EMS

- Too often, the very emergency medical system that people count on for help unintentionally risks or even causes preventable harm to three related groups:

1. Patients
2. Members of the community
3. EMS Personnel

EMS

- Risk of harm to Patients:
- In 1999, the institute of Medicine report ***To err Is Human*** called the attention of the public and medical community to the topic of preventable medical events.
- Since then, the nation's healthcare system has moved toward a culture of safety in many inpatient and outpatient settings
- These concepts and practices have yet to be widely embraced in the EMS community

Slide 1

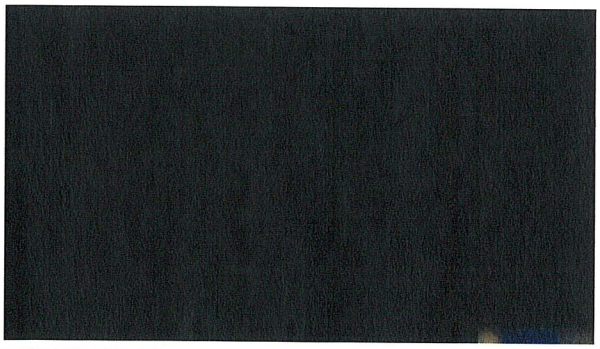
MB1 Mark Briggs, 4/29/2022

EMS

- Risk of harm to Patients:
- Providing EMS can be a high speed, demanding and adrenaline rush on the cutting edge.
- The job demands no mistakes be made when lives are on the line
- In the field it is you and your partner and an engine crew, in the most cramped, dark, confined space on the top floor of the structure and your patient is always pushing 300lbs or more
- Paramedic's are human and can make mistakes

EMS

- Risk of harm to Patients:
- The question we need to ask is not who made the mistake, but why the mistake was made?
- Only after it is determined how the mistake was made can the system be fixed
- Lets find out why things are going wrong, and make this non-punitive if this approach is to be successful
- With paramedics able to report their errors freely in some form, can help to prevent future mistakes or help with future training topics and scenarios



EMS

- Risk of Harm to Members of the Community:

EMS risk causing harm to the public. An example of this is the interaction between an ambulance responding to an emergency event and the general public.

EMS

- Ground Ambulance Crashes in the US

Between 1992-2011 (20years), there were an annual estimated mean of 4,500 motor vehicle traffic crashes involving an ambulance.

Of these crashes:

- 65% resulted in property damage (only)
- 34% resulted in an injury/injuries
- Less than 1% resulted in a fatality/fatalities

- **Injuries and fatalities include occupants in all cars involved in a traffic crash involving an ambulance*

EMS

Of the annual mean 29 fatal crashes involving an ambulance:

- 58% while in emergency use
- 42% while in non-emergency use

Of the estimated annual mean 1,500 injury crashes*:

- 59% while in emergency use
- 34% while in non-emergency use

EMS

- With the fatal and injurie crashes on the rise is it time to flip the switch off?
- Lights and sirens don't have a huge effect on response times
- In seven studies that analyzed response times, found that with lights and siren , there was an average of 1.7-3.6 minutes decrease in arrival times
- This is not a huge amount of time
- Granted, there are some patients where this could mean the difference between life of death, however for the majority of patients a few minutes will not have much impact

EMS

- Light and sirens may not be the best treatment for the patient
- Determining when light and siren are beneficial for the patient is important
- It can also startle other drivers on the road and cause them to panic

EMS

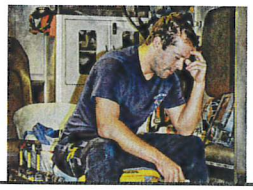
"Slowing down is sometimes the best way to speed up."

EMS

- We need to slow down to be better care givers.
- Take just fifteen seconds to stop and think about your next action!

EMS

- Risk of harm to Personnel



EMS

- Risk of harm to EMS Personnel

  EMS Personnel are expected to (and often expect themselves to)

1. Do their work under difficult, unpredictable and rapidly changing circumstances
2. Work long hours in harsh environments, with limited information, assistance, supervision and resources to accomplish their mission
3. In a course of a day, they may be exposed to risk such as infectious organisms, emotional stress, fatigue, physical violence, occupational injury, vehicle crashes, and personal liability

EMS

- Risk of harm to EMS Personnel
- In 2019, there were 47,500 suicide fatalities in the U.S. and an estimated 1.4 million attempts.
- One potential risk factor is occupation
- First responders are associated with mental issues to include:
  - Hopelessness
  - Anxiety
  - Depression
  - Post-traumatic stress disorder

EMS

- Risk of harm to EMS Personnel

The day to day stress and the work culture can lead to unhealthy habits

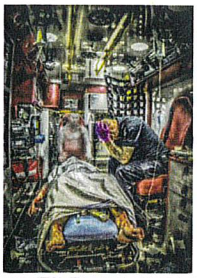
- Drinking
- Drugs
- Reckless behavior
- Self-harming behavior
- Disregarding public safety

EMS

- Where do I turn?
- It's ok to ask for help!
- IAFF Center of Excellence
- This is a one of a kind treatment facility here to help 844-221-2192

EMS

EMS



Question?

Mbriggs@co.lucas.oh.us

Death, Dying, and the First Response Firefighter Paramedic

SHAWN WITTKOP NRP, BSN

Objectives

Discuss Death and Dying Education

Discuss and identify the stages of death

Define Dependent Lividity and Rigor Mortis

Identify whether or not to start resuscitation

Discuss reasons why a family would call 911 when death is expected

DNR, HCMPOA, Living Wills

Discuss the cumulative effects of Death and Dying to the First Response Firefighter Paramedic

Resources for Self and Team Care

Death and Dying Education

Limited Education Provided to Pre Hospital Providers

Ongoing research recognizes this

"The nature of paramedic work means regular interaction with those who are bereaved and grieving. However, to date, little attention has been paid to how paramedics can support those who are grieving."

The Difference Between Life and Death?

In a broad sense:

- Cessation of Heartbeat and Breathing
  - As time progresses
    - Dependent Livdity
    - Rigor Mortis

When do these occur is the general question?

What about those who have Died?

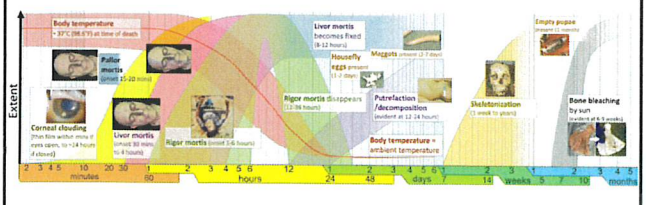
Dependent Lividity

- A reddish-blue-purple discoloration of the skin resulting from the gravitational pooling of blood in the blood vessels evident in the lower lying parts of the body in the position of death
  - 15-30 minutes after death and becomes Fixed about 4-6 hours after death

Rigor Mortis

- A few hours after a person the joints of the body stiffen and become locked in place. The phrase is Latin, with rigor meaning stiffness and mortis meaning death.

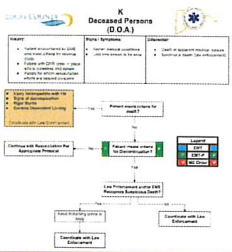
Time Considerations



Dependent Lividity

Rigor Mortis

LCEMS protocol

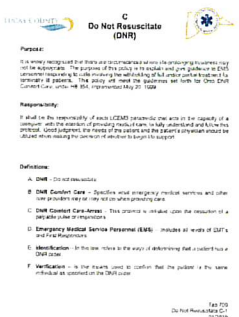


K
Deceased Persons
(D.O.A.)

Special Considerations:

1. When a deceased person is encountered, emergency personnel should avoid disturbing the scene or the body as much as possible, unless it is necessary to do so to care for and assist other victims.
2. Once death has been determined, paramedics should transfer responsibility of scene management to a police agency, fire department and/or the coroner's office.
3. The paramedic and/or first responder should not leave the scene until responsibility for management of the scene has been transferred to an appropriate agency.
4. Patient criteria for obvious death:
   a. **There is injury which is incompatible with life** (e.g., decapitation, evisceration/enteritis, burns beyond body recognition)
   b. **The victim shows signs of decomposition.**
   c. **The victim shows signs of rigor mortis** (Note: All 4 extremities should be physically assessed for stiffness related to rigor mortis).
   d. **Extreme dependent lividity** (Physically roll patient to evaluate dependent body areas for signs of blood pooling).
5. ***Criteria for obvious death must be documented in the patient care record (ePCR).***
6. Death cannot be adequately determined in the hypothermic patient who may be asystolic, apneic, stiff and cold to the touch. Follow the guidelines for **Hypothermic Cardiac Arrest (Tab 800, Section H).**
7. If any doubt exists that the patient is dead at the time of arrival of the life squad resuscitative measures should be instituted immediately and continued until:
   a. Appropriate DNR is verified
   b. Arrival at the hospital
   c. ***On-Line Medical Control*** authorizes discontinuation of prehospital resuscitation as outlined **in *LCEMS protocol Tab 800, Section G.***
   d. Physician has pronounced the patient dead.

