Office Preparedness
for
Pediatric Emergencies

Provider Manual

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Developed in collaboration with the *North Carolina Office of Emergency Medical Services*, the *North Carolina Chapter of the American Academy of Pediatrics*, the *North Carolina Association of Pediatric Nurse Practitioners*, the *North Carolina Academy of Physician's Assistants* and the *North Carolina Academy of Family Practice Physicians*. The authors are very appreciative for the review and comment given by these individuals during the development of the project.

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Introduction

EMS-C in North Carolina

Since 1990, we have been working to improve the pediatric component of our emergency medical services system in North Carolina. The North Carolina Emergency Medical Services for Children Program (EMSC) received initial funding from the Federal Maternal and Child Health Bureau in the Fall of 1990, and a 16 hour continuing education course addressing pediatric care in the out-of-hospital setting was developed. In the past six years more than 1500 health care providers have received this training. An educational course has also been developed for Emergency Department physicians and nurses in an attempt to improve the care of children after they have been transported to hospitals.

EMS-C and the Primary Care Provider

The North Carolina EMSC Task Force recognizes that office and clinic based primary care providers are vitally important members of the pediatric emergency care team in our state. Children with potentially life threatening illnesses and injuries are brought to primary care offices by parents or care providers who are seeking help from health care professionals whom they know and trust. The office site then serves as an entry to the emergency care system and it is here that vital, perhaps even life dependent pre-hospital care, is provided. From the office, EMS is accessed and care is transferred to other health care professionals who continue to deliver emergency care. Ideally, the child is then transported to a facility where advanced pediatric care can be provided in the Emergency Department and subsequently in a pediatric intensive care unit if necessary. The spectrum of EMSC care continues after resolution of the acute illness with rehabilitation, and includes reintegration of children, who may now have special health care needs, into the community.

We recognize that pediatric primary care providers serve many roles in the emergency care system in addition to offering resuscitative care. Primary care providers serve as educators to teach children and families about issues such as injury prevention and recognition of pediatric emergencies . This information gives families the tools to know when to access EMS directly. Pediatric primary care providers offer critical support to children and families who find themselves in the midst of the emergency care system in coordinating efforts of the subspecialists and multidisciplinary teams. They provide continuity to the child and family as he or she progresses from critical care into rehabilitation. Primary care providers then serve as strong child advocates making sure that children receive the special services necessary to reintegrate them into the community.

Through this workshop entitled “Office Preparedness for Pediatric Emergencies”, we hope to bring pediatric primary care providers and emergency care providers in our state closer together with a common goal: to improve the emergency care offered to each and every child in North Carolina. We believe that preparation of the office and the office staff is crucial in order to offer children the best possible outcome following an emergency situation. We wish to thank you for all your efforts to make a positive difference in the lives of our children.

Karen Frush, MD
Mike Cinoman, MD

Preparing the Office for Pediatric Emergencies

A six month old female has had fever, vomiting, and diarrhea for two days. She has been sleeping all morning and her mother had been unable to get her to take a bottle at all. She was brought to the office today because mom was having difficulty waking her up.

Mom appears very concerned and frightened as she gives this information to the receptionist.

1. Are your medically and non-medically trained office personnel prepared to respond to this or other emergency situations?
2. Do you have the necessary equipment and medicines needed to manage this infant? Are they readily available?
3. Who will call 911 or access EMS? What level of pediatric care is provided by your local EMS system?

It takes more than good resuscitation knowledge and skills to provide high quality care during a pediatric emergency. Your office staff needs to be prepared: they need to have adequate knowledge, training and resources to respond to an emergency. We will review several items which should be in place to ensure that your staff and your office are prepared to handle a pediatric emergency.

Recognition

The first person to assess patients arriving in the office may be the least medically sophisticated employee - the secretary or receptionist. These employees should be able to recognize emergencies and know how to summon help.

