Northwest Community EMSS
Continuing Education

Seizures, Submersion & Special Needs

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National EMS Education standard:
Epidemiology, pathophysiology, psychosocial impact, presentations, prognosis, and management of (complex depth, comprehensive breadth) patients who are involved in pts with a seizure, a submersion incident or those pts with special needs including high tech individuals.

Assigned readings:
This handout; NWC EMSS SOPs

Goal: Upon completion of the class, each participant will independently do the following with a degree of accuracy that meets or exceeds the standards established for their scope of practice:

OBJECTIVES:

1. Assess and manage CSHCN and technology dependent children based on the SOPs.
2. Appreciate the challenges faced by families of CSHCN and technology-dependent children and defend the need for consistent compassionate, competent EMS care.
3. Recognize the patient with a VP shunt and understand the special considerations of caring for that individual.
4. Appreciate the most knowledgeable individual of a pt with a VP shunt is their primary caregiver and utilize the knowledge they have to offer in the time of acute need.
5. Recognize the patient with an LVAD and understand the special considerations of caring for that individual.
6. Anticipate the need for instruction from the LVAD coordinator and quickly obtain the necessary information in order to contact them.
7. Recognize the pt with a life vest in place& understand special consideration of caring for that individual.
8. Appreciate the need for the patient with a life vest to never be without it attached to their person; unless immediately attached to a defibrillator.
9. Anticipate accommodations that may be needed in order to properly manage the patient with a developmental disability.
10. Explain the purpose, indications, typical parts, types of tubes, elements to assess, and methods of troubleshooting a tracheostomy.
11. Describe the EMS management of a child with a trach who presents in respiratory distress or with one of the common complications related to tracheostomies.
12. Sequence the events that lead to drowning.
13. Differentiate a dry from a wet near drowning.
14. Discuss the incidence of "wet" versus "dry" drowning and the differences in their management.
15. Identify the unique aspects of cold water immersion.
16. Discuss the complications and protective role of hypothermia in the context of near-drowning.
17. Correlate the abnormal findings in assessment with the clinical significance in the patient with near-drowning.
18. Identify the body systems that incur dysfunction/insult with drowning.
19. Differentiate among the various treatments and interventions in the management of near-drowning.
20. Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a treatment plan for the near-drowning patient.
21. List the factors affecting survival and predicting a good vs. unfavorable outcome.
22. Integrate pathophysiological principles and assessment findings to formulate a field impression and implement a management plan for the patient who has had a diving accident.
23. Differentiate among the various treatments and interventions for the management of diving accidents.
24. Describe the specific function and benefit of hyperbaric oxygen therapy for the management of diving accidents.

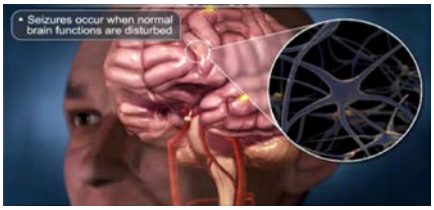
NWC EMSS CE

Seizures, Submersion and Special Needs

Seizures

Introduction

Nearly 3M people (1% of the pop) in the US have some form of epilepsy. Nearly 4% of Americans (1 in 26) will develop epilepsy at some point in their lives. Epilepsy is the 4th most common neurological disorder in the US after Alzheimer's disease, stroke & migraine. It is greater in prevalence than cerebral palsy, multiple sclerosis and Parkinson's disease combined. Each year there is an estimated 150,000 new cases. The age of onset can occur at anytime from infancy to older age; however it depends on the underlying etiology of the seizure disorder. The majority of people will experience their first seizure before age 20 and 30% of all people with seizures will develop them before age 5. The underlying etiology may include but not limited to infection, metabolic disorders, medications, genetics and hypoxia.



Definitions:

Seizures and epilepsy are not the same.

Seizure: The official definition of a seizure is "a transient occurrence of signs and/or symptoms due to an abnormal excessive or synchronous neuronal activity in the brain."

This means that during a seizure, large numbers of brain cells are activated abnormally at the same time. It is like an "electrical storm" in the brain. The nature of the seizures depends on many factors, such as the person's age, the sleep-wake cycle, prior injuries to the brain, genetic tendencies, medications, which circuits in the brain are involved, and many others.

Epilepsy: Disease characterized by an enduring predisposition to generate epileptic seizures and by the neurobiological, cognitive, psychological, and social consequences of this condition. Translation: a seizure is an event and epilepsy is the disease involving recurrent unprovoked seizures. An epileptic seizure is a transient occurrence of signs and/or symptoms due to abnormal excessive or synchronous neuronal activity in the brain.

Etiology:

70% of cases have no known cause. Of the other 30%, the following conditions/etiologies may cause instability or irritability of the brain and possibly lead to seizures:

Newborns and infancy

a. Genetic metabolic defects
b. Developmental brain defects
c. Perinatal injuries
d. Severe hypoxia
e. Metabolic disorders; hypoglycemia, hypocalcemia, vitamin B6 deficiency

Childhood

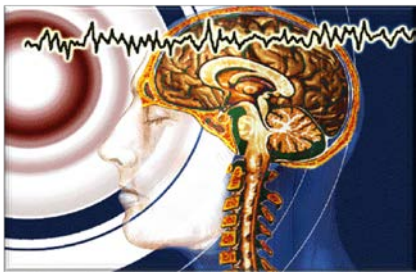
a. Brain infections: Meningitis, encephalitis, brain abscess. First seizure may occur during acute stage of illness or later due to residual damage to some brain cells.
b. Less common causes: Tumors, toxins, vascular disease, degenerative disease, and trauma; febrile (under the age of 4)
c. Other infectious diseases: mumps, measles, diphtheria and others

Young adults

a. Head trauma
b. Tumor if first seizure over the age of 20 (40% of patients with brain tumors experience seizures)
c. Toxins, including alcohol (5000 hospitalized each yr) and drug withdrawal (lead, mercury poisoning)
d. Infectious diseases: lupus erythematosus
e. Eclampsia

Older adults

a. Stroke (Brain attack)
b. Head trauma (recent or past)
c. Hypoxia
d. Hypoglycemia and other metabolic abnormalities (Ca, K, or manganese)
e. Brain tumors; primary or metastatic
f. Vascular disorders
g. Idiopathic epilepsy (the most common cause of seizures)
h. Degenerative neurological disease, Alzheimer's
i. Brain abscesses
j. Abrupt withdrawal of anticonvulsants or chronically used sedatives



Heredity really plays a minor role in most case of seizures. All persons inherit varying degrees of susceptibility to having a seizure(s). Inheritance plays a greater factor when no other specific cause can be identified. There are variables that can lower a seizure threshold such as:

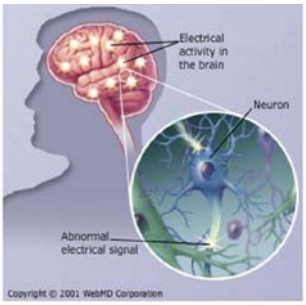
1. Sleep deprivation
2. Diet (poor)
3. Stress
4. Interaction of medication
5. Psychotropic phenothiazines
6. Mental illness
7. Drugs: theophylline, stimulants such as PCP, cocaine, LSD, amphetamines & their derivatives

The Basic Classification System

The basic classification is a simple version of the major categories of seizures. The new basic seizure classification is based on 3 key features.

- Where seizures begin in the brain
- Level of awareness during a seizure
- Other features of seizures

Defining where seizures Begin



The first step is to separate seizures by how they begin in the brain. The type of seizure onset is important because it affects choice of seizure medication, possibilities for epilepsy surgery, outlook, and possible causes.

Focal seizures: Previously called *partial seizures*, these start in an area or network of cells on one side of the brain.

Generalized seizures: Previously *called primary generalized,* these engage or involve networks on both sides of the brain at the onset.

Unknown onset: If the onset of a seizure is not known, the seizure falls into the unknown onset category. Later on, the seizures type can be changed if the beginning of a person's seizures becomes clear.

Focal to bilateral seizure: A seizure that starts in one side or part of the brain and spreads to both sides has been called a secondary generalized seizure. Since the term generalized refers only to the start of a seizure. the new term for secondary generalized seizure would be a *focal to bilateral seizure*.

Describing Awareness

Whether a person is aware during a seizure is of practical importance because it is one of the main factors affecting a person's safety during a seizure. Awareness is used instead of consciousness, because it is simpler to evaluate.