DNR Protocol



C
Do Not Resuscitate
(DNR)

Purpose:

It is widely recognized that there are circumstances where the prolonging life process may not be appropriate. The purpose of this policy is to establish and give guidance to EMS personnel responding to calls involving the withholding of full and/or partial treatment to terminally ill patients. This policy will meet the guidelines set forth for Ohio DNR Comfort Care, which will be implemented May 27, 1998.

Responsibility:

It shall be the responsibility of each LCEMS paramedic that acts in the capacity of a caregiver with the intention of providing medical care, to fully understand and follow this protocol. Good judgment, the needs of the patient and the patient's physician should be utilized when reading the definition of adverse to begin life support.

Definitions:

A. DNR – Do not resuscitate.

B. DNR Comfort Care – Specifies what emergency medical services and other care providers may not or may not do when providing care.

C. DNR Comfort Care-Arrest – Task initiated upon the cessation of a perceptible pulse or respirations.

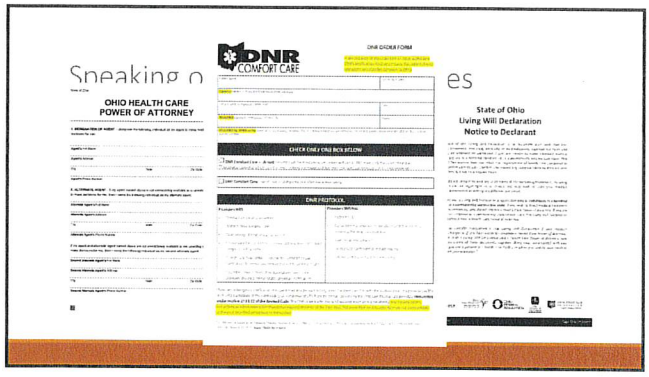
D. Emergency Medical Service Personnel (EMS) – includes all levels of EMT's and First Responders.

E. Identification – In this law, refers to the ways of determining that a patient has a DNR order.

F. Verification – is the means used to confirm that the patient is the same individual as mentioned on the DNR order.

Tab 709
Do Not Resuscitate Ord
3/1/2010

Speaking o es



OHIO HEALTH CARE
POWER OF ATTORNEY

DNR COMFORT CARE

DNR ORDER FORM

CHECK ONLY ONE BOX BELOW

DNR POSITION

State of Ohio
Living Will Declaration
Notice to Declarant

OHIO DNR

Any individual may have a DNR order form completed; you do not have to have a terminal illness, a life-threatening, or life shortening condition. Completion of a DNR order form will allow you to have your choices regarding CPR honored across the spectrum of health care providers.

OHIO DNR

An individual may be a:

- DNR Comfort Care (DNRCC) or
- DNR Comfort Care - Arrest (DNRCC-Arrest)

The difference between the two is when the DNR protocol becomes active. The DNR protocol lists the actions that a healthcare provider will and will not take during your care

OHIO DNRCC

The DNRCC

- Effective as soon as an authorized healthcare provider signs the form
- This means that as soon as the form is signed, you will not receive any of the treatments listed in the DNR protocol as "Will Not," including resuscitative medications, CPR, ventilator care, continuous cardiac monitoring, or defibrillation

OHIO DNRCC - ARREST

Does not become effective until you experience cardiac or respiratory arrest

Up until the time you experience a cardiac or respiratory arrest, you will receive all medical care necessary to treat any illness or injury, including intubation

You will be treated as any other medical patient

The DNR Protocol

Individuals with either a DNRCC or DNRCC – Arrest will receive the following care under the DNR protocol. Healthcare providers Will:

Conduct an initial assessment

Perform basic medical care

Clear airway of obstruction or suction

If necessary, (for comfort of the patient) may administer oxygen, CPAP, or BiPAP

If necessary, (for comfort of the patient) may obtain IV access for hydration or pain medication to relieve discomfort, but not to prolong death

If possible, may contact other appropriate health care providers (e.g., hospice, home health, physician/APRN/PA)

The DNR Protocol

Once the DNR protocol is activated healthcare providers

Will Not:

Perform CPR

Insert artificial airway adjunct (intubation, ventilator, etc.)

Administer medications with the intent of restarting the heart or breathing

Defibrillate, Cardiovert, or initiate Pacing

Initiate continuous cardiac monitoring

Prolonging Death

Providing care with the intent of keeping the person alive as opposed to providing care for comfort purposes

Can you receive other Healthcare?

DNR does not mean DO NOT TREAT

You can and should receive the medical care you require in the event of illness and injury.

The DNR solely pertains to Cardiopulmonary Resuscitation (CPR) and does not address and is not limited by other conditions

So if I can have treatment, what are some examples?

Urinary tract infections

Heimlich maneuver for choking

Fractures

Influenza

Bleeding

Uncontrolled Pain

Dehydration

Revoke

A patient can revoke your the DNR at any time either verbally, by destroying the DNR order form, or permanently removing the DNR identification items

Who Can Change a patient's DNR?

A patient can change your DNR status at any time

If a patient assigned someone to be their Health Care Power of Attorney agent, absent a substantial change in their condition, they cannot change or override your DNR decisions if they completed a DNR order form with an authorized health care provider

A Health Care Power of Attorney agent can only revoke a DNR order if they were the one who requested/had the DNR order form completed on your behalf

Another physician or the medical director of an EMS organization cannot override your DNR decisions if the patient completed a DNR order form with their authorized healthcare provider

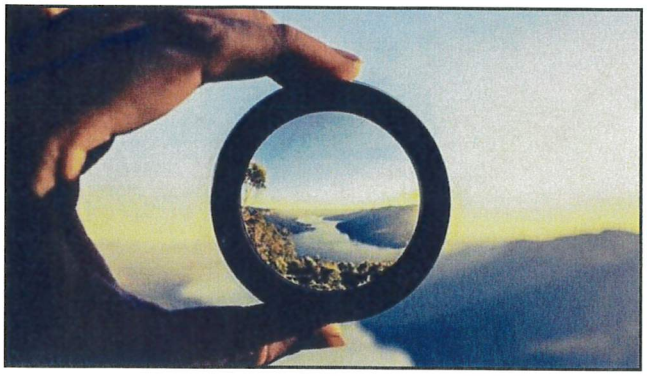
A patients family members, friends, or others cannot override a DNR decisions if a patient completed a DNR order form with their authorized healthcare provider

Living Will and HCPOA

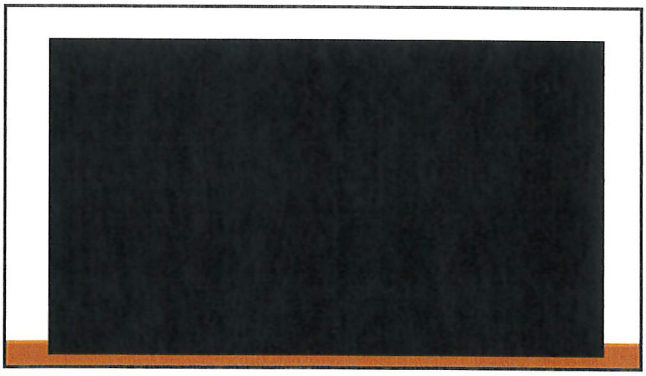
Have the representative show you the patients wishes if the patient cannot verbalize this

Consult with Medical Control

Overload

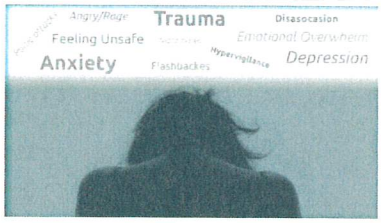



STRESS of the JOB



Compassion Fatigue

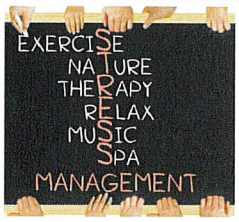
Vicarious Trauma & Burnout



The approach to taking action

Listening Actively
- To yourself
- To each other

Self Care



- Get the sleep you need
- Eat healthy
- Meditate
- Take in nature
- Check out a good book
- Say yes...and no
- Make time for friends
- Get to know yourself better
- Take a social media break

