Objectives

Upon successful completion of this CE module, the ECRN provider will be able to:

1. Differentiate a superficial from partial thickness from full thickness burn given a description of the wound.
2. Discriminate sources of burn injuries between thermal, inhalation, electrical, chemical, and radiation.
3. Distinguish the difference between mild, moderate, and severe hypothermia given signs and symptoms assessed.
4. Devise a pain management plan for the patient with hypothermia.
5. Discuss use of QuikClot, CAT, IO, and needle decompression.
6. Discuss the indications and techniques of placing an IO and performing needle decompression.
7. Review selected Region X SOP’s as related to the topic presented.
8. Identify a variety of EKG rhythms and 12 lead EKG’s.
9. Successfully complete the post quiz with a score of 80% or better.
Largest Organ - Skin

A most important, yet least appreciated human organ

Protects from
✓ Fluid loss
✓ Bacterial invasion
✓ Trauma via insulation

Provides
✓ Natural surface for sensation perceiving temperature, pressure (touch), and pain
✓ Aids in temperature regulation
  - Radiation – *primary mechanism to maintain body temperature*
  - Evaporation via sweating
  - *Vasodilation or vasoconstriction as necessary to dissipate or conserve heat*
✓ Flexibility to accommodate movement
The Layers of Skin

Epidermis – outer most layer
- Drying and dead cells
- Constantly being regenerated – abraded away during normal activity of daily living
- Sebum (oil) on surface acts as barrier (i.e.: to water & other fluids)

Dermis – tissue layer below epidermis
- Contains blood vessels, glands, nerve endings
- Glands secrete sebum (oil), sweat
Skin Layers cont’d

Subcutaneous tissue – fat and connective tissues

Insulation layer – minimize trauma and prevent heat loss

Heat moves slower through fat than muscle

Blood directed under sub-Q layer (i.e.: to preserve body heat) therefore takes longer for heat to move to skin so heat loss slows

Blood directed to dermis (i.e.: when core blood has an elevated temperature) to increase the skin temperature and increase rate of heat loss
Structures Under Skin Layer

- Muscles with thick, fibrous capsules of fascia
- Nerves
- Tendons
- Bones
- Vital organs
Types of Burns

- Thermal
- Inhalation
- Electrical
- Chemical
- Radiation
General Information

Majority of burn injuries are minor and occur at home or work

Majority of burns are self-treated

Common sources
- Hot water
- Curling iron
- Touching hot surface

Home treatment is usually sufficient with generally good outcomes
Thermal Burns

Most often caused by fire, steam, hot liquids

Scald burn from hot liquid most common to children and older adults

Goal – ✓ Remove the source
✓ Stop the burning process – cool the wound
Inhalation Exposure

Inhalation of hot air or gases have potential to cause damage to the respiratory system

Increased risk of also breathing in dangerous and damaging gases

- Carbon monoxide
- Cyanide
Anticipated Damage

If you know what to expect, then you are not surprised if the patient develops that complication!

Airway compromise
Can develop quickly and surprise you
✓ Listen for change in voice (↑ hoarseness)
✓ Watch for carbonaceous sputum
CO Monitoring

Non-invasive tool – Rad 57
Be suspicious of vague early symptoms
✓ Headache
✓ Nausea
✓ I must have the “flu”
✓ “Everybody” at home is sick

Obtain and document results of Rad 57 evaluation for CO levels
## CO Monitoring – Region X SOP

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Signs and Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 5%</td>
<td>None (normal for non-smoker)</td>
</tr>
<tr>
<td>5 – 9%</td>
<td>Minor headache (may be normal for smoker)</td>
</tr>
<tr>
<td>10 – 19%</td>
<td>Headache, shortness of breath</td>
</tr>
<tr>
<td>20 – 29%</td>
<td>Headache, nausea, dizziness, fatigue</td>
</tr>
<tr>
<td>30 – 39%</td>
<td>Severe headache, vomiting, vertigo, altered LOC</td>
</tr>
<tr>
<td>40 – 49%</td>
<td>Confusion, syncope, tachycardia</td>
</tr>
<tr>
<td>50 – 59%</td>
<td>Seizures, shock, apnea</td>
</tr>
<tr>
<td>Greater than 59%</td>
<td>Coma, death, cardiac dysrhythmias</td>
</tr>
</tbody>
</table>
Electrical Burns