Focal aware: If awareness remains intact, even if the person is unable to talk or respond during a seizure, the seizure would be called a focal aware seizure. This replaces the term simple partial.

Focal impaired awareness: If awareness is impaired or affected at any time during a seizure, even if a person has a vague idea of what happened, the seizure would be called focal impaired awareness. This replaces the term complex partial seizure.

Awareness unknown: Sometimes it's not possible to know if a person is aware or not, for example if a person lives alone or has seizures only at night. In this situation, the awareness term may not be used or it would be described as awareness unknown.

Generalized seizures: These are all presumed to affect a person's awareness or consciousness in some way. Thus no special terms are needed to describe awareness in generalized seizures.

Describing Motor and Other Symptoms in Focal Seizures

Many other symptoms may occur during a seizure. In this basic system, seizure behaviors are separated into groups that involve movement.

Focal motor seizure: This means that some type of movement occurs during the event. For example twitching, jerking, or stiffening movements of a body part or automatisms (automatic movements such as licking lips, rubbing hands, walking, or running).

Focal non-motor seizure: This type of seizure has other symptoms that occur first, such as changes in sensation, emotions, thinking, or experiences.

It is also possible for a focal aware or impaired awareness seizure to be sub-classified as motor or non-motor onset.

Auras: The term aura to describe symptoms a person may feel in the beginning of a seizure is not in the new classification. Yet people may continue to use this term. It's important to know that in most cases, these early symptoms may be the start of a seizure.

Prodrome: prior to having a seizure, the pt may become increasingly irritable and ill at ease hours or even days before the seizure. Not well understood, but is distinct from an aura.

Describing Generalized Onset of Seizures

Seizures that start in both sides of the brain, called generalized onset, can be motor or non-motor.

Generalized motor seizure:

The generalized tonic-clonic seizure term is still used to describe seizures with stiffening (tonic) and jerking (clonic). This loosely corresponds to "grand mal." Other forms of generalized motor seizures may happen. Many of these terms have not changed and a few new terms have been added.

Generalized non-motor seizure: These are primarily absence seizures and the term corresponds to the old term "petit mal." These seizures involve brief changes in awareness, staring, and some may have automatic or repeated movements like lipsmacking.

Reference: Fisher RS, The 2017 ILAE Seizure Classification. Presented at the American Epilepsy Society Annual Meeting, December 2016.

Authored by: Patricia O. Shafer RN, MN | Joseph I. Sirven, MD on 12/2016

Long Term Treatment for Patients with Seizures

Modern methods can achieve full or partial control of seizures in about 75 percent of cases. In many cases, however, seizures are highly resistant to current therapies.

Medication—the major form of treatment is long-term antiepileptic drug therapy. Over 20 antiepileptic drugs are currently in use. While multiple-drug therapy is sometimes necessary, single-drug therapy is more common.

Surgery—when medication has failed, surgery may be an option. The most common form takes place when the tissue causing seizures is confined to a small area of the brain that can be safely removed without damaging personality or function.

Ketogenic Diet—this doctor-prescribed, high-fat, low-carbohydrate, and reduced-calorie diet may succeed in some childhood cases when standard treatment fails.

Vagus Nerve Stimulator—this implanted device periodically stimulates the brain through the vagus nerve and can reduce seizures in some patients.

EMS Standards and Practice

Obtain history while initiating treatment…

History/frequency/type of seizures

- Prescribed meds and patient compliance; amount and time of last dose
- Recent or past head trauma; fall, predisposing illness/disease; recent fever, headache, or stiff neck
- H/o ingestion/drug or ETOH abuse; time last used

Consider possible etiologies:

- Anoxia/hypoxia
- Anticonvulsant withdrawal/noncompliance
- Cerebral palsy or other disabilities
- Infection (fever, meningitis)
- Eclampsia
- Metabolic (glucose, electrolytes, acidosis)
- Stroke/cerebral hemorrhage
- Toxins/intoxication; OD; DTs
- Trauma/child abuse
- Tumor

IMC: special considerations:

1. No bite block. vomiting/aspiration precautions; suction prn
2. Protect patient from injury; do not restrain during tonic/clonic movements
3. Position on side during postictal phase unless contraindicated

If generalized tonic/clonic seizure activity: MIDAZOLAM 2 mg increments IVP/IO q. 30-60 sec
(0.2 mg/kg IN) up to 10 mg IVP/IO/IN titrated to stop seizure If IV/IO unable/IN contraindicated: IM 5-10 mg (0.1-0.2 mg/kg) max 10 mg single dose.
All routes: may repeat to total of 20 mg prn if SBP ≥ 90 (MAP ≥ 65) unless contraindicated. If hypovolemic, elderly, debilitated, chronic dx (HF/COPD); and/or on opiates or CNS depressants: ↓ total dose to 0.1 mg/kg.
Identify and attempt to correct reversible precipitating causes (see above)

Benzodiazepine administration takes precedence over bG determination in pts who are actively seizing

Obtain and record blood glucose level per System procedure (capillary and/or venous sample)

If < 70: DEXTROSE or GLUCAGON per Hypoglycemia SOP (p. 37 NWC EMSS SOPs)

Pre-eclampsia / Eclampsia hypertension in Pregnancy

If generalized tonic clonic seizure activity (ECLAMPSIA):

MAGNESIUM (50%) 2 Gm in NS to total volume 20 mL (slow IVP) over 5 min (Alt. 2 Gm in 50 mL NS IVPB on mcgtt tubing over 10 min). Max 1 Gm / min.If pt. received 2 Gm for preeclampsia prior to experiencing a seizure, may give an additional 2 Gm to Rx seizure

If seizure persists after magnesium:

MIDAZOLAM 2 mg increments IVP/IO q. 30-60 sec (0.2 mg/kg IN) up to 10 mg IVP/IO/IN titrated to stop seizure. If IV/IO unable and IN contraindicated: IM dose 5-10 mg (0.1-0.2 mg/kg) max 10 mg single dose.

All routes: may repeat to total of 20 mg prn if SBP ≥ 90 (MAP ≥ 65) unless contraindicated. If chronic dx (HF); &/or on opiates or CNS depressants: ↓ total dose to 0.1 mg/kg

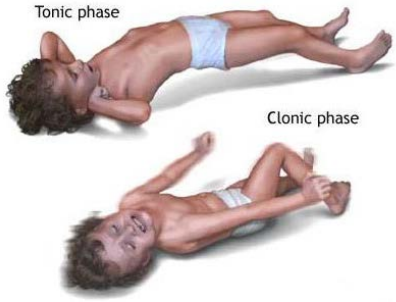
(p. 64 NWC EMSS SOPs) VIII.

Febrile seizures

A febrile seizure is a single, generalized, tonic clonic seizure lasting fewer than 20 minutes that occurs with fever (38 ☐C or higher
without evidence of intracranial infection or any other defined cause (nonfocal neuro exam). Seizures with fever in children who have had previous nonfebrile seizures, anticonvulsant use, known neurological disease, and history or clinical suspicion of head trauma are excluded from the definition. These seizures tend to be single episode/self-limited.

Incidence and epidemiology

1. Affects 2-5% of all children under 5 years of age
2. Occur between 6 months and 3 years of age
3. 95% occur prior to 5 years
4. Boys 3-4 X more likely to experience
5. Slightly higher incidence in black children over white



Etiology

- Genetics: 2-3 X higher in siblings of children who had febrile convulsions.
- A child who has had a febrile seizure has a 33% chance of having another one if less than one year when he had his first.
- Autosomal dominant transmission with incomplete penetrance and variable expression (only one gene is necessary for susceptibility, but a variety of other factors must play a role for that gene to express itself).
- Maturity of nervous system: Maturation of NS is associated w/ excitability of neurons. Maturation occurs more rapidly in females which may explain increased risk in males.
- Fever lowers seizure threshold in everyone as does a rapidly rising temp. Most children have temp of 102.2 °C (39 °F) or greater at time of diagnosis. Rate of rise may be more important than absolute temperature, although others argue that magnitude of temp is of greater relevance.

- Viral infections more often than bacterial. Common viral infections: roseola infantum, influenza A virus, viral pharyngitis, tonsillitis, and viral pneumonia. Possible bacterial infections: salmonella, shigellosis, otitis media, pneumonia, bacteremia, urinary tract infection and bacterial enteritis.
- Immunizations can provoke: MMR given within 7-10 days, and DPT given within 48 hours. Most common after the pertussis component.