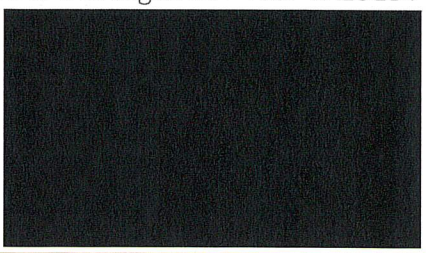
Support is Available

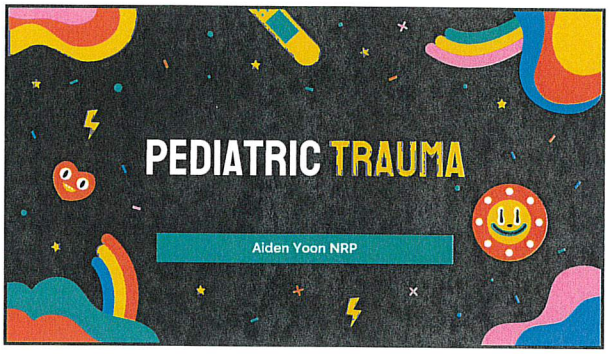
Resources at the table

- IAFF website
  - https://www.iaff.org/behavioral-health/
- OAPFF website
  - https://www.firefightermentalhealth.org/
- IAFC website
  - https://www.iafc.org/docs/default-source/1assoc/ichiefsmag_2020summer.pdf
  - https://www.iafc.org/docs/default-source/1vcos/ziv/11103_iafc-yellow-ribbon-report.pdf
- Ohio EMS
  - https://publicsafety.ohio.gov/what-we-do/our-programs-new/first-responder-wellness

Help is available at the fingertip!

Were in this together! Your VALUED!




PEDIATRIC TRAUMA
Aiden Yoon NRP


HANDTEVY
Pediatric Emergency Standards
HANDTEVY APP
ID : LucasC
Password : LucasC
If it does not ask for ID/password and it does not work, then contact myself and/or Brent

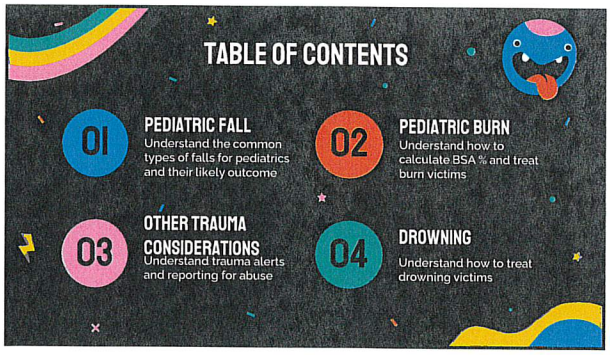


TABLE OF CONTENTS
01
PEDIATRIC FALL
Understand the common types of falls for pediatrics and their likely outcome
02
PEDIATRIC BURN
Understand how to calculate BSA % and treat burn victims
03
OTHER TRAUMA CONSIDERATIONS
Understand trauma alerts and reporting for abuse
04
DROWNING
Understand how to treat drowning victims

TRAUMA IS THE NUMBER 1 CAUSE OF DEATH AGE 1-18

01 PEDIATRIC FALLS

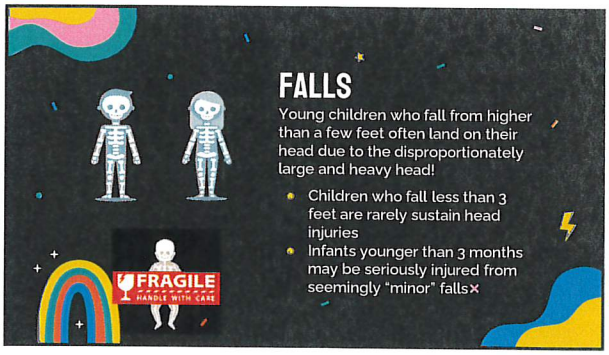
Tab 1100: Section H Pediatric Head Trauma

Tab 1100: Section G Pediatric Extremity Trauma

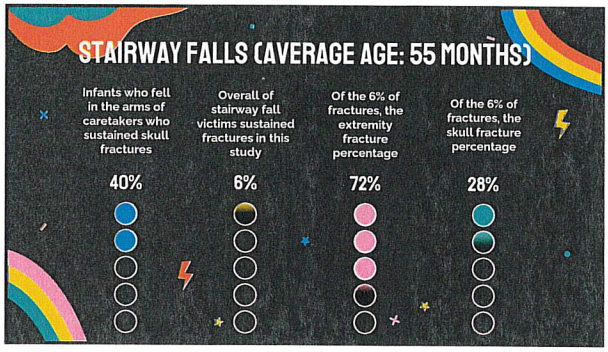
FALLS

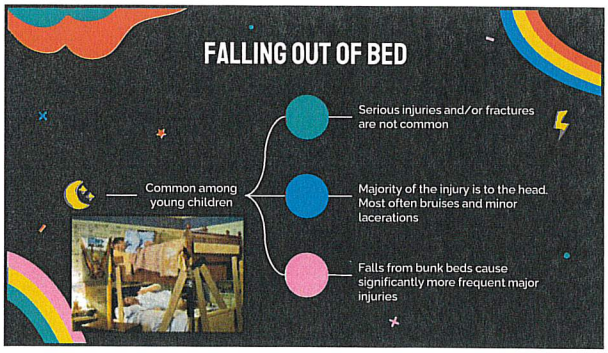
Young children who fall from higher than a few feet often land on their head due to the disproportionately large and heavy head!

- Children who fall less than 3 feet are rarely sustain head injuries
- Infants younger than 3 months may be seriously injured from seemingly "minor" falls×




COMMON LOCATIONS OF FALLS
STAIRS
BED
SHOPPING CART
BABY WALKER
FREE FALL


STAIRWAY FALLS (AVERAGE AGE: 55 MONTHS)
Infants who fell in the arms of caretakers who sustained skull fractures
40%
Overall of stairway fall victims sustained fractures in this study
6%
Of the 6% of fractures, the extremity fracture percentage
72%
Of the 6% of fractures, the skull fracture percentage
28%


FALLING OUT OF BED
Common among young children
Serious injuries and/or fractures are not common
Majority of the injury is to the head. Most often bruises and minor lacerations
Falls from bunk beds cause significantly more frequent major injuries

INJURIES RELATED TO SHOPPING CARTS AND BABY-WALKERS

FALL FROM CART

- Most patients had injuries to their head
- 18% of the time leads into fractures
- These falls from shopping carts onto a hard non-energy-absorbing surface did not cause serious head injuries

BABY-WALKER

- Extremity injuries are uncommon in baby-walker related falls
- Most patients had injuries to the head
- Significant injuries usually occur when patients fall down stairs with walkers

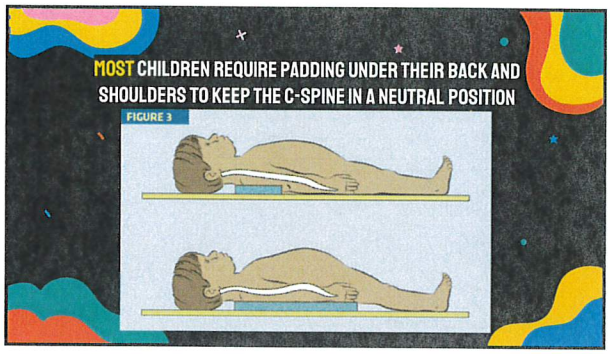
FREE FALL

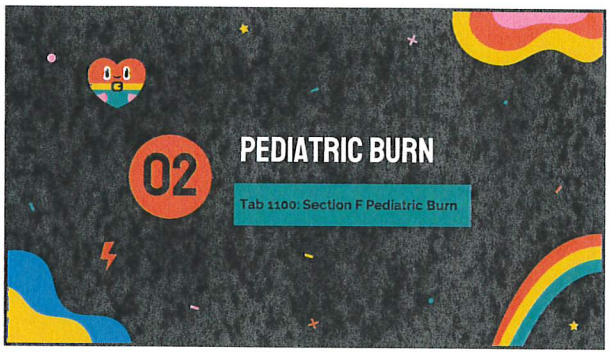
- Routine household falls cause little or insignificant injury
- Children who were observed to fall by caretakers sustained much less severe injury compared to the group who fell from a claimed "shorter height" and who were not observed by caretaker.
  - People are bad at guessing height of fall when they did not observe
- Young children do not typically sustain severe or life-threatening injuries in falls from furniture in homes

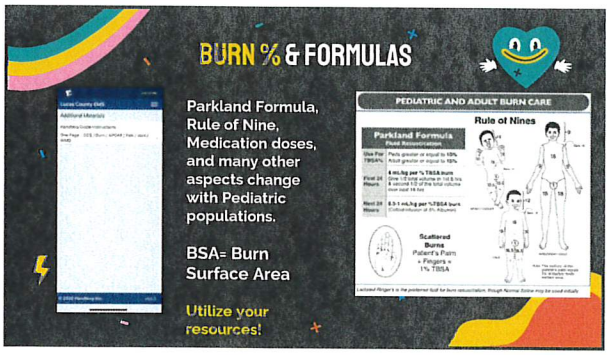
SPINAL MOTION RESTRICTION!