Contact with an electrical source
Kids biting on electrical cords
Kids sticking objects into outlets
High power line contact

Internal damage could be extensive

Lightening injuries
High voltage
High current
High temperature

Lasts a fraction of a second
Lightning Injuries

Lightening often strikes near-by object and some current travels sideways or radiates outward in alternate pathways.

Burns from lightening are usually superficial (fern-like, feathering).

Feathering may be present
  - Transient from 1 – 24 hours

Electricity has dissipated by the time a rescuer reaches a victim.

Further strikes are possible if storm remains near-by.
Lightening victims that will arrest will do so prior to your arrival
Asystole from strike usually resolves spontaneously (ROSC)
Apnea is caused by interruption in respiratory control center of brain
Survival is possible with prompt intervention starting with by-stander CPR (although some permanent disability often remains)
If the victim is up and walking around, triage is directed to the ones still laying on the ground
   “Reverse triage” performed – tend first to those that appear dead
Visible burns treated (cooled and covered) – most will be superficial
Lightning Injuries – Why do they arrest?

Massive current is like patient was defibrillated
Cardiac activity often resumes spontaneously and quickly
Respiratory center in brain is depressed due to current flow
  Breathing will not always resume spontaneously
  On-going respiratory arrest then causes a second cardiac arrest due to the continuing hypoxia
Long term effects in survivors
  Cataracts, neuro and/or psychological difficulties, perforated ear drum
Lightning Strike

Maintain high index of suspicion

- History of recent or on-going storm with thunder and lightning
- Patient partially clothed or naked
  
  *Clothes can disintegrate or be blown off*
  
- Patient unconscious or confused
- Evidence of perforated ear drum
  
  *Pain, hearing loss, ringing in ears*
- Fern-like splatter pattern of skin burn
Chemical Burns

Contact with household or commercial chemicals in liquid, solid, gas forms

Damage continues below the skin surface

Alkalis burn deeper and more aggressively than acid materials

Common alkalis involved in exposure
✓ Lime
✓ Plaster and mortar
✓ Oven and drain cleaners
✓ Dishwasher powder
✓ Fertilizers
✓ Sparks from sparklers
Radiation Burns

Caused by sun, tanning booths, sunlamps, x-rays, or radiation treatment for cancer

Damage may not be evident until hours after exposure

Very painful injuries due to most of these are surface wounds and nerve endings are intact to signal pain
Evaluation of Burns

First step is to stop the burning process
  Remove patient from contact with source when the scene is safe

Need to evaluate type of injury involved
  This evolves greatly over a short period of time
  The image worsens before improvement is noted
Superficial Burns

Involves only epidermis and upper dermis layers

Irritation of living cells and nerve endings
✓ Therefore painful
✓ Minor edema
✓ Redness to skin
Partial thickness Burns

Penetrates slightly deeper than a superficial burn producing greater destruction

- Reddened
- Usually *VERY* painful
- Edematous
- Blisters produced
Partial Thickness Burns

Often further defined as superficial partial and deep partial

Note evidence of blistering in both images; VERY painful

Superficial partial

Deep partial
Ultraviolet Keratitis

Cornea traps ultraviolet radiation when watching arc welder without eye protection

✓ Injury to cornea
✓ Delayed eye pain
✓ Transient blindness possible
✓ Usually heals within 24 hours
Full Thickness Burns

Burn penetrates epidermis and dermis and extends into subcutaneous layers or even deeper