Status epilepticus

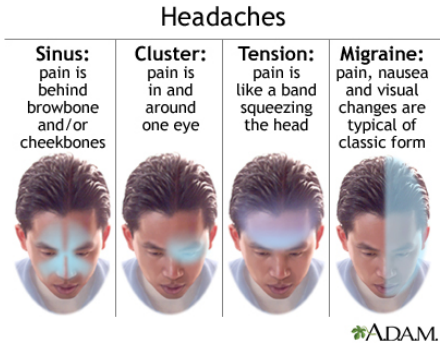
By definition status is two or more seizures without an intervening period of normal neurologic function or one seizure that progresses for 10 minutes or longer. This is considered a major emergency that may lead to aspiration, brain damage, fracture of the long bones and of the spine, necrosis of the heart muscle, and severe dehydration. During seizure activity cerebrovascular resistance increases and autoregulation fails; as a result it is life-threatening.

The brain becomes hypoxic. Some of the common causes in adults are withdrawal from prescribed medications (or non-prescribed), toxemia of pregnancy, kidney failure, meningitis, head trauma, hypoxia, hypoglycemia, stroke, cerebral palsy and encephalitis.

Differential Diagnosis

Not all "spells" are seizures. Other conditions that should be considered include the following:

- Syncope (eg, cardiac arrhythmia, vasovagal syncope, dysautonomia)
- Metabolic conditions (eg, hypoglycemia, hyponatremia)
- Migraine (eg, migrainous aura, migraine equivalent)
- Vascular conditions (eg, transient ischemic attacks)
- Sleep disorders (eg, cataplexy, narcolepsy, night terror)
- Movement disorders (eg, paroxysmal dyskinesia)
- Gastrointestinal conditions (eg, esophageal reflux in neonates and infants)
- Psychiatric conditions (eg, conversion, panic attacks, breath-holding spells, malingering, secondary gain)



ILAE 2017 Classification of Seizure Types Basic Version [1]

Focal Onset
- Aware | Impaired Awareness
- Motor Onset
- Non-Motor Onset
- focal to bilateral tonic-clonic

Generalized Onset
- Motor
  - Tonic-clonic
  - Other motor
- Non-Motor (Absence)

Unknown Onset
- Motor
  - Tonic-clonic
  - Other motor
- Non-Motor

Unclassified [2]

[1] Definitions, other seizure types and descriptors are listed in the accompanying paper & glossary of terms

[2] Due to inadequate information or inability to place in other categories

ILAE 2017 Classification of Seizure Types Expanded Version [1]

Focal Onset
- Aware | Impaired Awareness
- Motor Onset
  - automatisms
  - atonic [2]
  - clonic
  - epileptic spasms [2]
  - hyperkinetic
  - myoclonic
  - tonic
- Non-Motor Onset
  - autonomic
  - behavior arrest
  - cognitive
  - emotional
  - sensory
- focal to bilateral tonic-clonic

Generalized Onset
- Motor
  - tonic-clonic
  - clonic
  - tonic
  - myoclonic
  - myoclonic-tonic-clonic
  - myoclonic-atonic
  - atonic
  - epileptic spasms
- Non-Motor (absence)
  - typical
  - atypical
  - myoclonic
  - eyelid myoclonia

Unknown Onset
- Motor
  - tonic-clonic
  - epileptic spasms
- Non-Motor
  - behavior arrest

Unclassified [3]

[1] Definitions, other seizure types and descriptors are listed in the accompanying paper and glossary of terms

[2] Degree of awareness usually is not specified

[3] Due to inadequate information or inability to place in other categories

Submersion and Drowning Injuries

Sara W. Nelson, MD Department of Emergency Medicine,
Maine Medical Center, Assistant Professor of Emergency Medicine,
Tufts University School of Medicine. May 1, 2015
https://www.ahcmedia.com/

Epidemiology

Drowning accounts for more than 500,000 deaths worldwide each year. Despite this staggering number, drowning deaths are thought to be underreported, due in part to the confusing nomenclature used to classify these deaths. 97% of deaths from drowning occur in low- and middle-income countries, and in many regions of the world drowning is either the first or second leading cause of death in the pediatric population. Although the incidence of pediatric death due to drowning in the United States has significantly decreased over the past 30 years (2.68 per 100,000 children to 1.96 per 100,000), it is still a frequently encountered injury pattern and an area in which EMS should be well versed.

Table 1. United States Risk Factors for Drowning by Age Group[9,11,12]

Infants and Toddlers
• Unsupervised bath time
• Bath seats
• Caucasian ethnicity
• Residential pools
• Low and middle income families
Children and Adolescents
• Underlying medical conditions
• Access to open bodies of water
• Unsupervised swimming
• African-American ethnicity
• Male sex
• Autism spectrum disorders
Teenagers and Adults
• Underlying medical conditions
• Intoxication
• Trauma
• Tourism
• Swimming alone
All Ages
• Cardiac arrhythmia syndromes
• Epilepsy

The leading cause of death in the US between 2006-2010 among children (1-18 years of age) was unintentional injuries. In the CDC's database on all-cause mortality, drowning was responsible for roughly 4500 deaths during this time period, which equates to roughly 12% of all pediatric deaths. This is second only to MVCs. *To put this into perspective, more children died from drowning in the US between 2006 and 2010 than from sepsis, chronic lung disease, influenza, and pneumonia combined.* For all age groups, there were more than 17,000 U.S. deaths from drowning during this same time period.

The location of drowning, particularly pediatric drowning, has been well studied. In the US, children younger than the age of 1 year most often drown in bathtubs, buckets, and toilets, while children ages 1 to 4 are more likely to drown in a pool. It is often under appreciated that young children can drown in as little as 5 cm of water. After the age of 4, children and adolescents are more likely to drown in open water. Almost 50% of all fatalities occur in open water.

Additional risk factors associated with drowning of infants and toddlers are unsupervised bath/pool time and the use of bath seats while in the bathtub. In the adolescent population, the majority of drownings are related to risky behavior, such as the use of alcohol or illicit drugs, or diving-related trauma. In all age groups, medical conditions such as epilepsy, cardiac disease, and predisposition to cardiac arrhythmias (e.g., prolonged QT syndrome) increase the risk of drowning. (See Table 1.)

DEFINITIONS

Immersion: to be immersed is for a body part to be covered in a liquid medium; it does not require the entire body to be underwater. For an immersion victim to drown, the oral and nasal airways must be under water or other liquid medium, limiting the victim's ability to breath.

Immersion syndrome: This is characterized by sudden cardiac arrest caused by massive vagal stimulation following sudden contact with very cold water. Because of the rapidity with which immersion syndrome can occur, victims are rarely rescued promptly. The majority drown.

Post-immersion syndrome: Delayed deterioration of a previously asymptomatic or minimally symptomatic patient.

Submersion: to be submersed is for the entire body to be covered in a liquid medium. Explicit in this definition is that the airway, in its entirety, is under the liquid medium.

Near-drowning: Survival, at least temporarily, after suffocation in liquid medium. Death did not occur or occurs more than 24 hours after submersion. Recommended that the term be dropped, but still in frequent use in clinical areas.

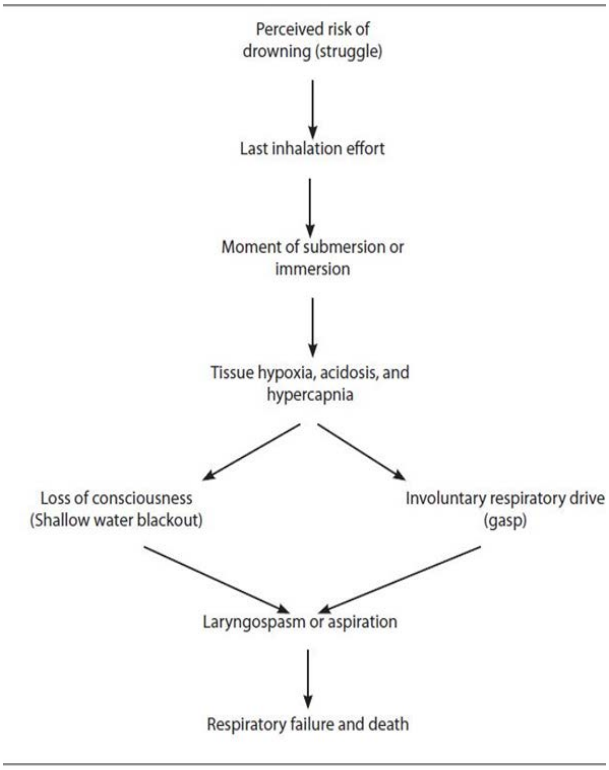
Interval time: survival trends directly correlate with the time between initial airway compromise and ventilatory efforts by either the victim, spontaneously, or through the rescuer through basic life support. This time difference is known as the interval time.