- Potential for spinal injury?
- Altered mental status?
- Spinal tenderness, and/or deformity?
- Neurologic deficit and/or complaints?

Tab 500 : II Spinal Motion Restriction


MOST CHILDREN REQUIRE PADDING UNDER THEIR BACK AND SHOULDERS TO KEEP THE C-SPINE IN A NEUTRAL POSITION
FIGURE 3


02
PEDIATRIC BURN
Tab 1100: Section F Pediatric Burn


BURN % & FORMULAS
Parkland Formula, Rule of Nine, Medication doses, and many other aspects change with Pediatric populations.
BSA= Burn Surface Area
Utilize your resources!
PEDIATRIC AND ADULT BURN CARE
Rule of Nines
Parkland Formula
Fluid Resuscitation

CRITICAL BURNS (TO BURN CENTER / ST VINCENT)

CRITERIA

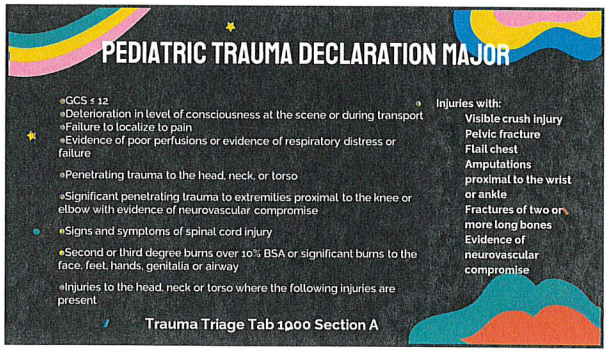
- More than 20% BSA (more than 10 years old)
- More than 10% BSA (less than 10 years old)
- 3rd degree burns less than 5% BSA
- 2nd and 3rd degree burns to face, eyes, hands, and feet
- Electrical burns
- Respiratory burns
- Deep chemical burns
- Burns with extremes of age or chronic disease
- Burns associated with major traumatic injury

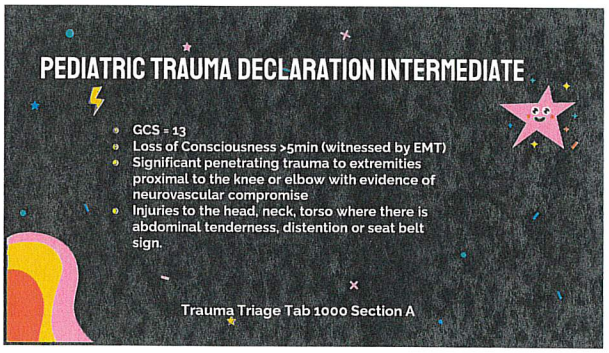
PEDIATRIC BURNS PROTOCOL SPECIAL CONSIDERATIONS

- Do not overlook the possibility of multiple system trauma
- Do not overlook the possibility for child abuse with children sustaining burns
- Never apply ice or cool burns that involve more than 10% of BSA. Burn patients are prone to hypothermia
- Circumferential burns to extremities are dangerous due to potential vascular compromise secondary to soft tissue swelling
- Consider CO poisoning. Treat with 100% oxygen by mask
- With airway involvement, consider transport to the closest hospital for optimal airway management

03 OTHER TRAUMA CONSIDERATIONS

Tab 1100: K Pediatric Multiple Trauma


PEDIATRIC TRAUMA DECLARATION MAJOR
GCS ≤ 12
Deterioration in level of consciousness at the scene or during transport
Failure to localize to pain
Evidence of poor perfusions or evidence of respiratory distress or failure
Penetrating trauma to the head, neck, or torso
Significant penetrating trauma to extremities proximal to the knee or elbow with evidence of neurovascular compromise
Signs and symptoms of spinal cord injury
Second or third degree burns over 10% BSA or significant burns to the face, feet, hands, genitalia or airway
Injuries to the head, neck or torso where the following injuries are present
Injuries with:
Visible crush injury
Pelvic fracture
Flail chest
Amputations proximal to the wrist or ankle
Fractures of two or more long bones
Evidence of neurovascular compromise
Trauma Triage Tab 1000 Section A


PEDIATRIC TRAUMA DECLARATION INTERMEDIATE
GCS = 13
Loss of Consciousness >5min (witnessed by EMT)
Significant penetrating trauma to extremities proximal to the knee or elbow with evidence of neurovascular compromise
Injuries to the head, neck, torso where there is abdominal tenderness, distention or seat belt sign.
Trauma Triage Tab 1000 Section A


PEDIATRIC TRAUMA DECLARATION TRANSPORT
MAJOR
Transport to:
Toledo Hospital
St Vincent's Hospital
INTERMEDIATE
Transport to:
Toledo Hospital
St Vincent's Hospital
St Charles
UTMC

IMMOBILIZATION WITH CAR SEAT

LUCAS COUNTY CHILDREN SERVICES

Call 419-213-CARE (2273) to report abuse or neglect.

LUCAS COUNTY CHILDREN SERVICES

www.lucaskids.net
705 Adams St, Toledo, OH 43604

REPORTS CAN BE MADE 24 HOURS A DAY, 7 DAYS A WEEK

WOOD COUNTY

WOOD COUNTY JOB AND FAMILY SERVICES 419- 354-6999

CHILD ABUSE HOTLINE 1-866-860-4136

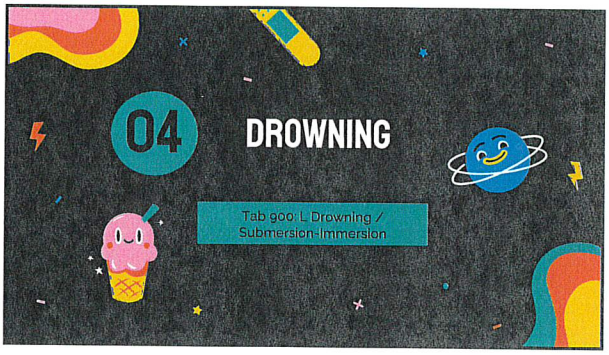
1928 E. GYPSY LANE ROAD, BOWLING GREEN, OHIO

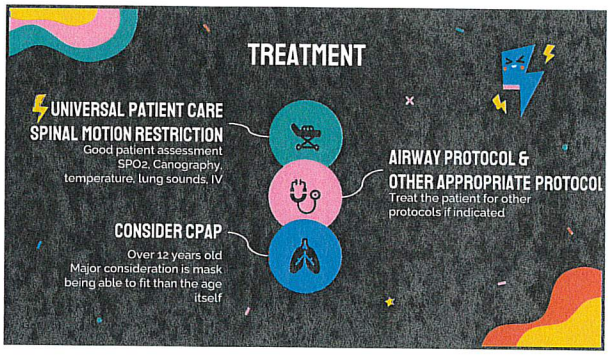
AFTER HOURS AND/OR WEEKENDS YOU CAN CONTACT WOOD COUNTY SHERIFF'S DEPARTMENT 419-354-9001 FOR THE ON CALL WORKER

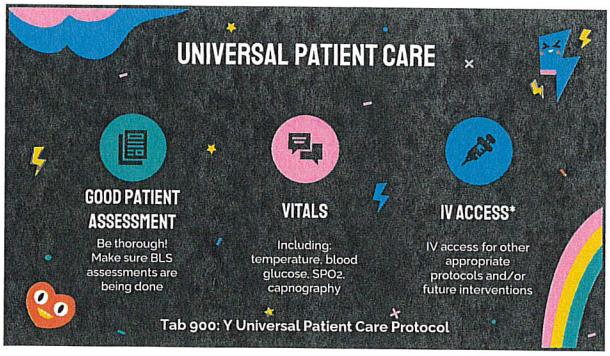

WHAT INFORMATION DO YOU NEED TO PROVIDE?
You may choose to be anonymous
Your name and contact information. It will be documented that you met your legal obligation to report suspected child abuse or neglect
Name, address, age of the child; Parent's information
Nature and extent of abuse and/or neglect
Actions taken by you and/or other professionals


WHAT IF I DON'T MAKE A REPORT?
LAW
In Ohio, failure to report by a mandated reporter is a misdemeanor of the first degree
FINE
$1,000
JAIL
May result in 6 months jail term
PERSONAL
May result in job or certification loss


MYTHS OF REPORTING
ANONYMITY
Child protective services cannot disclose your name. You can be called to court to testify
CUSTODY
Children are not always taken away from a home due to a report.
PROOF
Only reasonable suspicion is required to make a report
REPERCUSSION
All states have laws protecting people acting in "good faith."