- Muscles
- Bones
- Internal organs

Regenerative properties of tissues destroyed

Peripheral nerve endings destroyed

Margins of wound may be painful as they are usually mixed superficial and partial thickness burns

Coloration of wound dependent on nature of burning agent and tissue damaged

Skin grafting usually required due to destruction of dermal layer
Full Thickness Burn

Can vary in appearance: white, brown, dark red, charred
Typically dry and leathery
Involvement over joint can hamper patient mobility in the future
Burn Assessment – Rule of Nine’s

Burn severity is assessed/measured by various factors

- Amount of body surface area (BSA) affected
- Degree/level of burn
  - Superficial - specialty care usually not required
  - Partial thickness
  - Full thickness
- Location of the burn
  - Critical areas: face (airway), encircling of hands/feet (mobility, ability to provide self-care and self-support), genitals (higher risk of infection)
- Pre-existing condition of patient factors into outcome
Rule of Nine’s - Adult

Approximation of BSA obtained
11 topographical regions of body identified
   Head and neck – 9%
   Anterior chest – 9%
   Posterior chest – 9%
   Anterior abdomen – 9%
   Posterior abdomen – 9%
   Each entire upper extremity – 9% + 9%
   Anterior surface each lower extremity – 9% + 9%
   Posterior surface each lower extremity -9% + 9%
   Genitalia -1% (ALL body sizes!)

\[ 9\% \times 11 = 99\%; \ 99\% + 1\% = 100\% \]
Rule of Nines

**Adult**
- Head = 9% (front and back)
- Chest = 18%
- Back = 18%
- Right arm = 9%
- Left arm = 9%
- Right leg = 18%
- Left leg = 18%
- Perineum = 1%

**Child**
- Head = 18% (front and back)
- Chest = 18%
- Back = 18%
- Right arm = 9%
- Left arm = 9%
- Right leg = 13.5%
- Left leg = 13.5%
- Perineum = 1%
Rule of Nine’s - Child

Modified to account for the difference in anatomy for the different age groups
Sources may vary slightly over redistribution in the child

Generally:
➔ The head is proportionately larger in the younger population
➔ The legs are generally smaller proportionately

The genitalia always remain 1%
Rule of Nine’s - Infant

As in the child, the head is proportionally larger than in the adult.

The lower extremities are proportionately smaller in surface area than in the adult.

Note: The percentages can vary slightly based on sources cited.
Palmar Calculation of Burns

Alternative system for approximating BSA
Uses palmar surface of patient as a point of reference
Hand plus fingers (Region X SOP)* = approximately 1% BSA

Easier calculation especially for small sized wounds
Rule of Nine’s quicker for larger surface area involvement

*FYI - Debated whether palm or hand (palm + fingers) should be used. Studies indicate palm in Western Civilization is slightly <1% BSA and palm + fingers is slightly >1%. Sources vary to include fingers or not.
Scene size-up and safety at the scene extremely important
Provide Routine Adult Trauma Care as necessary
Assess for airway compromise
✓ Wheezing
✓ Hoarseness
✓ Stridor
✓ Carbonaceous sputum
✓ Singed nasal hair
Consider advanced airway
    Airway damage can cause swelling that can develop QUICKLY
Pain control

✓ Morphine 2 mg IVP/IO every 2 minutes, repeated every 2 minutes as needed up to 10 mg

  *If no IV access, follow pain management SOP for Fentanyl*

Further care dependent on mechanism of burn

Evaluate depth and estimate extent

IV/IO fluid challenge

  How would this be delivered?

