep Partial Thickness

- May require grafting to promote functional outcome/cosmetic appearance

Picture from ABA ABLS instructor slides

Full Thickness

- Both layers of skin are destroyed
- White, charred, or opaque appearance
- All sensation is lost



Picture from ABA ABLS

instructor slides

Full Thickness (4th degree)

- Involves fat, fascia, muscle, and/or bone

Picture from ABA ABLS instructor slides

Chemical Burns

- Acid burns:
  - Household products
  - Causes coagulation necrosis and protein precipitation
    - Limits tissue damage
- Alkalis
  - Oven cleaners, fertilizers, drain cleaners
  - Causes liquefaction necrosis and protein denaturation
  - Causes deeper and more severe burns
- Organic compounds
  - Petroleum, etc
  - Cause damage given their fat solvent action
  - When absorbed through the skin they can cause liver and kidney toxicity

Chemical Burns

- WEAR PPE!!!
- Remove all patient's clothing
- Brush off powders first, then irrigate with water for at least 20 minutes
- Do not try to "neutralize" the chemical
- Need to be transported to a burn center
- Can progress quickly to full thickness in few days

Hydrofluoric Acid Burns

- TOXIC TOXIC TOXIC!!!
- Low concentrations <10% take 6-18 hours to appear but causes severe pain
- Higher concentrations cause immediate pain and tissue death
- Patient death can occur from hypocalcemia
- TREATMENT:
  - Flood with water!!!!
  - Apply calcium gel to neutralize the fluoride
  - Cardiac monitoring

Gasoline/Diesel Burns

- Prolonged contact can cause cutaneous injury
- If absorbed can cause organ failure/death
- Systemic toxicity can be seen within 6-24 hours

Tar Burns

- Contact and chemical type burn
- Cooling the tar with cold water
- No need to remove the tar emergently
- Remove with petroleum based product: Vaseline
  - Mayonnaise
  - Peanut butter

Electrical Burns

- “Grand Masquerader”
  - Small burn with huge internal injuries
- AC/DC
  - AC more dangerous
- Lightening
- 2 Large bore Ivs
  - 4ml LR x TBSA x kg
  - ECG monitoring
  - Remove all rings, watches, jewelry
- Myoglobinuria- IVF high rate until urine clear

Fluid Resuscitation

- Why is this so important???
  - Edema that occurs in the second 24 hours post burn can worsen pending over or under resuscitation
  - Resuscitate burns >20-30% TBSA
- Pre-hospital fluid management guideline:
  - <5yrs 125cc/hr
  - 6-13yrs 250cc/hr
  - >14yrs 500cc/hr
  - Lactated Ringer's is solution of choice

Fluid Resuscitation

- Parkland Formula circa 1968
  - 2-4ml LR x TBSA x kg
  - Give ½ of total amount in the first 8 hours. Clock starts at the TIME OF THE BURN- NOT ARRIVAL
  - Remainder of fluid over the next 16 hours

Adults	2ml LR xTBSA x kg
Children <14yrs	3ml LR xTBSA x kg
Electrical burns	4ml LR xTBSA xkg

End Point Resuscitation

- URINE OUTPUT!!!!
  - Adults: 0.5ml/kg/hr (30-50cc/hr)
  - Children: 1ml/kg/hr

Does the Parkland Formula Work?

- Yes! However, once started, monitoring of the patient, measuring urine output, and adjusting fluids based on clinical findings is paramount.
- University of Texas Southwestern (2008) studied the use of Parkland formula in >400 patients over 15 years with TBSA >19%. No electrical burns included- thermal only with inhalational burns evaluated by bronchoscopy. Parkland formula was a good starting point.

Who Needs More Fluid?

- Alcohol use
- Dehydration
- Associated traumatic injury
- Delayed resuscitation
- Those with inhalational injuries
- High Voltage electrical injuries
- Meth Lab explosions

“Under” Resuscitation Issues

- Multisystem organ failure due to lack of tissue perfusion
- Acute renal failure
- Can cause deepening of the burn wounds which can lead to more surgery/grafting

“Over” Resuscitation Issues

- Pleural Effusions/Pulmonary edema
- Abdominal compartment syndrome
  - Intra-abdominal pressure >25mmHg
  - Will get high peak pressures on airway
  - Low urine output
  - Decreased lung compliance
  - Will need a decompressive laparotomy

Burn Wound Management

- Clean dry sheets
- Thermal insulation blanket
- NEVER apply wet dressing, sheets, or blankets
- If transporting between facilities may see silvadene dressings applied.