Shallow Water Blackout (Hyperventilation drowning): Occurs when swimmers hyperventilate before going under water resulting in a lowered arterial carbon dioxide level thus reducing the stimulus to breathe. With increased muscular activity, arterial oxygen tension is lowered rapidly. Unconsciousness caused by progressive hypoxia will occur with drowning soon to follow.

PATHOPHYSIOLOGY

The drowning process is the stepwise progression of events leading to respiratory failure, hypoxia, and death.

Figure 3. The Drowning Process[22-25]



(See Figure 3.) When the human body is submersed, there is an unconscious drive to breath-hold. Breath holding occurs when the victim closes the larynx to prevent air from being inhaled or exhaled. Once submersed, the victim will quickly deplete oxygen stores. As the drowning process continues, the victim becomes progressively acidotic, hypoxic, and hypercapnic. Hypercapnia is the primary stimulus of the respiratory drive. At some point the victim, feels the extreme need to take a breath. That is when they inhale the liquid medium into their lungs. Because of the obstructed process, that first breath can trigger a larygospasm. If long enough, the thought used to be that people would suffer a “dry” drowning however many studies disprove that. If laryngospasm does not occur and water does enter lungs, it was referred to as a wet drowning. The bottom line, when water enters into the lungs, it disrupts the normal mechanisms including surfactant that then results in atelectasis, creating a V/Q mismatch. Water ultimately is toxic to the alveoli, disrupting the capillary membranes. Add to that fact, that it may be salt water, river water, pool water treated with many chemicals; they create a high risk for infection and other pulmonary injury.

All organ systems are affected after a submersion injury as a result of asphyxia, hypoxia and acidosis. Respiratory failure, aspiration pneumonia, barotrauma, and adult respiratory distress syndrome (ARDS) are frequent complications. Arrhythmias as well as cardiogenic shock may also be seen. Renal dysfunction is a common finding (acute tubular necrosis). Liver and gastrointestinal dysfunction may also occur. However, it is the irreversible hypoxic-ischemic damage to the brain that accounts for most of the long term complications.

Risk factors that have been identified as indicators of irreversible neurologic injury and mortality include):

- Age less than 3 years
- Submersion longer than 5 minutes.
- Resuscitation not attempted for 10 minutes after rescue
- Seizures, fixed/dilated pupils, decerebrate posture, flaccid extremities and/or coma
- Asystole on arrival to the emergency department
- Arterial blood pH <7.1
- Elevated blood sugar level
- Glasgow Coma Scale <5 or
- Apnea after cardiopulmonary resuscitation.

The mammalian diving reflex should be briefly mentioned with the understanding that it has greater relevance to the cerebral recovery in children. When an individual is submersed in cold water, it can enhance the chances for cerebral survival and recover after a near drowning incident. Symptoms associated with this reflex that can be found in children and some adults are the following:

a. A strong inspiratory gasp with cessation of breathing
b. A strong vagal response with shunting of circulating blood from the skin to the heart and brain. Heart rate rapidly decreases to as low as 5-6 beats/minute mediated by vagal stimulation and peripheral vasoconstriction.
c. A small, sufficient supply of oxygen is very slowly circulated to the lungs, heart, and brain.

These patients may appear dead but may actually be alive, therefore treatment includes beginning resuscitation; while leave the extremities cold with active rewarming of the thorax and transport.

Based on simplified, triage-based, neurologic classification system created by Conn et al. and Modell et al.

1. A: Alert, fully conscious at scene; 90% chance of survival w/o neuro deficits.

2. B: Blunted; pt who is obtunded but arousable at the scene. He responds purposely to pain & breathes on own.

3. C: Comatose (not arousable, with abnormal respirations and inappropriate or absent response to pain); 34% die, 20% have neurological impairment.

Patients may be classified in three stages. Each stage

progressively lowers the chance of survival.

a. Abnormal flexion (old decorticate)
b. Abnormal extension (old decerebrate)
c. Flaccid

EMS Treatment

Needless to say, most submersion incidents occur in less than ideal circumstances for EMS to access the patient; this is indeed true in our own system (audio tape). Scene safety for providers is paramount.

"The biggest hazard in a water rescue is the rescuer! Between five and 10 rescue personnel drown every year attempting water rescues because they do not have a plan, do not wear personal flotation devices (PFDs), overestimate their skills, underestimate the power and dynamics of water, have ineffective or inadequate training, lack the necessary equipment, or have inadequate manpower. As responders, we are "action oriented" and feel the need to act fast. A water rescue requires planning, caution and training."

The ultimate goal in the treatment of a submersion victim is to reverse the hypoxic insult. The most beneficial treatment will be found through adequate oxygenation and ventilation. If the patient is able to now protect their own airway, but oxygenation sats are less than 92% then supplement oxygenation with 100%O2 and PEEP via CPAP should be administered. If the patient is not responsive, the patient may need intubation.

In accordance with NWC EMSS SOP's, for the environmental emergency of submersion, EMS should:

EMERGENT: If awake with good respiratory effort, yet congested and increased work of breathing: O2 /C-PAP mask to deliver5-10 cm PEEP; use 15 L/NRM if CPAP unavailable or contraindicated.

If SBP falls < 90 (MAP < 65): Titrate PEEP down to 5 cm; remove C-PAP if hypotension persists

CRITICAL: If unresponsive and ineffective ventilations with a pulse: Ventilate using BLS airways and BVM.

No need to clear airway of aspirated water by any means other than suction.

Abdominal thrusts contraindicated.

Pts usually respond after a few ventilations. Consider need for advanced airway if patient does not respond to initial bag and mask ventilations.

CRITICAL: If unresponsive, apneic and pulseless: CPR using traditional A-B-C approach due to hypoxic nature of arrest. CPR should be started on pulseless drowning victims unless it is known that they have been under water for more than one hour. Do not delay CPR to take a temperature. **Do not pronounce dead (confirm triple zero)** at scene unless submerged for over 1 hour. Death should **not** be pronounced until the patient is rewarmed to at least 90˚ F and fails to respond to resuscitative efforts. Rx per appropriate SOP.

"The reported incidence of cervical spine injury in drowning victims is low (AHA, 2010). Unnecessary C-spine immobilization can impede adequate opening of the airway and delay delivery of rescue breaths. Routine stabilization of the cervical spine in the absence of circumstances that suggest a spine injury is not recommended." "If there is suspicion for cervical spine injury, based on history or examination, and the patient cannot cooperate with the examination, maintain inline stabilization and place a cervical collar" (Schmidt & Sempsrott, 2015).

Additionally these patients are at high risk for vomiting and aspiration, therefore EMS must be prepared for this to occur by providing suction nearby to minimize aspiration.

If the patient is in arrest, the priority focuses on to resuscitation efforts. "Given the lack of human evidence and relatively small number of animal investigations, the recommendation for administration or withholding of medications is not clear. It may be reasonable to consider administration of a vasopressor during cardiac arrest according to the standard ACLS algorithm, concurrent with rewarming strategies (Class IIb- AHA, 2010). If the pt is awake or alert, then rewarming per SOP p. 29 is indicated.

According to the 2010 AHA ACLS Guidelines, all victims of drowning who require any form of resuscitation (including rescue breathing) need to be transported to a hospital for evaluation and monitoring, even if they appear well following the event.

Report - convey the following to OLMC:

1. Precipitating event
2. Type and temperature of the water
3. Amount and type of water contamination
4. Degree and duration of immersion/submersion
5. How and when the patient was rescued
6. Patient status upon rescue and EMS scene arrival
7. Time to first resuscitation efforts (duration of untreated cardiac arrest)
8. Initial response to treatment
9. Adequacy and type of ventilation
10. Measurement and production of blood flow during chest compressions (demonstrated by capnography), and return of spontaneous circulation
11. Patient condition at time of transport

Observe for and report S&S of increased ICP: (Cushing's response - ↑ SBP; widened pulse pressure; ↓ HR; ↓ RR and/or abnormal respiratory pattern)

This next section will include a variety of information on patients with special health care needs, both in the pediatric population as well as the adult population. The information listed is based on the population specific to our area of the country and the individuals most commonly seen in our response area. In no means is this list exhaustive of all pts. specialized health care needs.