04
DROWNING
Tab 900: L Drowning / Submersion-Immersion


TREATMENT
UNIVERSAL PATIENT CARE
SPINAL MOTION RESTRICTION
Good patient assessment SPO2, Canography, temperature, lung sounds, IV
CONSIDER CPAP
Over 12 years old
Major consideration is mask being able to fit than the age itself
AIRWAY PROTOCOL & OTHER APPROPRIATE PROTOCOL
Treat the patient for other protocols if indicated


UNIVERSAL PATIENT CARE
GOOD PATIENT ASSESSMENT
Be thorough! Make sure BLS assessments are being done
VITALS
Including: temperature, blood glucose, SPO2, capnography
IV ACCESS*
IV access for other appropriate protocols and/or future interventions
Tab 900: Y Universal Patient Care Protocol

TREAT FOR HYPOTHERMIA

REMOVE PATIENT FROM ENVIRONMENT

Move the patient somewhere warm (ambulance)
Remove patient from the environment

PROTECT AGAINST HEAT LOSS

Remove wet clothing
Cover patient with blanket

AVOID ROUGH MOVEMENT

Rough handling of the patient may precipitate arrhythmias

PEDIATRIC AIRWAY TAB IIOO SECTION A

BVM

If adequate oxygenation and ventilation is obtained with BVM, it is acceptable to defer intubation until transfer of patient at hospital

INTUBATION

Consider head blocks/ CID to maintain ETT placement for all intubated patients

CRICOTHYROTOMY

Needle/ surgical cricothyrotomy is only to be considered for a complete airway obstruction with no other means for patient ventilation

ATTEMPT

Limit intubation attempts to 3 per patient

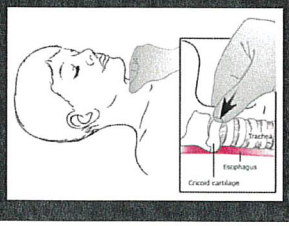
SPO2

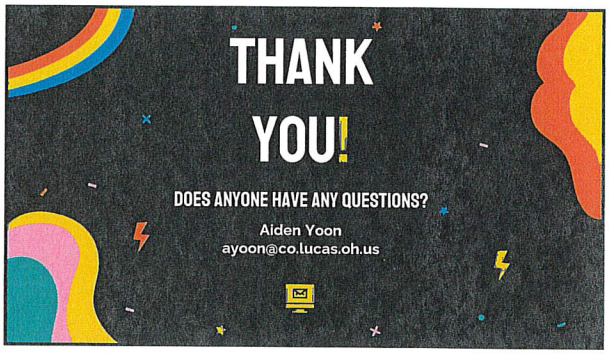
Continuous pulse oximetry should be utilized in all patients with inadequate respiratory function

SEDATION

Any post-intubation (advanced airway) sedation for pediatric patients must be authorized by On-Line Medical Control

SELLICK'S MANEUVER
CRICOID PRESSURE





REFERENCES

Joffe M, Ludwig S. Stairway injuries in children . Pediatrics 1998;82:457-461.

Lyons TJ, Oates RK. Falling out of bed: A relatively benign occurrence . Pediatrics 1993;92:125-127.

Pitone ML, Attia MW. Patterns of injury associated with routine childhood falls. Pediatric Emergency Care 2006; 22:470-4.

Smith GA, et al. Babywalker-related injuries continue despite warning labels and public education . Pediatrics 1997;100(2) electronic

Smith GA, et al. Injuries to children related to shopping carts . Pediatrics 1996;97:161-165.

Williams RA. Injuries in infants and small children resulting from witnessed and corroborated free falls . J Trauma 1991;31:1350-1352.

Oxygenation/ Ventilation CE

Aiden Yoon NRP

Objectives

01
Proper Sizing
Proper sizing of ET tube and iGel

02
ETCO2
Understanding capnography waveform

03
Troubleshooting
Understanding how to fix issues ETCO2 notifies providers

04
CPAP
Proper usage and indication for CPAP usage

05
Case Review
Understand QA/QI process and how to improve based on common issues that occur in the county.

Sizing Endotracheal Tube and/or iGel

Weight

iGel has predefined weight range! People on the border gets a size up. Most adults should get size 8 ETT. Go down when needed.

Age

Handtevy

When you do not have an accurate weight or uncertain, especially for pediatrics, utilize Handtevy for ideal/approximate weight.

Trial and Error

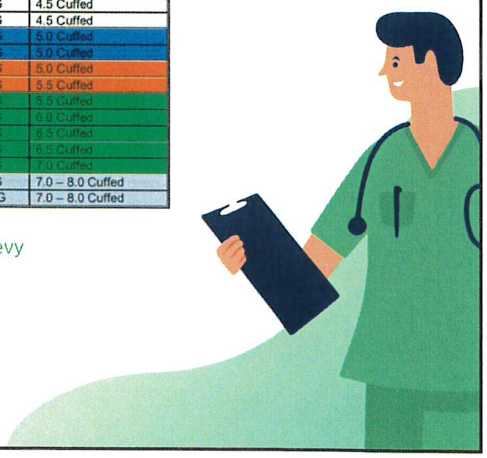
Things happen. Due to certain unique circumstances, you might have to change tube sizes or equipment.

Tube Size

Tube size (ID)	Age/weight
3 mm	Term >3 kg up to <8 months
3.5 mm	8 months to <2 years
4 mm	2 to <4 years
4.5 mm	4 to <6 years
5 mm	6 to <8 years
5.5 mm	8 to <10 years
6 mm	10 to <12 years
6.5 mm	12 to <14 years
7 mm	14 to <16 years

Age	Ideal Weight	ET Tube Size
Premie	2 KG	2.5 – 3.0 Cuffed
Newborn	4 KG	3.0 Cuffed
4 MO	6 KG	3.5 Cuffed
6 MO	8 KG	3.5 Cuffed
1 YR	10 KG	4.0 Cuffed
2 YR	12 KG	4.0 Cuffed
3 YR	15 KG	4.5 Cuffed
4 YR	17 KG	4.5 Cuffed
5 YR	20 KG	5.0 Cuffed
6 YR	22 KG	5.0 Cuffed
7 YR	25 KG	5.0 Cuffed
8 YR	27 KG	5.5 Cuffed
9 YR	30 KG	5.5 Cuffed
10 YR	35 KG	6.0 Cuffed
11 YR	40 KG	6.5 Cuffed
12 YR	50 KG	6.5 Cuffed
13 YR	60 KG	7.0 Cuffed
ADULT	75 KG	7.0 – 8.0 Cuffed
ADULT	100 KG	7.0 – 8.0 Cuffed

- National Hospital for Neurology and Royal London Hospital (2011). *Core Topics in Airway Management*. Cambridge University Press
- Handtevy



Capnographic Waveform Components

01 Respiratory Baseline

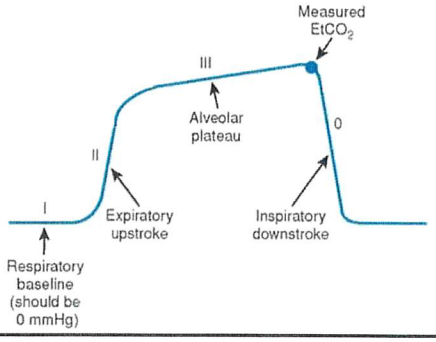
Inhalation
Usually zero

02 Expiratory Upstroke

The beginning of exhalation. CO2 begins to travel from the alveoli through the anatomical dead space of the airway.