    *In 200 ml increments titrated to response*

    *Patient formula is 20 ml/kg to calculate appropriate total fluid volume*

    *Monitor breath sounds listening for early heart failure*
Region X Field Treatment Thermal Burns

Superficial
- Cool area with water or sterile saline
- <20% BSA – apply sterile saline soaked dressings
- Caution – do not over cool major burns or apply ice directly to wound

Partial or full thickness
- Cover wound with DRY sterile dressing

*Note: often, just exposure to air increases pain level; keep wound covered*
Region X Field Treatment Electrical Burns

Assess for dysrhythmias – monitor cardiac rhythm

Identify and document any entrance and exit wounds noted with electrical burns

Assess neurovascular status of affected part

Evaluate circulation/movement/sensation

- Pulses or capillary refill
- Ability to move distal extremities
- Ability to sense touch

Im mobilize affected part

Cover wounds with DRY sterile dressings
Region X Field Treatment Chemical Burns

Refer to Haz/Mat protocol

If powdered chemical, first brush away excess with yourself protected from exposure

Remove clothing if necessary
  Pay attention to personal safety!

Flush burn area with sterile water or saline after it is brushed away

If eye involvement
  Assist patient with removal of contact lens
  Irrigate with saline or sterile water continuously
  Do not contaminate uninjured eye with irrigation material
Sterile Saline or Sterile Water???

Sterile saline – preferred wound irrigant/cleanser of choice
  Isotonic
  ✓ Will not be pulled into cells causing edema
  ✓ Will not pull fluid out of cells causing dehydration
  Does not damage tissue
  Does not impede healing
  Does not alter normal skin flora

Sterile water
  Moves into cells causing cells to swell and potentially burst
    If must be used, anatomy should not soak in it
  Great to use to wash hands with intact skin or to drink
Review of Medications - Morphine

Opioid analgesic
CNS depressant
Causes euphoria and ↓ sensation to pain
Dilates veins – increases venous capacity and decreases venous return to heart
  ↓ pre-load – volume of blood in heart before contraction
  ↓ after-load – pressure heart has to work against to pump blood forward out of heart
Onset – 15 – 30 minutes
Peak – 20 minutes post IV route
Duration – 7 hours
Morphine cont’d

Used for control of pain
Reduces anxiety (anxiolytic)
Administered slowly and in small increments to desire effect
  2 mg IVP/IO; repeated every 2 minutes to max 10 mg
Reversal agent is Narcan/Naloxone

Precautions
✓ Watch for respiratory depression
✓ Monitor for drop in blood pressure
✓ May induce nausea and vomiting (normal response of brain receptors)
✓ As an opioid, will constrict pupils
✓ May alter level of consciousness
Fluid Challenges

May be necessary due to fluid shift due to destruction related to burn

Patients often lose tremendous amounts of fluid that need to be replaced over the first 24 hours

Provide fluid in increments of 200 ml fluid challenges

“Increment” means to continue to administer moving toward goal

Formula – 20 ml / kg

Goal – improvement in patient condition

Burn patients often receive much larger than 1 – 2 L

Always monitor lung sounds for development of pulmonary edema during fluid replacement
Practice – Rule of Nine’s

Review the following 3 victims

Using the Rule of Nines or palmar method, calculate the BSA involved

Discuss what care you would have provided in the field if you were the initial responder

What complications would you have monitored for in the field?
Burn Calculation #1

Calculate BSA involved
Inside right thigh

What is the field care?
What are potential complications?
Burn Calculation #1

BSA – approximately 3 - 4%
  Full leg is 18%; anterior OR posterior surface is 9% each
  This burn demonstrates a portion of anterior thigh only

Field care – begin to cool the site
  Due to small amount BSA can transport with moist sterile saline dressing in place
  Address pain with Morphine 2 mg increments IVP up to 10 mg max

Complications?
  If perineum was involved, would make this a critical wound
  Fortunately, the joint was not involved
Burn Calculation #2

Calculate BSA involved
Entire face & neck minus left cheek area
Upper anterior chest

What is appropriate for field care?
What are the potential complications?
Burn Calculation #2

BSA – Face and neck 4.5% (if total head then it would be 9%)
  Minus the 1% or palm surface for left cheek
  Full chest is 9% (total anterior OR posterior torso is 18%)
  Just upper chest is 4.5%
  Total approximately 8%