Secretaries or receptionists should be instructed about signs and symptoms that may signal a pediatric emergency such as:

- labored breathing
- cyanosis or pale lips
- stridor or audible wheezing
- decreased level of consciousness
- seizures
- vomiting after a head injury
- uncontrollable bleeding

Response Plan

A clear **response plan** should be in place for any emergency recognized in the office. Each member of the office staff should have a specific role in the management of the emergency.

1. Determine who is responsible for calling 911 or accessing EMS
2. Identify medical staff member who should be notified by the receptionist who recognizes an emergency.
3. Establish and post protocols regarding:
    a. Accessing EMS
    b. Notification of provider or nurse within the office/clinic

4. Have contingency plans for staff if no physician or PCP is in the office.
5. Have office nurse periodically check the waiting area.
6. Pre-assign roles for a "resuscitation team" (see section four:Mock Codes in the Office)
    - Primary care provider "runs the code"; provides medical direction
    - Office nurse - draws up, administers medications, fluids
    - Aide - assist care provider, perform chest compressions
    - Secretary - Activate EMS system; record events during resuscitative efforts
7. Be sure that staff members are adequately trained to fulfill their roles in an emergency.
    - Provide training for the receptionist to identify infants and children in distress
    - Don't assume medical providers are experienced in handling pediatric emergencies. Determine skill level and knowledge of newly employed medical personnel
    - Be sure all office staff have received CPR training and all medical staff have received PALS training
    - Supplement certification with teaching specific to the most common problems seen in your office.
    - Support re-certification in PALS, BLS for medical care providers
8. Personnel designated to call 911 or local EMS number should receive prior training in accessing the EMS system.
    a. Teach staff about your local EMS system
        - ✓ First responders
        - ✓ EMT's
        - ✓ Paramedics
    b. Staff should be able to provide information needed by the EMS dispatcher
        - ✓ office address
        - ✓ patient's age, condition, vital signs
        - ✓ transport destination
        - ✓ need for ALS unit (if appropriate)
9. Office personnel should call ahead to the receiving hospital as soon as possible and report to the receiving physician (either emergency department or intensive care unit)

Equipment and Broselow system

Trained personnel must have appropriate equipment and medications to use at the time of an emergency.

1. All office staff members must know where resuscitation equipment is located. A resuscitation room can be pre-stocked in an organized way, or an equipment box can be prepared and taken to the site of the resuscitation.
2. Equipment and medications should be organized according to the size of the child. A set of equipment such as the ***Broselow-Luten System*** allows quick reference to determine appropriate equipment size, fluid volumes and medication dosages. The Broselow-Luten system uses a color coded tape measure to assign each child a color

corresponding to his or her length. Equipment is organized and stored in drawers or sections of a bag according to colors. In an emergency the appropriate sized equipment and dosages of medications are immediately available. This system has proven especially helpful in settings where pediatric emergencies do not occur routinely.

2. Each office should develop a system to ensure that all equipment, medicines, and fluids are routinely checked, re-stocked and readily available.

Provider Skills

The Primary Care Provider must be able to provide basic airway management and initiate the management of shock. Even if these skills were obtained in training, it takes practice to maintain them. Since office emergencies happen so infrequently, providers need to find a way to be sure resuscitation skills and knowledge are current and kept up to date. PALS (Pediatric Advanced Life Support) and APLS (Advanced Pediatric Life Support) courses provide an excellent opportunity to renew knowledge and skills.

1. **PALS** Course - Pediatric Advanced Life Support course focuses on early recognition of shock and respiratory distress, addressing assessment and management issues.
2. **APLS** Course - Advanced Pediatric Life Support course was developed jointly through the American Academy of Pediatrics and the American College of Emergency Physicians. This course covers pediatric emergencies such as shock and respiratory distress. Additionally it includes topics such as neurologic emergencies, poisoning and meningitis.
3. **ENPC** - Emergency Nurse Pediatric Course was developed through the Emergency Nurse Association. This course covers basic assessment, critical care and emergency pediatric situations. Triage skills and skills station are incorporated into small group sessions.
4. **CME** - There are an increasing number of CME opportunities in pediatric emergency care. Lectures are offered at state, regional, and national meetings, and some institutions offer short courses in resuscitation and stabilization with local providers.