03 Alveolar Plateau

When the sensor is receiving the CO2-rich gas that was in the alveoli



04 Measured $ETCO_2$

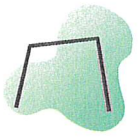
The peak measurement at the very end of phase 3

05 Inspiratory Downstroke

The patient inhales again, bringing clear air past the sensor, dropping the graph back down to zero to start over

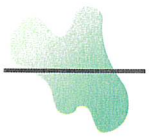
Waveforms

Normal



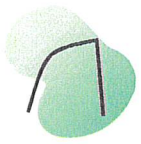
Normal waveform. What you expect to see from most of your patients.

Apnea



Apnea: not breathing

Slightly Obstructive

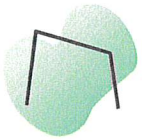


In between normal and obstructive waveform

Obstructive

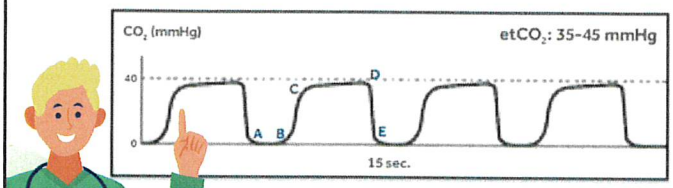
"Shark Fin" waveform

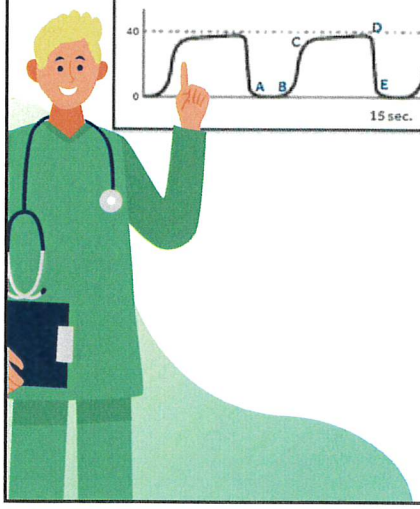
Downward sloping plateau



Plateau is sloping in a direction different than normal waveform

Normal Waveform



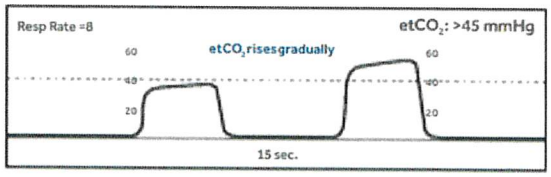


- Similarly to a sinus cardiac rhythm, the rate can be fast, slow, or change throughout your interaction.
- Even during cardiac arrest, this is the waveform we would like to see
  - During cardiac arrest, our relative values of ETCO2 is a little different than other reference materials.

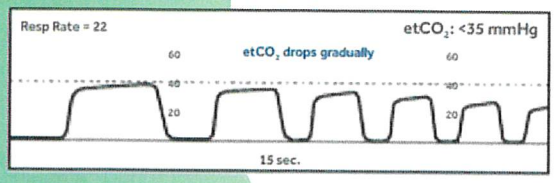
Increase in $ETCO_2$

Possible Causes

- Hypoventilation
- Decrease intidal volume
- Increase in metabolic rate
- Rapid rise in body temperature
- ROSC



Decrease in $ETCO_2$



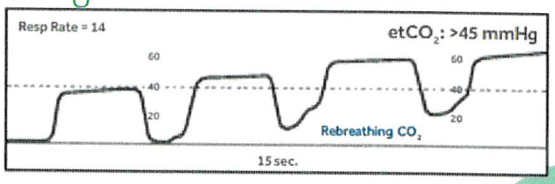
Possible Causes

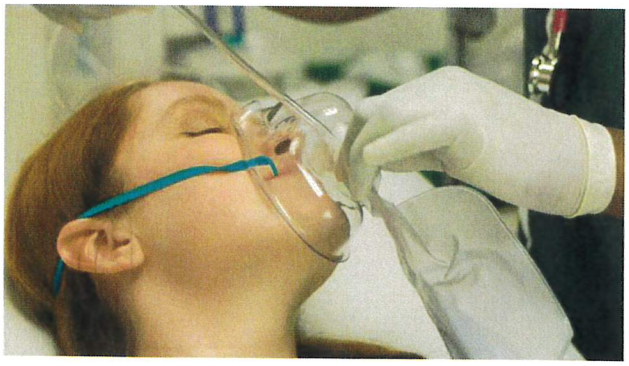
- Hyperventilation
- Increase intidal volume
- Metabolic acidosis
- Fall in body temperature

Climbing

Possible Causes

- Rebreathing
- Inadequate inspiratory flow
- Insufficient expiratory time

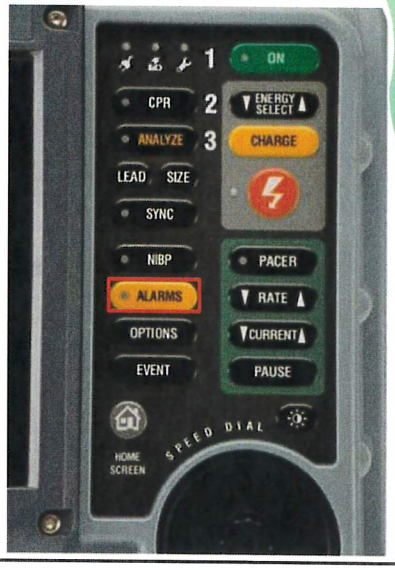




Apnea

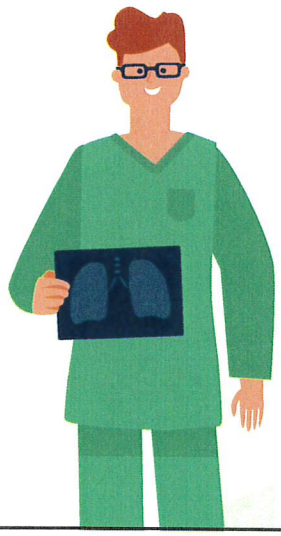
"Press the *silence* button."

- **Critical event needing emergency intervention**
- **Airway disconnected, dislodged, kinked, or obstructed**



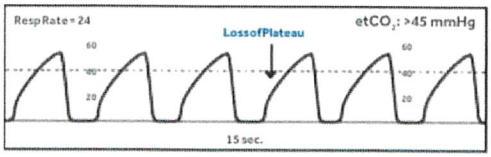
Capnography Tab 500 Section F

Troubleshooting Guide



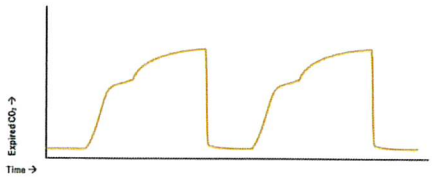
Observation	Possible Cause	Corrective Action
ALARM/APNEA message appears.	No breath has been detected for 30 seconds since last valid breath	First check the patient, then ventilation equipment (if used) for leaks or disconnected tubing
CO^2 FILTERLINE OFF message appears	FilterLine, or any other CO^2 accessories disconnected or not securely connected to the LIFEPAK $EtCO^2$	Connect FilterLine, or any other CO^2 accessories, to input connector or tighten connection.
CO^2 FILTERLINE BLOCKAGE message appears	FilterLine is twisted or clogged. The message appears after 30 seconds of unsuccessful purging. Airway Adapter clogged	Check the FilterLine and if necessary replace it. Check the Airway Adapter and if necessary, replace it.
CO^2 FILTERLINE PURGING message appears	FilterLine tube twisted or clogged with water, or rapid altitude change occurred.	Check the FilterLine and if necessary, untwist or reconnect it.
Et CO^2 values are erratic.	A leak in the tubing. A mechanically ventilated patient breathes spontaneously.	Check for connection leaks and line leaks to patient and correct if necessary. No action required
Et CO^2 values are consistently high or lower than expected.	Physiological cause. Ventilator malfunction. Improper calibration.	Check patient. Check ventilator and patient. Contact qualified service.
XXX appears in place of Et CO^2 value	CO^2 module not calibrated successfully. CO^2 module failed.	Contact qualified service personnel. Contact qualified service personnel

Obstructive Waveform

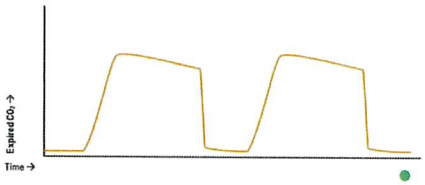


Possible Causes

- Bronchospasm/Asthma
- COPD
- Foreign body in the upper airway
- Partially kinked or occluded artificial airway
- Obstruction in the airway circuit