Central Line Catheters

Types of partially implanted devices: Multilumen central line catheters (Hickman, Broviac)

These are blind or closed end devices that have a removable cap on the external end of the catheter and a clamp on the tubing distal to the clamp that closes flow to and from the vein. (Adirim & Smith, 85) The external end of a partially implanted catheter may have a number of ports or lumens. Catheters are usually configured into single, double or triple lumen devices. The number of lumen depends on the intended use of the catheter and the patient's needs. The catheter gauge is marked in millimeters on the side of the lumen.

The state of the art in radiology has evolved to the point where image-guided placement of tunneled catheters such as perm-catheters for dialysis, PICCs, Hickman catheters and implantable port catheters is often preferred to surgically placed catheters. Ultrasound and fluoroscopic guidance allows safe, precise placement with less complications than the use of standard surgical landmarks. Also, the same interventional radiological approach eases catheter and port repair, if needed.

The Hickman catheter is made of silastic (a silicone elastomere) that is softer than a simple triple-lumen catheter. The Hickman catheter comes in double-lumen and triple-lumen varieties. These catheters can stay in place for weeks to months; some patients have had the same Hickman catheter for years!

Surgeons often access the subclavian vein under the clavicle and place the distal catheter tip at the SVC/right atrial junction or in the right atrium, but the distal end of the catheter is pulled under the skin for 2-4 inches and comes out of the chest close to the nipple or over the sternum. This creates a "tunnel" which decreases the risk of infection. Interventional radiologists more often select the internal jugular vein for central catheter placement. It runs straight down to the superior vena cava, which reduces the risk of malposition o f the catheter and possibly also of central venous obstruction.

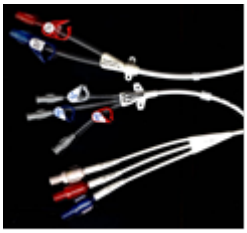
Peripherally Inserted Central Catheters (PICC)

These central lines are long, flexible, silicone catheters that are usually inserted into the basilic or cephalic vein via the antecubital space. The catheter is advanced into the superior vena cava. It is the most common external central venous line. Their use is associated with a lower rate of infection than other partially implanted central lines. They can remain in place for up to a year.

EMS providers should not take blood pressures in the arm with a PICC line.

Accessing a central line:

This process needs to be done with strict aseptic technique. Be very careful not to introduce bacteria into the central line, as they can cause a life-threatening infection. Also, if improperly done, the patient is at high risk for an air embolism. Ask the caregiver if the patient received TPN (total parenteral nutrition) through the central lines. TPN is incompatible with a multitude of medications and the line should be flushed first.



If there is an appropriated trained professional, they should be the ones that access the central line.

☐ Wash hands with soap and water or waterless cleaner; apply sterile gloves and a surgical mask. Also have the patient turn away from the access site.

☐ Cleanse the injector cap with chlorhexidine

☐ Close the clamp on the tubing 3" from the cap prior to removing the protective injection cap

☐ Remove the protective cap

☐ Secure a 10 or 12 mL syringe prefilled with 5 mL NS onto the injection port site of the central line.

☐ Unclamp the catheter and aspirate 5 mL of blood from the line. Reclamp the catheter and discard the aspirate into an appropriate container for disposal at the hospital.

☐ If blood can be aspirated, secure a new syringe filled with 10 mL NS, unclamp and slowly infuse 5-7 mL of NS into the catheter to ensure patency. Reclamp the catheter and remove the syringe.

☐ Attach the well-primed IV line to the injection port – secure with tape and unclamp the line to begin IV flow. Be careful not to introduce any air into the catheter and the IV tubing and bag must NEVER run dry.

Surgically implanted medication delivery systems

Portacath, Medi-port, LAS Port ®

Portacath is a generic term that describes any implantable venous access device. A small intravenous catheter several millimeters in diameter and 20 – 25 cm in length is inserted into a large vein behind the clavicle. The catheter is connected to a "port" that is

shaped like a disc and is about the diameter of a 25 cent coin. It has a flexible silicone membrane injection port that is self-sealing. The port is then totally implanted into the subcutaneous tissue into the subcutaneous tissue in the left or right pectoral regions where it can be easily felt and accessed. Patients receiving chemotherapy will often have a portacath. Administration of an IV medication or collection of a blood sample is both simplified and made much less uncomfortable when a portacath is available. They must be accessed with a noncoring needle that has a solid tip and side hole opening. It is recommended that this injection needle has a 90 degree angle. A regular IV catheter or metal needle will permanently damage the port and prevent proper resealing of the port when the needle is removed.

Vascular Access Device Complications

Hemorrhage: Most patients with a VAD are on some type of anticoagulant therapy to prevent the device from developing obstructing clots. These medications place the patient at risk for increased bleeding (GI and intracranial bleeds). If external bleeding, apply direct pressure to site.

Air embolus - clinical presentation

- Headache; dyspnea; chest pain
- Altered mental status; hypoxia

If air embolus is suspected:

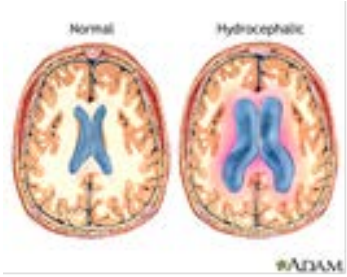
- Place the patient in left lateral Trendelenburg position.
- 15 L O_2
- ECG, pulse ox, capnography monitors
- Time sensitive patient

Infection of catheter site, catheter tunnel, or system wide sepsis can occur. Assess the access site for redness, swelling, drainage and tenderness. Provide supportive care (IVF, vasopressors) and transport. Tunnel infections occur earlier than device-related bacteremia or fungemia and can be associated with serious local morbidity or death. Tunnel infections almost always require catheter removal at the hospital.

Central venous septic thrombophlebitis is a potentially lethal complication that can be successfully managed at the hospital with prompt catheter removal and IV antimicrobial therapy. The patient can experience a septic pulmonary emboli from seeding of an infected intravascular clot.

Shunts

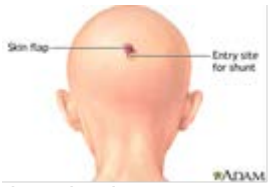
Hydrocephalus: Cerebral spinal fluid (CSF) is produced in the choroid plexus of the first and second ventricles of the brain. It circulates through the 3rd and 4th ventricles and then around the brain and spinal cord in the subarachnoid space. It is reabsorbed in the dural sinuses of the brain.



Hydrocephalus (too much CSF) develops when there is an interruption of this normal circulation due to an increase in CSF production, obstruction of CSF flow, or a decrease in CSF absorption. The ventricles become enlarged with cerebrospinal fluid. This condition causes the brain tissue to become compressed against the skull, causing serious neurological problems. It often begins in infancy and may co-exist with many congenital and acquired disorders such as myelomeningocele, intraventricular hemorrhage, and infection. Other indications include post- meningitis, brain injury, surgery, or tumors.

Untreated, hydrocephalus is fatal. **Shunting** is necessary to drain the excess fluid and relieve the pressure in the brain. This should be done as soon as hydrocephalus is recognized to give the child the best possible neurological outlook.

Shunts are inserted to drain excess CSF and reduce ICP.



Location: They are surgically implanted into the brain to drain CSF from the ventricles into another part of the body.

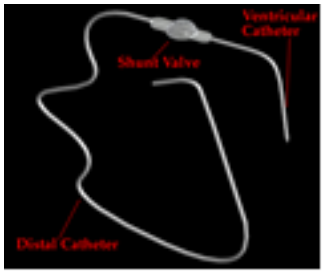
Typical device: All shunts have three basic parts: a Ventricular (proximal) Catheter, a Shunt Valve (one-way valve system) and a Distal Catheter. They may have on-off valves, an antisiphon device, and a reservoir.

The shunt is inserted in the OR under general anesthesia. A flap is cut in the scalp and a small ("Burr") hole is drilled in the skull. The Ventricular Catheter may enter from various positions of the skull, most commonly from the right front top of the skull or from the right back side of the skull just above and behind the ear. This allows the catheter to pass through a relatively silent portion of the brain which minimizes risk of complications.

The ventricular catheter attaches to the one way valve which is placed under the skin on the outside of the skull. From the valve, the distal shunt tubing is tunneled underneath the skin down to a body cavity. The fluid is released into this cavity and absorbed.