Maintaining Readiness

The courses described above can help maintain provider knowledge and skills, but it takes more than this to maintain a state of "office readiness" for a pediatric emergency. The best way to ensure readiness is to ***PRACTICE***!! Here are some suggestions:

1. ***Mock Codes*** - provide an opportunity to walk staff members through an emergency scenario. A mannequin can be used to make the practice session more "life-like". Staff members need to be able to identify their tasks and responsibilities during the emergency and demonstrate communication skills, medical skills, etc.
2. ***Critique, Action Plans*** - Team members should critique each other's performances, and specific action plans for improvement and problem solving should result from the effort (i.e., training needs, skills practice, equipment needs, organizational issues).
3. ***Scavenger Hunt*** - another method to identify equipment and/or medication needs. A staff member is given a list of items needed in an emergency and given a set time to find them.

Documentation

Documentation must be a part of office training and mock codes. Complete and accurate information regarding resuscitative efforts is vital for ongoing patient care and transfer of care. Emergency situations are the most difficult to document properly: stress levels are high; there are often not enough trained assistants; other patients in the waiting room must be tended to. When documenting, one should:

- Record dates and times of treatments, calls for transport and transfer
- Record stabilization attempts, medication dosages and response, fluid volumes and the child's weight or assigned color in a color-coded system.
- Note consultations obtained and record conversations or explanations given to the family
- Document patient's condition at time of departure from office

Designate a recorder during every mock code and critique the documentation as well as the code itself. In addition, keep records of mock codes held in the office with a note of "lessons learned" from each one. If there has been a recent change in office equipment (forms, etc.), you may want to include these as specific teaching points following a mock code.

EMS

If a child requires resuscitation in your office, you need help from other health care providers to ensure the best possible outcome. Local EMS personnel can provide you with the help you need.

You and your staff should become familiar with the local EMS system. EMS personnel that respond to pediatric emergencies may include volunteers and/or paid personnel such as police officers, firefighters, EMTs, paramedics or other private or public personnel. The level of training varies among these providers: first responders may have been trained only in CPR and basic first aid; conversely, Emergency Medical Technicians (EMTs) such as EMT-Intermediates (EMT-I), or EMT-paramedics (EMT-P) have substantially more comprehensive training. In the case of EMT-Ps this can be up to 1000 hours or more of instruction. Paramedics, under medical control, can intubate, start IV and IO catheters, administer IV and nebulized medications, defibrillate, and perform other advanced skills.

Generally, when you request an "Advanced Life Support" team, the responders will have relatively higher levels of training.

Only a small number of EMS calls are for pediatric patients (5-10%). You can help EMTs and paramedics gain experience in working with children by inviting them into your office.

Pediatric equipment is required on ambulances, just as it is in your office. EMS-C grant funds have provided advanced life support vehicles in North Carolina with Intraosseous equipment and color-coded tapes.

EMS personnel are well trained in resuscitative skills and are important members of the health care team. However, they cannot help you unless they are called. If your area has 911 service, EMS may be accessed as soon as your office recognizes a pediatric emergency. If your community does not yet have a 911 emergency number (some don't), dial your community's seven digit emergency EMS access number.

Teach children and parents to call 911 or another appropriate emergency number for pediatric emergencies. Far too often, children arrive at the Emergency Department in severe distress, having been transported by private vehicle with only one adult (the driver) in the car!

EMS, EMSC & Primary Care Providers

Introduction

As a pediatric primary care provider you see children who suffer from all degrees of illness or injury: from a mild cough to severe asthma; from a scratch or scrape to a severe laceration. You may find yourself in the position of initiating emergency care, and when this happens, who can you call for help? Are you aware of the capabilities of the Emergency Medical Services (EMS) System in your community? Do the parents of your patients know when to call you and when to call EMS directly? Are EMS and EMSC integrated within your community?