Field care
  Cool burn
  Provide pain relief (Morphine 2 mg increments IVP to max of 10 mg)
  Monitor for airway involvement

Complications
  Airway compromise
  Over cooling that could cause hypothermia
Burn Calculation #3

Calculate BSA involved
- Entire upper extremities
- Entire lower extremities

What is appropriate field care?
What are potential complications?
Burn Calculation #3

BSA – Both upper extremities: 9% x 2 = 18%
   Both lower extremities: 18% x 2 = 36%
   Total BSA 18 + 36 = 54%

Field care
   Cool burn
   Address pain control – Morphine 2 mg increments IVP to max 10 mg
   Transport with dry dressings

Complications
   Airway involvement – listen for hoarseness, stridor
   Over cooling causing hypothermia
      Over 20% BSA has potential to become over cooled and cause hypothermia
Potential Short Term Complications

Presence can affect overall severity & recovery of patient

✓ Hypothermia
  *Tissue destruction alters body’s defenses; allows loss of fluid that promotes evaporation and therefore loss of body heat*
  *Reflex vasoconstriction lost with injured skin*

✓ Hypovolemia
  *Damaged blood vessels unable to retain plasma content*
  *Loss of plasma affects osmosis and ability to shift fluids*

✓ Electrolyte imbalance
  *Massive shift of fluid to interstitial space*
  *Electrolyte regulation disrupted*
  *Careful EKG monitoring required*
Long Term Potential Complications - Burns

- Skin grafting required
- Scarring
- Contractures - affects activities of daily living
- Internal damage
Case Presentation #1

Group of friends at a bon fire
Diesel fuel added to fire and it flared
Patient standing close to source and shirt caught fire
Face burnt as shirt was removed

What would you do when arriving at this scene???
Case #1 Review

✓ Confirm scene is safe
✓ Stop the burning process
✓ Assess for airway involvement
✓ Assess for BSA, degree of burn, location of burn, pre-existing conditions
✓ Control pain
   Keep wound covered

Opioid medication – which one is preferred in Region X SOP?
   Morphine 2 mg repeated every 2 min to titration, max of 10 mg
   Longer lasting than fentanyl
Case Review #1  Assessment

BSA – approximately 12% (plus whatever burn to face we don’t see)

Degree – Mix
  Superficial on the edges
  Partial thickness – blistered areas
  Full thickness – whitened area lower right abdomen

Follow-up: patient transferred to Loyola Burn Unit
  Abdominal area skin grafted with donor site from patient’s right thigh
Myths Regarding Burn Care

Cool a burn with butter
   Wrong! – Great for toast – bad for burns.
   Butter heats up relative to the environment and therefore continues the burning process
   Butter has to be washed off for proper hospital treatment – increased pain to patient due to the washing involved to remove the butter
   Can slow healing process, increase risk of bacteria entry

Clean the burn with alcohol
   Wrong! Alcohol will cause excruciating pain and a burning sensation
   *Ever grab an alcohol wipe with a paper cut on your finger??*
   Alcohol dries skin when it evaporates
Myths cont’d

Clean a burn with vinegar
  Wrong! – Great for cleaning windows, not for burns
  Vinegar is acid and will cause excruciating pain
  And dries skin when it evaporates

Cool a burn with cold meat
  Wrong!
  Increases risk of bacterial contamination (i.e.: E coli)

Break the blisters
  Wrong! An intact blister acts like a bandage protecting the delicate, damaged skin below the surface of the blister
  Breaking a blister allows entry of bacteria into the wound area
Escharotomy

Surgical procedure to allow accommodation for excessive swelling of tissues

Without this procedure, compartment syndrome would develop

When swelling is down, surgical repair occurs, large scarring results
Environmental Trauma - Hypothermia

Human body relies on constant, stable conditions – homeostasis

The body works hard to constantly maintain a healthy core and peripheral temperature for optimum function of the human body

\[98.6^\circ F = 37^\circ C\]