Shunts are named for the position of their proximal and distal catheters. The proximal catheter is usually in one of the ventricles. The distal catheter is tunneled under the skin and is most often in the peritoneal cavity

(ventriculoperitoneal [VP] shunt). It could be placed in the right atrium (ventriculoatrial [VA] shunt); pleural cavity (v-pleural shunt), gall bladder, ureter, urinary bladder, or thoracic duct.



In VP shunts, an extra length of distal catheter is placed into the peritoneal cavity to allow for growth (Aehlert, 646). Some patients have more than one shunt which may or may not be connected; others may have old nonfunctioning shunts that have not been removed.

VP shunts are prone to complications

The most common causes of shunts not working correctly are mechanical complications (shunt hardware malfunction), over drainage or under drainage of CSF fluid, bleeding and infection.

S&S malfunctioning shunt:

In general, when a patient's shunt is not working properly, they will develop the same or similar complaints that they had prior to having the shunt placed. Family members will usually notice these problems before health care providers can pick them up since initially, they can be intermittent and very subtle.

Infection: "Shunts can become infected at the time of surgery or via the body fluids such as the blood stream. Infections can be very serious and can lead to strokes, paralysis, or even death. Many times the shunt will stop flowing due to debris from the infection. One may see redness, swelling, or tenderness along the path of the shunt. If the abdominal end becomes infected one may develop peritonitis with severe abdominal pain and fever. If the shunt is in the lung, the patient can develop pneumonia. If the shunt is in the heart, the patient may develop endocarditis. If the brain end becomes infected, an infection of the brain can lead to meningitis as depicted on the left. The patient may present with fever, confusion, headache, a stiff neck, some or all of these." http://neuroanimations.com/Hydrocephalus/Shunts/shunt_malfunction.html)

Malfunction: Any of the shunt parts may develop sub-optimal or incomplete function. If you look at the ventricular catheter closely, there are tiny holes in it which can become obstructed with tissue growing into the holes. This results in obstruction of CSF flow. Some tissue debris may flow into the valve and obstruct flow as well. The valve is a mechanical device and it is subject to malfunction just like any other mechanical device. Finally, the distal catheter end may become obstructed by tissue. It may also migrate out of its cavity due to movement of the surrounding tissue environment (lungs, heart, bowel). (http://neuroanimations.com/Hydrocephalus/Shunts/shunt_malfunction.html)

After several years, failure often results from damaged tubing, overdrainage, or erosion of the equipment through the skin or into an abdominal organ. Perforation of the stomach or intestine may present as peritonitis. Surgery will be necessary.

Tracheostomy

A tracheostomy is a vertical or horizontal surgical opening into the trachea that is usually done in the OR under general anesthesia. It forms a temporary or permanent opening that bypasses the nose and mouth for ventilation. The terms tracheotomy and tracheostomy are interchangeable.

Stoma is the opening of the tracheostomy. The tract is usually established and healed in about 5 days. The stoma is kept open with a tracheostomy tube.

A tracheostomy is performed in children for several reasons:

- ☐ To bypass an upper airway obstruction
- ☐ Manage chronic aspiration
- ☐ Allow for long term ventilation

An anatomical or functional blockage of the airway can lead to significant respiratory distress requiring a tracheostomy. This obstruction may be isolated or part of a syndrome or multi-system disorder; it may be congenital or acquired.

Tracheostomy tubes

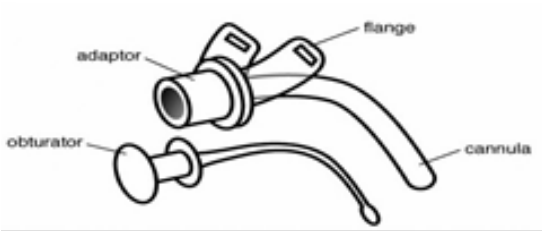
A tracheostomy (trach) tube is a curved tube that is inserted into a tracheostomy stoma. All tracheostomy tubes have similar parts:

Adaptor: Portion of the trach tube seen on the outside of the patient's neck between the flanges; universal size to allow connection of respiratory equipment

Flange: Place to connect the ties

Tube or cannula: part that goes in the stoma

Obturator: Guide used during trach tube change



Trach tubes come in different sizes and types:

- ☐ Internal diameter ranges from 3.0 to 6.5 mm for pediatric single cannula tubes
- ☐ May be a single tube or have an inner cannula that can be removed and cleaned. External diameter is larger with a double cannula tube.

- ☐ Length increases with size: neonatal, pediatric, adult
- ☐ Curvature of the tube varies by brand and size. Goal: Avoid touching the posterior tracheal wall
- ☐ Trach tubes may or may have a cuff: Infants and young children generally have uncuffed tubes. Children > 8 years generally have cuffed tubes.
- ☐ Fenestrated tubes have a hole in the stem that allows breathing through the vocal colds to permit talking or weaning off of the trach
- ☐ Tube selection is dependent on the size of the airway and the child's needs

EMS Care of a child with a Tracheostomy

Listen to caregivers *– they know the child best*

Critical HISTORY: History of present illness – *what is different today?*; interventions taken prior to EMS arrival; child's baseline abilities; why the child has a trach (syndromes/diseases), status of the upper airway; reason for a ventilator; if the child can breathe on their own; baseline vital signs; amount and route for home oxygen; suctioning frequency and what their normal secretions are like; devices and medications; medical information forms.

Look for MedicAlert® jewelry or health forms if usual caregiver is not available.

Assess for DOPE and infection (tracheal or pulmonary); reassess pulse, RR frequently

Displaced- total or partial removal of tube

Obstructed – mucus plug, blood, foreign body, or moved against soft tissues

Pulmonary problems – pneumothorax, pneumonia, reactive airway, aspiration

Equipment – ventilator malfunction, oxygen depletion, and tubing kinked

Check breath sounds while ventilating. If not clear or if gurgling – suction

If breathing is adequate but low pulse ox: apply infant mask directly over stoma – or as tolerated by child.

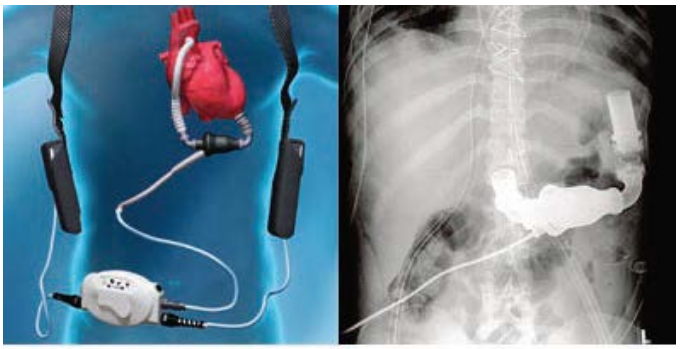
Assess circulation/perfusion.

ECG monitor: Consider bradycardia as secondary to ventilatory/oxygen problem until proven otherwise. ***Suctioning*** is the most common procedure done for a child with a trach. Suctioning maintains a patent airway by removing secretions that the child is unable to cough out of the trach tube. Proper suctioning technique reduces potential complications resulting from improper technique. Assessing secretions enables EMS to recognize signs of concern, such as infection, dehydration, or potential complications.

EMS Guide: Mechanical Circulatory Support
Organization January 2013 Thoratec Corporation

What is a Ventricular Assist Device (VAD) / Mechanical Circulatory Support (MCD)?

A ventricular assist device (VAD) is a mechanical pump that's used to support heart function and blood flow in people who have weakened hearts.



How does a VAD work?

The device takes blood from a lower chamber of the heart and helps pump it to the body and vital organs, just as a healthy heart would.

What are the parts of a VAD?

The basic parts of a VAD include: a small tube that carries blood out of your heart into a pump; another tube that carries blood from the pump to your blood vessels, which deliver the blood to your body; and a power source.

What is the power source?

The power source is either batteries or AC power. The power source is connected to a control unit that monitors the VAD's functions. The batteries are carried in a case usually located in a holster in a vest wrapped around the patient's shoulders.

What does the control unit or controller do?

The control unit gives warnings, or alarms, if the power is low or if it senses that the device isn't working right. It is a computer.

Patient Management

1. Assess the patient's airway and intervene per your protocol.
2. Auscultate heart sounds to determine if the device is functioning and what type of device it is. If it is continuous flow device, you should hear a "whirling sound".
3. Assess the device for any alarms.
4. Look on controller usually found around the waist of the patient and to see what color tag and device it is.