As a child advocate and pediatric primary care provider, you can help assure that appropriate emergency care is delivered to pediatric patients in your community. The system currently in place to provide this is the Emergency Medical Services System.

Components of EMS

EMS systems have been evolving in this country since the early 1970s. The basic parts of an EMS System include: (1) Public Access. This is the mechanism the public uses to obtain EMS services. It may be a seven digit telephone number or, more commonly, a basic or enhanced 911 telephone system. (2) Dispatch. This is a subsystem where a person within an organization actually directs the EMS unit and personnel to respond to the incident. Efforts are currently underway to provide special medical training to these individuals so that they can give medical pre-arrival instructions for victims or families to follow until EMS arrives on the scene. Persons with this special training are called Emergency Medical Dispatchers (EMD). (3) Personnel and Equipment. This includes the ambulances, equipment on the ambulances and the ambulance staff (basic EMTs or EMT Paramedics) which actually respond, treat and transport the patient. (4) Medical Control. This is medical oversight and direction provided to the field technicians (EMTs, Paramedics, etc.) by physicians. (5) Medical Facility. This is the facility that receives the patient being treated and transported by EMS. There are other aspects of a comprehensive EMS system including prevention, first responders, public education, specialty treatment centers, etc. Primary care providers should be familiar with their local system.

The EMS System, although comprehensive, has evolved addressing primarily adult injury and illness, due in part to the fact that pediatric emergencies comprise less than 10% of EMS calls. Recently, however, the importance of proper emergency care for children has been embraced by EMS and efforts are now underway to ensure that children also receive high quality emergency care. As a pediatric primary care provider, you are a critical resource in bringing this about.

Emergency Medical Services for Children

The Emergency Medical Services for Children (EMSC) system, as a part of the global EMS system, uses the same public access, the same dispatch, the same ambulances and equipment and the same personnel and facilities to respond to emergencies of children as adults. The specialized training, equipment and medical oversight necessary to appropriately address the needs of the pediatric patient are areas in which EMS needs your expertise to ensure proper response.

In a fully integrated EMSC system, pre-hospital care includes Basic Life Support personnel such as first responders and basic emergency medical technicians (EMTs) or several levels

of Advance Life Support (ALS) Care field personnel, including EMT-Defibrillation, EMT-Intermediate, EMT-Advance Intermediate and EMT-Paramedic. First responders may be firefighters, police officers, or volunteers. Care is delivered on scene and ALS care is delivered either through direct "on line" medical direction or through "off line" (indirect) medical direction. Indirect medical direction is comprised of triage and treatment protocols, training, system policies, and CQI. Direct medical direction is provided by the real time communications between the field technician and a physician or MICN (RN with approved EMS training) at a sponsor hospital via radio or telephone.

Hospitals providing specialized trauma care are designated by the state as level I, II or III trauma centers and are staffed and equipped to handle victims with moderate to severe injuries. The North Carolina EMSC committee is active in reviewing criteria required in providing pediatric trauma care.

Emergency Medical Services for Children (EMSC) is a broad based, comprehensive effort to improve health care delivery to children who have become suddenly ill or injured. High quality care can be provided only through the collaborative efforts of many health care professionals and child advocates, working through the whole spectrum of care from prevention to pre-hospital care through ED stabilization, critical care, and rehabilitation. As a primary care provider one way in which you play a critical role in this process is through educating parents and other care givers regarding recognition of pediatric emergencies. When should they call EMS and when should they call you? Should they take CPR or other training? These are important educational activities that you should undertake. You, as a primary care provider, may provide support to children and families once they enter the emergency system, and the myriad of subspecialists involved in the care of the multiply injured child. Once the acute phase of treatment has passed, primary care providers can coordinate rehabilitative care with the goals of returning the child to the level of activity that was normal before the emergency occurred.

Finally, it is important that your office, when it becomes the entrance point to the EMS system for a patient, is familiar with the EMS system in your region, and prepared to integrate quickly and efficiently into it.