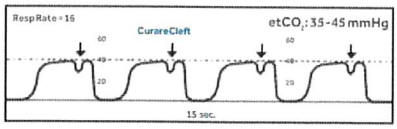
Reversal or Downward of Alveolar Slope



Possible Causes

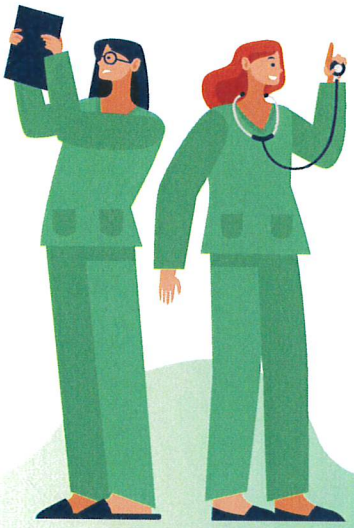
- Emphysema
- Poor gas exchange
- Pneumothorax with massive air leak

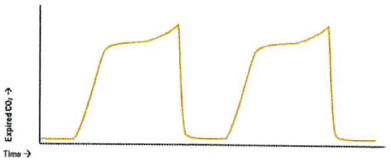
Curare Cleft and "Pigtail"



Possible Causes for Cleft

- Breathing against ventilation
- Not enough paralytics
- ROSC





High peak of the alveolar phase in poorly compliant lungs

Possible Causes for "pigtail"

- Poorly compliant lung
- Large pregnant belly
- Patients with excess adipose tissue in chest and/or torso

CPAP Tab 500 Section H

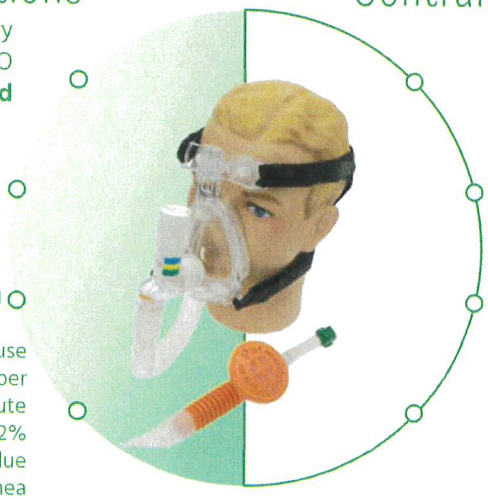
Indications

Dyspnea/ Hypoxemia secondary to CHF, COPD, submersion, CO poisoning **and**

- Awake and oriented
- Over 12 years old
- Able to fit the CPAP mask
- Ability to maintain an open airway
- Has a systolic BP above 90 mmHg

At least two or more of the following

- Retractions or accessory muscle use
- Respiratory rate greater than 24 per minute
- Pulse oximetry less than 92%
- Inability to speak in full sentences due to dyspnea



Contraindications

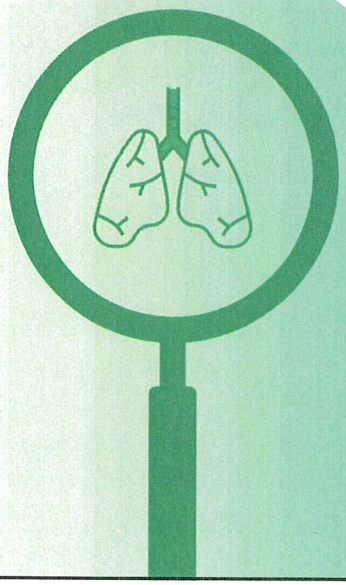
- Systolic BP <90
- Severely depressed LOC
- Respiratory arrest
- Cardiac arrest
- Agonal respirations
- Unconsciousness
- Shock associated with cardiac insufficiency
- Penetrating chest trauma
- Persistent nausea and/or vomiting
- Facial anomalies/ stroke obtundation/ facial trauma
- Pneumothorax
- Active upper GI bleed or history of recent gastric surgery

CPAP

Recommended CPAP Pressure Valve Settings:

Patient Condition	Initial Valve Setting	No Improvement / Patient tolerating mask
CHF / Pulmonary Edema	**10.0cm**	**10.0cm**
COPD / Asthma / Pneumonia	**5.0cm**	**7.5cm**
Submersion / Near-Drowning	**5.0cm**	**7.5cm**
CO Poisoning	**5.0cm**	**7.5cm**

CPAP provides over 50-60 lpm of O2



Good Assessment

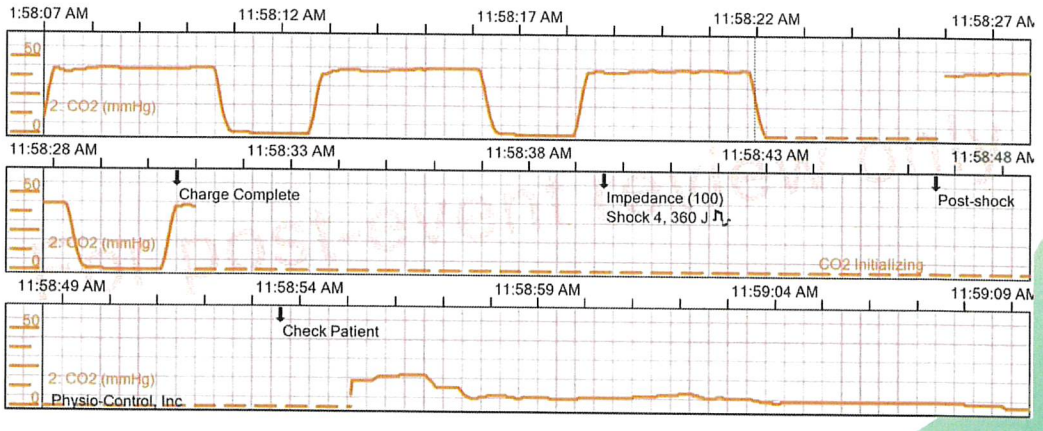
- Lung sounds
  - Multiple times!
- Continuous monitoring of vitals
- 12 lead ECG