5. Match the color on the device tag to the EMS Guide.
6. Intervene appropriately based on the type of alarm, tag (device) and EMS Guide.
7. Start large bore IV.
8. Assess vital signs – Use BP with doppler – with the first sound you hear is the MAP.
9. If no doppler, use the mean on the non invasive blood pressure machine. Transport to closest VAD center. Call the number on the device to get advice.
11. Bring all of the patient's equipment.
12. Bring the significant other if possible to act as a expert on the device in the absence of consciousness in the patient.

The LifeVest wearable cardioverter defibrillator is a treatment option for sudden cardiac arrest that offers patients advanced protection and monitoring as well as improved quality of life.

Unlike an implantable cardioverter defibrillator (ICD), the LifeVest is worn outside the body rather than implanted in the chest. This device continuously monitors the patient's heart with dry, non-adhesive sensing electrodes to detect life-threatening abnormal heart rhythms. If a life-threatening rhythm is detected, the device alerts the patient prior to delivering a shock, and thus allows a conscious patient to disarm the shock. If the patient is unconscious, the device releases a gelLifevest over the therapy electrodes and delivers an electrical shock to restore normal rhythm

The wearable defibrillator is a treatment option for patients who are at high risk for sudden cardiac arrest (SCA) or sudden cardiac death (SCD). Potential patient groups who may benefit from the technology include:

Post-myocardial infarction (MI) patients with complications

Cardiac surgery patients with complications

Heart transplant waiting list patients

Advanced heart failure patients

Patients undergoing drug loading with potentially pro-arrhythmic medications

Patients, who need an ICD, but have a condition that prevents or delays surgery (such as an infected ICD pocket)

Patients who simply do not want to undergo surgery or have an implant

The LifeVest was designed as an intermediate-term treatment option for people at high risk for SCA. Right now, people at a high, short-term risk of SCA are typically monitored in a hospital intensive care unit (ICU) or coronary care unit (CCU). With monitored beds costing up to $2,000 a day, this option quickly becomes very expensive and is primarily reserved for critical care patients.

Patients with a high, long-term risk of SCA are often candidates for an implantable cardioverter defibrillator (ICD), but this option is also expensive (up to $65,000) and requires surgery. According to Morgan Stanley, only one out of six US patients who need an ICD actually get one.

The LifeVest fills the therapeutic gap between hospitalization and an ICD. The LifeVest has the same important characteristics of both an ICU/CCU and the ICD; it continuously monitors the heart and is designed to provide prompt defibrillation when needed. It is believed that the wearable defibrillator has the potential to become the standard of care for intermediate-term patients at risk. And, in cases when an ICD is not feasible, it also can serve as a longer-term alternative.

To date, more than 23,000 patients have worn the wearable defibrillator and, approximately 98% have been successfully rescued from a life threatening episode of VF/VT.
http://www.resuscitationcentral.com/defibrillation/wearable-defibrillator/

Autism

Picture being trapped in your vehicle. You're not sure what happened. You were on the way to school. Your mom was driving. Now you can't move, your arm feels funny and your mom is beside you moaning softly. Strangers are stopping. They are pounding on the windows. Why are they pounding? You are going to be late for school. Late isn't good. You get a tardy. You begin to hear sirens, loud sirens. And now there are lights. Don't look at them—flashing lights give you seizures, your mom says. Your hands begin to flap. You start rocking. People are yelling. They've opened the door now and are asking you lots of questions. Your mom told you not to talk to strangers. They grab your head and won't let you move it. You need to rock, but you can't move because they are holding you still. You are definitely going to be late now. Your hands flap wildly…

Being involved in a medical emergency is stressful for anyone, but when the patient is autistic, the associated stress is considerably higher because of the inherent nature of the EMS response. While the flashing lights and sirens of an approaching police car, ambulance or fire truck may bring a sense of comfort to some, for those that are autistic, these sounds meant to help may only add to their discomfort.

https://www.autismspeaks.org/what-autism

The term "spectrum" reflects the wide variation in challenges and strengths possessed by each person with autism.

Autism's most-obvious signs tend to appear between 2 and 3 years of age. In some cases, it can be diagnosed as early as 18 months. Some developmental delays associated with autism can be identified and addressed even earlier.

BACKGROUND

The Centers for Disease Control and Prevention (CDC) estimates autism's prevalence as 1 in 68 children in the United States. This includes 1 in 42 boys and 1 in 189 girls.

An estimated 50,000 teens with autism become adults – and lose school-based autism services – each year.

Around one third of people with autism remain nonverbal.

Around one third of people with autism have an intellectual disability.

Certain medical and mental health issues frequently accompany autism. They include gastrointestinal (GI) disorders, **seizures**, sleep disturbances, attention deficit and hyperactivity disorder (ADHD), anxiety and phobias.

In 2013, the American Psychiatric Association merged four previously distinct diagnoses into one umbrella diagnosis of autism spectrum disorder (ASD). These included autistic disorder, childhood disintegrative disorder, pervasive developmental disorder-not otherwise specified (PDD-NOS) and Asperger syndrome.

Autism spectrum disorders range from mildly to profoundly disabling and the journey is long for caregivers with a family member that is diagnosed.

About 1 percent of the world population has autism spectrum disorder. (CDC, 2014)

Prevalence in the United States is estimated at 1 in 68 births. (CDC, 2014)

More than 3.5 million Americans live with an autism spectrum disorder. (Buescher et al., 2014)

Prevalence of autism in U.S. children increased by 119.4 percent from 2000 (1 in 150) to 2010 (1 in 68). (CDC, 2014) Autism is the fastest-growing developmental disability. (CDC, 2008)

Quick Facts for EMS:

Some individuals with autism do not have a normal range of sensations and may not feel the cold, heat, or pain in a typical manner. In fact they may fail to acknowledge pain in spite of significant pathology being present. They may show an unusual pain response that could include laughter, humming, singing and removing of clothing.

Individuals with autism often have tactile sensory issues. Band-aids or other adhesive products could increase anxiety and aggression.

Move slowly, performing exams distal to proximal. Explain what you plan to do in advance and as you do it. Explain where you are going and what they may see and who might be there. This may avert unnecessary anxiety and/or outbursts or aggressions from the patient. Individuals who appear not to understand may have better receptive language, which is not entirely evident.

Expect the unexpected. Children with autism may ingest something or get into something without their parents realizing it. Look for less obvious causality and inspect carefully for other injuries.

If possible ask a caregiver what the functional level of the individual with autism is, and then treat accordingly. Stickers, stuffed animals and such which are used to calm young children may be helpful even in older patients.

Attempt to perform exams in a quiet spot if at all possible, depending on the severity of injury and safety of the scene. Demonstrating what the exam will consist of on another person first may help the person with autism have a visual knowledge of what your intentions are.

Rzucidlo, S.F. (2007). Autism 101 for EMS, from SPEAK Web site: www.papremisealert.com

When responding to situations involving an autistic patient, there are specific adjustments EMS providers can make in the delivery of care. The following should be considered if appropriate:

Avoid the use of lights and sirens when possible. This will help reduce the anxiety of those who are hypersensitive to external stimuli.

Limit the number of caregivers, allocating a key individual to the patient so the patient can better understand what is happening to them.

Provide direct requests using simple language. If you say, "Can you move over here?" the autistic patient may not understand you are actually asking them to move. Instead say, "Please move over here."

If transporting the patient, consider the response autistic individuals may have to the safety straps on a stretcher. Explain the purpose of the straps before application.

Inform the receiving facility of the patient's diagnosis. A

"hallway" bed may be unbearable for the autistic patient. Be sure to communicate any specific approaches that have proven successful with your patient.

Look for the less obvious. Remember that autistic individuals may be less aware of danger, may give misleading statements or may not be able to communicate the extent of the trauma. Use clues from the patient's environment and bystanders' accounts to obtain a complete picture of the situation.

Minimize distractions, providing very deliberate care with a distal to proximal approach. Explain each move before proceeding.

Recognize that although the individual may be non-verbal, autistic patients often have remarkable and intact receptive abilities. Remember, too, that they are literal thinkers. Avoid idioms or other figures of speech such as, "This will only hurt for a minute."

Allow the patient to perform self-stimulating activities unless it would other compromise care. These activities may be patients' ways of calming and comforting themselves.

Remember that autistic patients may be hyper- or hypo-sensitive to tactile stimuli. EKG patches, tape or gauze pads may be an added discomfort to them. Oral medications may be especially repugnant to them. Consider using pediatric medications for adults when possible.

Assess for pain, recognizing that autistic individuals may not respond to commonly used instruments such as the Wong-Baker FACES pain rating scale, due to their inability to read facial expressions. Commonly used modalities used to relieve pain such as hot and cold therapy may not be tolerated by the individual.