Escharotomies

- Typically in circumferential burns
- For compartment syndrome of extremities
- Can be done on chest, abdomen
- Clean wet to dry dressings post procedure
- Check neurovascular status of extremities during transit

Pain Management

- IV only
- IM/SQ routes unpredictable given changes in fluid volume and blood flow
- Morphine preferred drug
  - If allergic; use fentanyl or other alternative
- Only give what's needed to control the pain.
- May have an anxiety component

Which Patients Go to a Burn Center???

- Facial burns
- Hand, genitalia, perineum burns
- Burns over major joints
- Electrical burns
- Chemical burns
- Inhalational injuries
- TBSA >10% partial thickness
- Full thickness burns
- Burns with associated trauma
- Those with medical conditions that will complicate management
- Children
- Patients who will need long term rehab

Inter-facility Transport

- Secure airway
- 2 working large bore IVs
- Foley catheter
- Maintain NPO status
- +/- NGT
- Burn wounds covered in clean dry sheet with blanket
- Pain medication orders
- +/- tetanus
- Documentation

Disaster Management

- Mass casualty incidents
  - Man made/nature

- 123 Burn Centers in US
- ~1750 Burn beds available
- Trauma center does not equal Burn center

Disaster Management

- Mass Burn Casualty disaster occurs when the regional burn center has exceeded capacity to optimally care for burn patient
- Burn Center Surge Capacity
  - 1.5 X more the burn patients than the average daily census
- Know local triage policy/plans
- Practice those plans frequently

Disaster Management

- Triage to a burn center within 24 hours
- Secondary triage
  - Burn center to burn center
  - Burn director will implement
  - Maintain basic standards of care until transfer

MCI Triage Tags

- Red: Immediate treatment needed
- Yellow: delayed, less urgent
- Green: outpatient treatment
- Black: expectant – poor prognosis, even with treatment

Treatment of minor burns on scene

- Oral resuscitation if needed
- Oral pain meds
- Tetanus
- Dress wounds
- F/U as outpatient
- If needs burn center d/t criteria (hand burn, facial burn, etc) these patients will be transferred last

For Expectant Burns (Black Tag)

- Administer pain and anti-anxiety medications
- Do not intubate
- Do not transfer
- Offer emotional support as necessary

Case Study 1

- 18 year old female, estimated 70kg, victim house fire
- Pulled from house by firefighter
- You are on scene with patient starting care
- Intubated, suspect inhalational injury
- Initial estimate of 30-40% TBSA
- Calculate fluids

Case Study 1

- Fluid resuscitation
- 2ml/70/35%: 4900- give 2,450cc over first 8 hours: 306cc/hr
- 3ml/70/35%: 7350- give 3,675cc over first 8 hours; 460cc/hr
- 4ml/70/35%: 9800- give 4900 over first 8 hours; 612cc/hr

Case Study 1

- Patient went to outside hospital first, then transferred via medical helicopter
- Estimated initially at 60% on arrival (remember 30-40% by EMS) then 80% after full debridement in OR
- Grade III inhalational injury
- Complications during 2 month hospitalization:
  - Acute renal failure requiring dialysis
  - Multi-drug resistant infections
  - Sepsis
  - Adrenal insufficiency
  - Required amputations of 2 extremities

Case Study 2

- 35 year old male, car explosion
- Found by EMS in asystole
- CPR, ACLS started, PEA, then ROSC
- TBSA ~8-10%
- GCS 3T, intubated in field
- Soot in mouth and nose
- Cyano-kit initiated
- IVF started
- 100kg weight estimate

Case Study 2

- Fluid resuscitation
  - 2ml/100kg/10 %; 2000cc over first 8 hours; 250cc/hr
  - 3ml/100kg/10%; 3000cc over first 8 hours; 375cc/hr
  - 4ml/100kg/10%; 4000cc over first 8 hours; 500cc/hr

Case Study 2

- Bronchoscopy showed Grade III inhalation injury
- Initial carboxyhemoglobin 44.3
- ABG
  - pH 7.03 CO2 58 pO2 -68 HCO3 16.7/ sats 85%
- Required vasopressor support with levophed and neosynephrine
- 6 hours later patient went into PEA then V-fib then expired

Case Study 3

- 50 year old male, working on bridge construction site
- History of previous MI, CAD, CHF
- Electrocuted with 13000 volts
- Cardiac arrest on scene; CPR performed by bystanders, ROSC
- You have now arrived, what do you do now?
- What questions do you ask?
- How do you want to manage this patient?

Case Study 3

Case Study 3

- Fluid management?
  - Estimated body weight 80kg
- What would concern you in patient's medical history in giving IV fluids
- Where would you send the patient?
- What do you worry about?

Questions????

References

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