This should be your reference point to know if a patient is cool or warm
Process of Heat Loss

✓ Conduction – via direct contact
✓ Convection – via movement of air currents
✓ Radiation – via infrared rays
✓ Evaporation – via sweat due to change of a liquid to vapor
  Water evaporates from skin and lungs at a rate of ~ 600 ml/day
✓ Respiration – via combined mechanisms of convection, radiation, and evaporation
Heat Conservation or Generation

Goose bumps – impede air flow across skin
Shivering – increases metabolism
Peripheral vasoconstriction – pulls more blood away from surface and decreases the opportunity for heat loss
Staying warm and covered
Staying out of drafts and direct wind exposure
Changes in Body Temperature – A Process

Body will compensate by generating heat to maintain a core temperature as long as it can.

Symptoms may be acute – like falling through ice into cold water.

Symptoms may be subacute – someone trapped in a snowy, cold environment.

Symptoms may be chronic – homeless in a northern city without shelter.
Evaluation Mild hypothermia

Core temperature between $90^\circ - 95^\circ$ F ($32^\circ - 35^\circ$ C)

- Tachycardia
- Shivering
- Vasoconstriction – therefore pale
- Tachypnea
- Fatigue
- Impaired judgment

Note: normal body temperature is $98.6^\circ$F ($37^\circ$C)
Evaluation Moderate Hypothermia

Core temperature between 82° – 90° F (28° – 32° C)
✓ Cold-induced arrhythmias – bradycardia, some extra wave forms noted on rhythm
✓ Hypotension
✓ Respiratory depression
✓ Altered mental status
✓ Loss of shivering

Note: normal body temperature is 98.6°F (37°C)
Evaluation Severe Hypothermia

Core temperature less than 82°F (28°C)
✓ Coma
✓ Apnea
✓ Ventricular arrhythmias or asystole

As patient may appear “dead”, they must generally be rewarmed before being pronounced dead. Increased mortality in temperatures below 86°F (30°C)

Hence: A cold patient must be “warm and dead”
General Principles in Care of Hypothermia

- Remove wet garments
- Prevent further heat loss and wind chill exposure
- Maintain patient in horizontal position
- Avoid rough handling – may trigger dysrhythmias
- Monitor core temperature
- Monitor cardiac rhythm
Case Presentation

What do you think the mechanism of injury was?

Blistering and redness is present

This is frostbite

It can be hard to tell the difference between an injury from a cold versus hot source

The damage mirrors both mechanisms of injury

What care must be taken when seeing this injury?

Remove the jewelry before additional swelling occurs

Document what you did with the jewelry
Region X Field Treatment - Hypothermia

Initiate Adult Routine Medical Care

Frostbite
  Move patient to warm environment
  Rapidly re-warm frozen area
    Warm water if available
    Hot packs wrapped in a towel
  Handle skin like a burn
    Protect affected area with light, dry, sterile dressing
    Elevate and immobilize
    Do not let affected skin surfaces rub together
  Manage pain appropriately
Hypothermia Treatment cont’d

Systemic hypothermia
  Avoid rough handling and excess activity
  Apply heat packs to axilla, groin, neck and thorax
    *Areas where blood vessels are superficial*
  If pulse present, continue to assess patient

If pulses absent, move to Adult Emergency Cardiac Care SOP
  *Determine if extremities can be flexed or not to direct care*
Hypothermia Care cont’d

IF extremities CAN be flexed
- Follow appropriate cardiac protocol
- Extend time between repeating medications
- Repeat defibrillation only as core temp rises

IF extremities CANNOT be flexed
- Follow appropriate cardiac protocol
- Limit shocks to 1
- Withhold IV medications

   Medications unable to circulate in “frozen” circulation system
Rewarming Processes

Passive external rewarming
✓ Blankets
✓ Moisture barriers
✓ Insulating materials

Active external rewarming
✓ Warmed blankets
✓ Heat packs – neck, axilla, groin
✓ Immersion in warm water