01

Case Study

Cardiac Arrest

Case 1

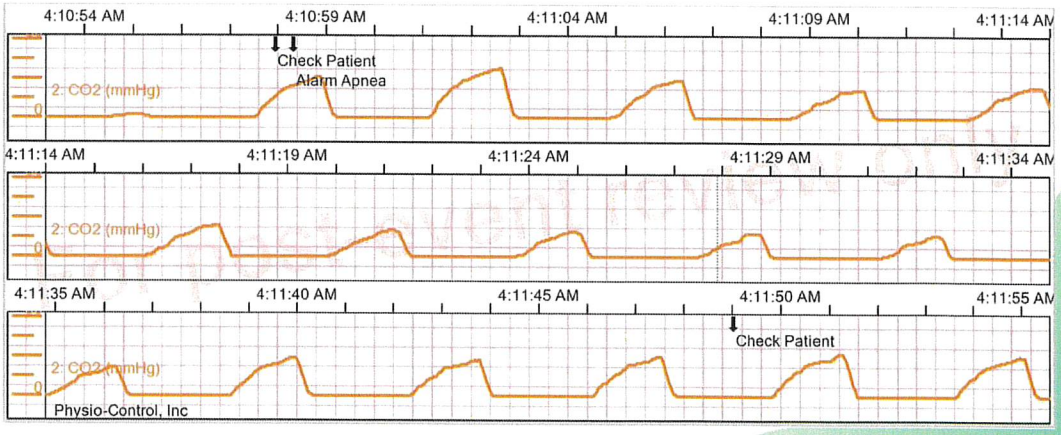


02

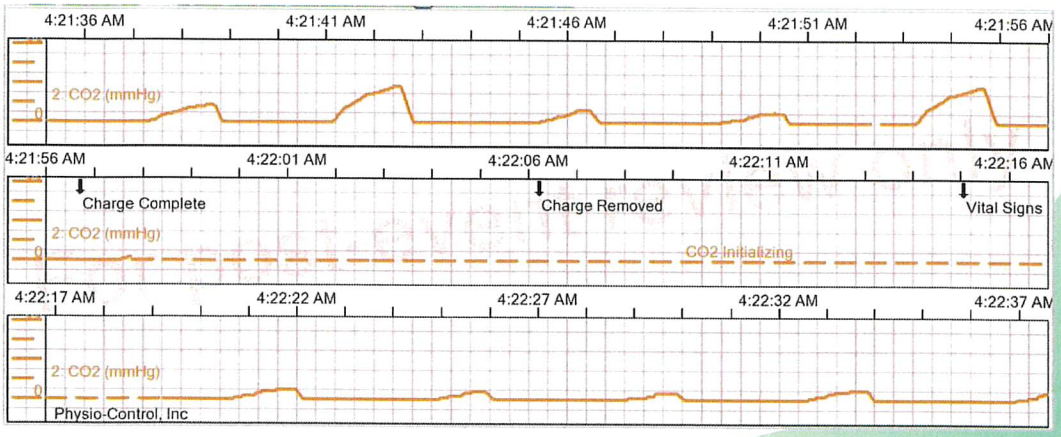
Case Study

Respiratory

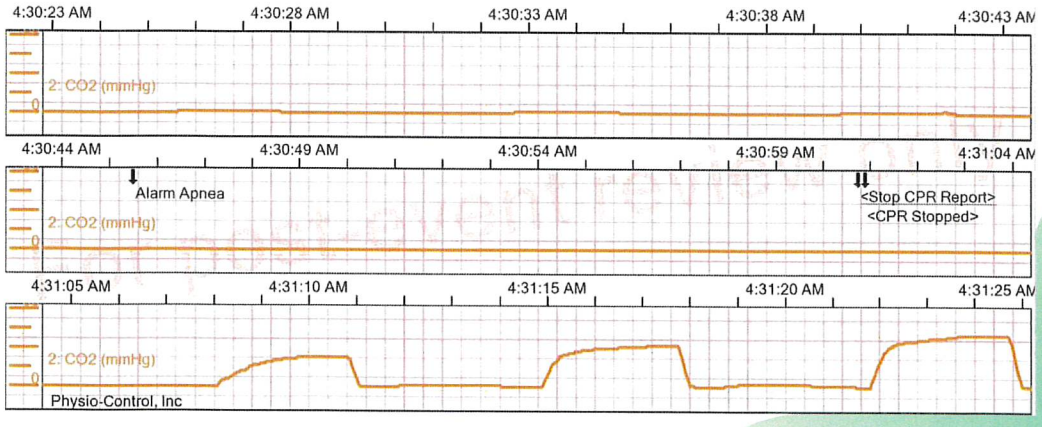
Case 2-1



Case 2-2



Case 2-3

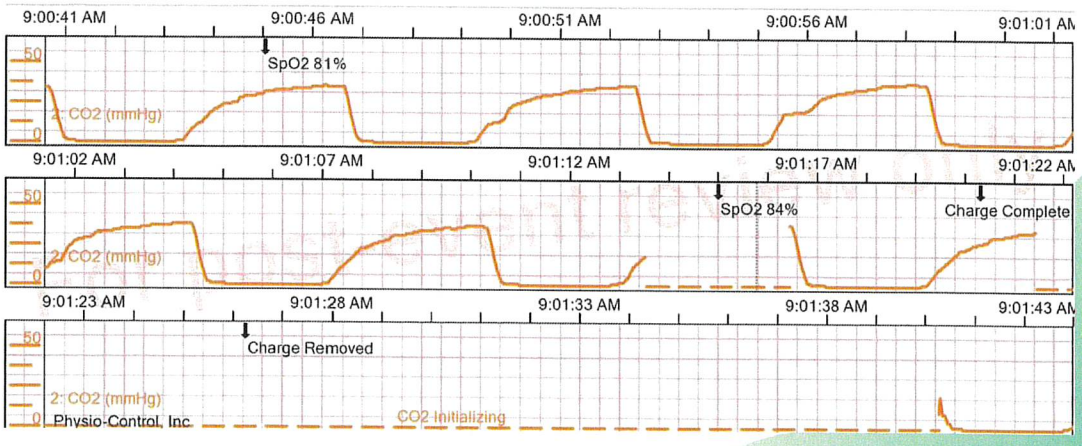


03

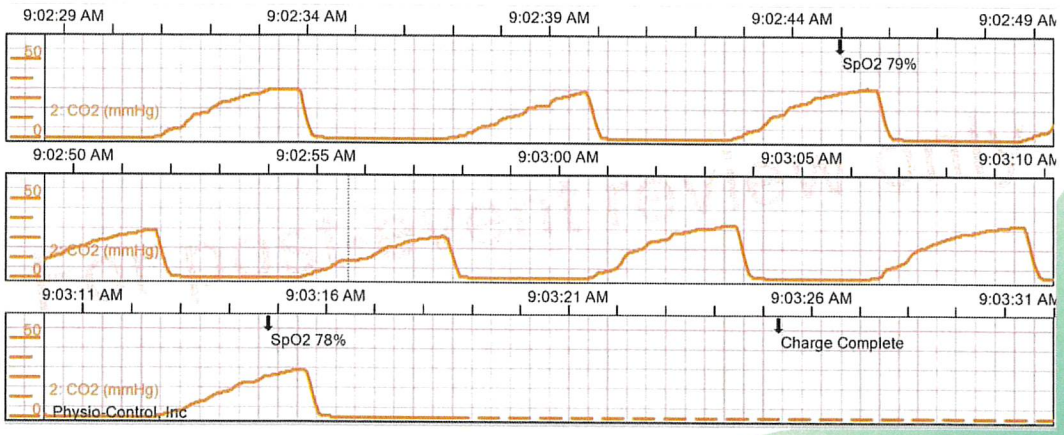
Case Study

Cardiac arrest

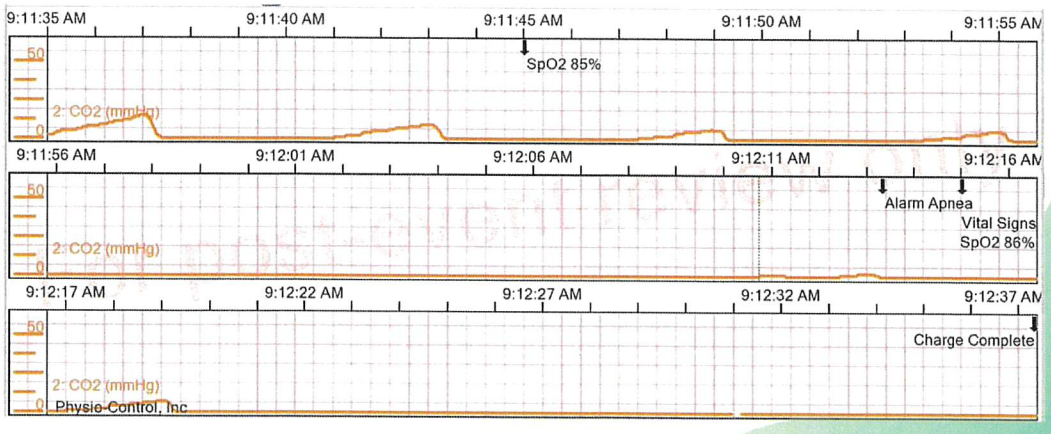
Case 3-1



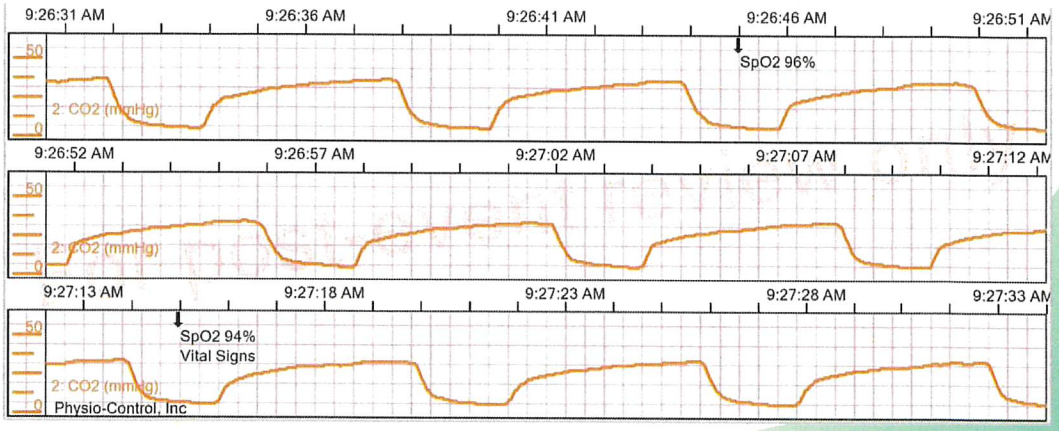
Case 3-2



Case 3-3



Case 3-4



Conclusions

Often times the issues are simple fixes. We have to continuously monitor the patient's ETCO2. Try to keep the monitor lead view with capnography and maintain airway monitoring. With any movement, including defibrillation, the airway should be checked!


Thanks
Do you have any questions?
ayoon@co.lucas.oh.us