Role of Primary Care Providers in EMS

To assist with the overall success of your local EMS system, you can work with the EMS system to develop appropriate protocols for the treatment of children in the pre-hospital setting. You can participate in the development and delivery of educational programs for EMS personnel. You should be an advocate for 911 if it does not exist in your area. You should help develop and/or support pediatric educational programs for both initial training and continuing education of EMS personnel.

Primary care providers are critical to the success of an EMSC program. It is through your commitment and working with all the members of the EMS team that high quality emergency care for children will become a reality.

Running Mock Codes in the Office

Purpose

Full pediatric cardiopulmonary arrest is, fortunately, an extremely rare occurrence in the primary care setting. Despite this fact, emergencies do occur in the office setting. In most cases these emergencies will be severe presentations of common pediatric diseases, including asthma, bronchiolitis, DKA, dehydration, head injury, poisoning or seizures. All of these disorders can become life-threatening if not managed appropriately and swiftly in the office.

In any emergency the ABC's must be addressed immediately. The sooner basic and advance life support is initiated, the greater the chance for complete recovery. However, the knowledge and skills required at the time of an emergency are not those that the primary care provider uses often. The mock code is a relatively simple drill that can help the entire office develop confidence and proficiency at a rare, but extremely important time for a critically ill child.

Managing an office emergency requires much more than just the clinical expertise to treat a severe or unusual disease. Communication and organization among the entire office staff are vital for a good outcome for the patient. Mock codes are tools to assist the entire office team develop these skills.

The mock code presented in this course is meant to represent "a typical scenario" that could occur in any office or clinic setting. The equipment used and the number of people who participate will vary depending on the location and style of your practice. The purpose is to represent *priorities and overall techniques* during an office emergency. It ***IS NOT*** to demonstrate what equipment or medications should be in all offices as that will vary depending upon your practice.

Overall Goal

The goal of this section is not just to demonstrate how a mock code could be done in your office. But also to provide suggestions and tools to help you organize your own ongoing practice drills. Only in this way can your staff maintain readiness to handle rare pediatric emergencies.

The instructor of the course will leave you with additional materials (code charting forms, drug references for code medications, and evaluation tools) you may use in your office during mock or real emergencies.

Goals for Individual Staff Members

1. Receptionist, secretary or other office staff who see the patient initially can identify signs and symptoms of an impending emergency ("Red Flags"): Respiratory Distress, Cyanosis, Seizures, Altered Mental Status, etc.
2. Office nurse, physician or both will review equipment needs, organize equipment, and familiarize staff with its location and proper use.
3. Providers will familiarize staff with local EMS, including proper access and capabilities.
4. Providers are familiar with medications used in cardiopulmonary emergencies.
5. Equipment and supplies are organized in a resuscitation room or code box

using a color-coded system (i.e. Broselow-Luten system).

6. Receptionist, nurse or other office staff will document during resuscitation.
7. Providers will maintain current resuscitation skills (through PALS, etc.) and request the same of the staff.

Suggestions for Organizing Office Based Mock Codes

1. Schedule them on a regular interval (monthly, quarterly) when all the staff is able to participate.
2. Involve all members of the office - Physicians, Nurses, Secretaries, Clerks, Nurse Practitioners, Physician assistants, etc. Consider inviting local EMS personnel to participate.
3. Choose scenarios that relate to severe presentations of relatively common problems: severe wheezing, dehydration, meningitis, head injury, DKA, etc.
4. Evaluate the code afterward to identify your strengths and weaknesses, and make changes in your office or organization to improve.
5. Develop a system to check equipment and medications at a regular interval to make sure stock is always present and not outdated.