Active internal rewarming
✓ Warmed humidified oxygen
✓ Warmed IV fluids
Medication Review - Fentanyl

Opioid narcotic analgesic

Less hypotension, respiratory depression, and CNS depression than Morphine

Used for pain control

Administer 1 mcg/kg IVP/IO/IN over 2 minutes to adults

  Peds 1 – 15 years old 0.5 mcg/kg IVP/IO/IN over 2 minutes

  Onset of action is immediate
  Peak effect is in 3 – 5 minutes
  Duration is 30 – 60 minutes

Dosing can be repeated in 5 minutes – max total dosing 200 mcg
Fentanyl cont’d

Watch for
  - Respiratory depression

Effects can be reversed with Narcan/Naloxone

Benefit is that this medication can be administered via the MAD route in absence of IV access
  - IN route of onset is 2 minutes
Rhythm Review

Identify the following rhythms

Discuss key distinguishing features which identify the rhythm

Open your SOP’s and review Region X SOP treatment for the rhythm
Rhythm Review #1

Identify the following rhythm and review Region X SOP treatment

$3^{rd}$ degree heart block – complete

No relationship between P waves (from SA node) and QRS

Start with Atropine 0.5 mg rapid IVP/IO followed by TCP
Valium for comfort; Fentanyl for pain
Sinus rhythm with wide QRS

Need 12 lead EKG to determine a left or right bundle branch block

Bundle branch block just widens out QRS width (representation of time)

Does not influence signs or symptoms, pulses, blood pressure

No special treatment for rhythm
Rhythm Review #3

Identify the following rhythms and review Region X SOP treatment

Torsades – evaluate for stability to determine electrical therapy or medications
Region X SOP Treatment –
Stable Polymorphic VT

✓ Skin warm and dry
✓ Systolic B/P >90

Amiodarone drip
150 mg diluted in 100 ml D5W
Delivered IVPB over a minimum of 10 minutes
Watch for hypotension
Region X SOP Treatment – Unstable Polymorphic VT

✓ Altered mental status
✓ Systolic B/P <90mmHg

Sedation Versed 2mg IVP/IO every 2 minutes titrated to max of 10 mg
  Do not delay cardioversion to sedate

Synchronized cardioversion 100 j

Begin Amiodarone drip – 150 mg/100 ml D5W minimally over 10 minutes

Continue cardioversion as needed 200 j/300j/360j

Note: For polymorphic VT, often defibrillation is required due to the disorganization of the rhythm
Identify the following rhythm and review Region X SOP treatment

NO PULSE PALPATED

PEA – patient needs high quality CPR with minimal interruptions in compressions (less than 10 second pause in compressions)

Evaluate patient for the H’s and T’s

Epinephrine is administered every 3 – 5 minutes IVP/IO
Region X SOP – Asystole/PEA

Begin CPR
   Push hard, push fast
   Rotate compressors every 2 minutes
   Withhold compressions no longer than 10 seconds

Consider possible causes – H’s and T’s

Begin fluid challenges in 200 ml increments

Epinephrine 1:10,000 1 mg IVP/IO every 3-5 minutes

EMS to contact Medical Control to request terminating resuscitation for sustained asystole not responsive to interventions
   Withdrawing Resuscitation Efforts SOP
Consider the H’s and T’s

Explore for possible causes of the critical condition:

- Hypovolemia
- Hypoxia
- Hydrogen ion acidosis
- Hyper/hypokalemia
- Hypothermia
- Toxins
- Tamponade, cardiac
- Tension pneumothorax
- Thrombosis, coronary (AMI)
- Thrombosis, pulmonary embolism
12 Lead EKG Review

You are assessing the 12 lead EKG for ST elevation
Indicates acute injury is in process

Positive ST segment
If >1mm (1 small box) above baseline in at least 2 contiguous limb leads (I, aVL, II, III, aVF)
If > 2mm (2 small boxes) above baseline in contiguous chest leads (V1 – V6)
12 Lead EKG Review #1