Utilize the patient's caregivers whenever possible, allowing the caregiver to accompany the patient during transport. In essence, they can be used in the role of an interpreter.

Autism and Aggressive Behavior

Research indicates that those on the autism spectrum are 20 to 30% more likely to exhibit aggressive behavior than the general population. These aggressive behaviors are often escalated when the individual is distressed due to feeling unwell or uncomfortable. This aggressive or violent behavior must be thought of differently than as an act of violence that is planned and purposeful. Aggression in autistic individuals is often due to their inability to communicate verbally, and rather than an intentional act, it is a reaction to pain, irritability or fear. Recognizing this behavior as a form of communication and altering approach accordingly is important for the safety of the emergency responder and patient.

To decrease the likelihood of the autistic patient becoming violent, the emergency responder should first try to determine what the patient is trying to communicate. Understanding the behavior will better enable the emergency responder to provide proper help. Utilizing the caregiver to help decipher and assist EMS to respond to the patient's aggressive behavior is the most important tool the EMS provider has at his disposal. Caregivers know what words, actions or stimuli can calm a child and which could have the opposite effect.

Performing only those procedures that are absolutely vital to the patient's well-being and eliminating those that can be delayed until after transport will also help lessen anxiety-based behaviors. If time permits, demonstrating any procedures that must be done first on a stuffed animal or toy may help alleviate some of the patient's fear.

As always, the safety of the provider and the patient is of the utmost importance. Backing away and telling the patient who is becoming aggressive to "stop" in a clear, authoritative voice may help curb the aggressive behavior.8 The use of restraints should only be considered if there is imminent danger to the patient or others.

PCR Review #1	89 M car into the lake (Dispatch tape provided to you in slide presentation)
Based on dispatch info, who or what is needed to adequately work this scene?	
Are there any special considerations other than ITC needed by EMS to care of this patient?	
In reviewing the PCR, what priority level is given to this pt in accordance with current SOP?	
In accordance with SOP, should this patient have been resuscitated?	
Is there a situation in which the pt should NOT be resuscitated?	
What are the EMS priorities of care for this patient?	
What is a common occurrence for submersion patients? What should you have in preparation for such situations?	
Is CPAP indicated in this patient scenario?	
When would CPAP be indicated?	
What should be done for a pt that is unresponsive with ineffective ventilations but still has a pulse?	
Should this patient be moved with CPR being done?	
Outcome	Pt expired

PCR REVIEW #2	1M fell into a kiddie pool at a day care facility~ 10 sec of unresponsiveness
Based on dispatch info, who or what is needed to adequately work this scene?	
Are there any special considerations other than ITC needed by EMS to care of this patient?	
In reviewing the PCR, what priority level is given to this pt in accordance with current SOP?	
What are the EMS priorities of care for this patient?	
Should this pt via a family member or care giver be allowed to refuse care and transport to the hospital?	
Defend the above answer.	
Outcome	Story received that the pt had an ~10 sec submersion episode in which there was no cyanosis and given 1 rescue breath. Pt with noted normal respiratory rate and good pulse ox. After a period of observation, the pt was discharged.

PCR Review #3	59 M dispatched for a drowning s/p a fall
Who or what is needed to adequately work this scene?	
Are there any special considerations other than ITC needed by EMS to care of this patient?	
In reviewing the PCR, what priority level is given to this pt in accordance with current SOP?	
What are the EMS priorities of care for this patient?	
Is spinal restriction indicated in this patient scenario?	
Does this pt meet criteria for transport to L I or L 2 TC?	
Defend the above answer.	
Outcome:	Admitted to the LII TC, where he ended up being admitted because of the fall height into water and the + LOC. He had amnesia regarding the incident. He had a h/o respiratory issues including the need for nightly CPAP, sleep apnea and PEs. Diagnosed with an L1 burst fx without neuro deficits. He had pulmonary congestion upon CXR and ended up with aspiration pneumonia. He went to surgical stabilization; developed an ileus and subsequent PEs. Transferred eventually to rehab.
PCR #4	3 M found in a pool
What barriers to care might influence patient treatment?	
In reviewing the PCR, what priority level is given to this pt in accordance with current SOP?	
What are the EMS priorities of care for this patient?	
Outcome:	Pt arrived at hospital with good EtCO2, pulse oximetry and purposeful movement! No other information noted.
PCR #5	4 M found in pool
In reviewing the PCR, what priority level is given to this pt in accordance with current SOP?	
What are the EMS priorities of care for this patient?	
After reviewing these cases, what themes are noted?	
As discussed in the SOPs, what important additional factor must NOT be overlooked with cases involving submersion type incidents?	

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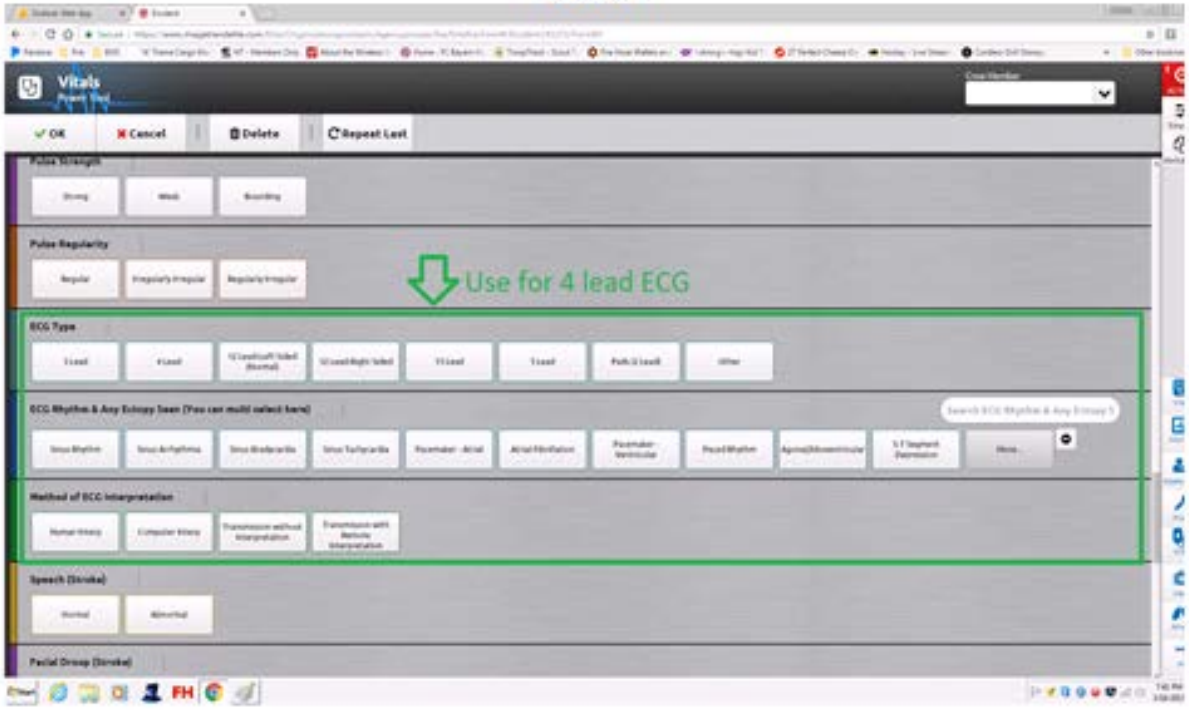
Please request information from your Image Trend super user for greater detail

EKG Documentation Location:
Documentation of the 4-lead ECG is now in one location only, the Vitals Power Tool. This removes the ability to document conflicting data in two different locations. This will also simplify documentation of basic ALS incidents. 12-leads, defibrillation and pacing are to be documented with the Monitor Power Tool.

CPR Vitals Power Tool (NEW):
A new power tool was designed to help simplify documentation of vitals obtained during CPR. Values for ETCO2 and the pt's underlying ECG rhythm are to be documented with this power tool. Respiratory rate and pulse rate are defaulted to zero for quicker documentation. Extraneous vital's fields that are not necessary documentation during CPR have been removed.

ALS Airway Power Tools (NEW):
Two new power tools were developed to help provide more accurate and simpler documentation when an ALS airway is attempted. Both the procedure related fields and the necessary confirmation fields have been combined into a power tool. Paramedics must choose the appropriate power tool based upon the outcome of the attempt: successful or unsuccessful.

4 Lead Documentation in Vitals Power Tool



12 Lead Documentation in Monitor Power Tool