Identify the following EKG for ST elevation and discuss SOP treatment

ST elevation in I, aVL, V2 – V6
12 Lead EKG Review #2

Identify the following EKG for ST elevation and discuss SOP treatment

Not diagnostic in presence of LBBB
ST Elevation in LBBB and Paced Rhythms

ST elevation noted in LBBB and paced rhythm
  Just what naturally happens to ST segment in these rhythms
  EKG therefore non-diagnostic

So how is decision made if patient might be acute MI?
  Diagnosis initially influenced by patient presentation
    Cardiologists will take patient to cath lab based on “story” – time is muscle and delay could be detrimental
  Could delay and wait for troponin levels

If EMS notifies receiving facility of EKG with LBBB or paced rhythm, listen to the patient complaint/presentation
  This may be strongest decision for activating cardiac alert or not
Equipment - CAT

An additional tool for use with uncontrollable hemorrhage

Direct pressure would be used initially

Device placed as far distal as possible
  Do not place directly over wound

Windlass (rod) tightened enough to stop bleeding or until loss of distal pulse

Time of application and site recorded
  Do not cover CAT but leave visible to caregivers

Consider pain management
QuikClot Dressing

Impregnated gauze for use to control bleeding
Important to place directly over the wound
Avoid lifting edges to “peek” at the site
If necessary, would apply the CAT first and then the Quikclot gauze
Procedure – Needle Decompression

Indications
Relief of trapped air in pleural space - tension pneumothorax

Equipment
Antiseptic
Longest and largest needle available (i.e.: 12-14 G, 2 - 3” long)

Once in the ED, a regular chest tube would be placed and temporary chest needle removed
Needle Decompression

Site identified

2\textsuperscript{nd} intercostal space (ICS)

Mid clavicular line – more lateral than you think

\textit{Tends to be nipple line for typical adult male}

\textit{The female anatomy could be rather unreliable}

Top of rib – to avoid nerve bundle and blood vessels

Question: If successful, will breath sounds be clear immediately???

NO! – It takes time for lung to re-expand

What happens is air under pressure is relieved, pressure relieved off of mediastinum and patient should b able to immediately “feel” better
Identifying 2\textsuperscript{nd} ICS

Find Angle of Louis, then “hang a Louis”
Palpate “dip” at superior aspect of sternum
Slide finger off toward the axilla
You will be in the 2\textsuperscript{nd} ICS
Now move lateral enough to be at the midline point of clavicle (male nipple line)
Procedure - IO

Choosing needle length

ID your site first, then choose most appropriate length needle

All size needles are 15 G

Pink 15 mm; Blue 25 mm; Yellow 45 mm in length

If you can feel the bone right under your fingers (like your radial area), then choose the pink needle

If there is some layer of subQ tissue under your fingers, choose the blue needle

Proximal humerus needs the length of the yellow needle

Not as secure in the bone – site not weight supporting so less bone density
Medication Review - Lidocaine

Local anesthetic useful for pain control

IO route putting fluids into non-expandable area!

Must be administered slowly and allowed to sit to allow for effects to be felt locally

Consider how your dentist may inject you for dental work and allows time for the effects to take place

Unresponsive patients may still react to pain

- Agitation
- Pulling/moving extremity away
- Increased heart rate
Lidocaine cont’d

Adult IO use
- Lidocaine 50 mg IO over 60 seconds; wait 60 seconds then begin infusion
  *Think 50-60-60*
- May be repeated once for pain control

Pediatric IO use
- Lidocaine 1 mg/kg (up to 50 mg) over 60 seconds; wait 60 seconds then begin infusion
- May be repeated once for pain control
Bibliography

Region X SOP’s; IDPH Approved April 10, 2014.
Z-Medica QuikClot Online educational program

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http://kidshealth.org/parent/firstaid_safe/emergencies/burns.html