During the mock code

1. Establish roles: Leader, Airway, Circulation, Recorder, a staff member that draws up meds and sets up equipment, another who repeatedly assesses the patient
2. Try to mimic an actual emergency as much as possible. During the mock code pretend that the intervention has not happened until that therapy has been set up and "delivered". In other words—the IV can't be started until someone has found the appropriate sized catheter and handed it to the individual attempting access. Providers will be better prepared if they have had actual practice in finding the medications and drawing them up. This could become expensive if all equipment and medications are opened and have to be discarded afterward. It may be useful to label saline vials as Epinephrine or Atropine, etc. for the purpose of practice drills. In some cases the local hospital or EMS may be able to supply outdated medication for practice.
3. Allow 15 minutes to "run" the code
4. Have a moderator (preferably not involved in running the code) supply information when requested; therefore, those running the code will not be certain of the outcome of their interventions until they are completed!

To Observe during the demonstration

CLINICAL

- ☐ Were the ABC's assessed rapidly at the onset of the emergency, then reassessed at frequent intervals during the resuscitation
- ☐ If IV access was not established within 90 seconds, did the team move rapidly to intraosseous access
- ☐ Once the ABC's were assessed, did the examiner complete a systematic evaluation of the patient
- ☐ When interventions were unsuccessful, did the team move rapidly to another intervention
- ☐ Was the patient stabilized before transfer, or was the "scoop and run" principle utilized
- ☐ Did office practitioners utilize services that EMS can provide, including equipment and skills

ORGANIZATIONAL

- ☐ Was EMS system activated promptly
- ☐ Was communication directed and clear between all members of the "code team"
- ☐ Were roles clearly assigned by the code leader
- ☐ Were all members of the code team free to make suggestions on the patient's behalf
- ☐ Did anyone speak to the family during the code
- ☐ Did someone record the events during the code

Scenario Samples

DKA 10 year old with new onset DKA. Polyuria and polydypsia for a week. Today lethargic and confused. Glucose 1200.

Sepsis 2 year old with meningococcemia. Found this morning with rash and almost completely unresponsive. Had URI yesterday otherwise fine.

Asthma 8 year old with Asthma. Has been wheezing for days with URI, but very severe this evening. Told mom before he was taken to the office that he had been giving himself puffs of his inhaler every half hour most of the day.

Head Trauma 6 year old with concussion and possibly more. Was playing soccer and collided with another child. The child was "out" for 2-3 minutes, then woke up and was groggy but oriented. Vomited once on the way to your office

Seizures 1 year old with a complex febrile seizure. Pulling at her ears and found to have a temp of 104. Mom gave her a bath to cool her off and she began to have a generalized seizure several minutes

	later. Her parents rushed her to the office while carrying her on their laps, and now the seizure has persisted for over 20 minutes.
Stridor	2 year old with possible epiglottitis. Woke up early this morning with very loud breathing and a barking cough. Feels very hot to touch, has been drooling for past 30 minutes, now appears nervous and tired.
Anaphylaxis	5 year old boy who was stung by a bee while playing outside. Mom notes that his eyes and lips swelled within minutes and she brought him to the doctor when he subsequently developed wheezing.

PROTOCOLS for Office Emergencies

The following section contains treatment protocols for pediatric office emergencies. The first section contains guidelines that have been published by the American Heart Association for cardiopulmonary resuscitation and emergency cardiac care. The guidelines cover both basic life support for the pediatric patient and medication algorithms for cardiovascular emergencies: asystole, bradycardia, ventricular tachycardia and ventricular fibrillation.

Some of this material is thoroughly covered in the Pediatric Advance Life Support Course (PALS), and it is not the purpose of this course to reteach it. However, in the interest of providing a quick, easy to use reference we have included the material on basic life support and full arrest in this manual as well.

As discussed previously, most office emergencies do not involve complete cardiopulmonary arrest, but severe presentations of common pediatric problems. Parents may not recognize the severity of an illness or the potential for deterioration, and may take the child to the primary care office rather than the emergency department. Early intervention by the primary care provider in these situations can truly make the difference between a good and bad outcome.

With this in mind, protocols for treatment of severe presentations of common pediatric emergencies are presented here. Some therapies may be very familiar while others are more obscure, and typically rendered in the pediatric emergency department or the intensive care unit.

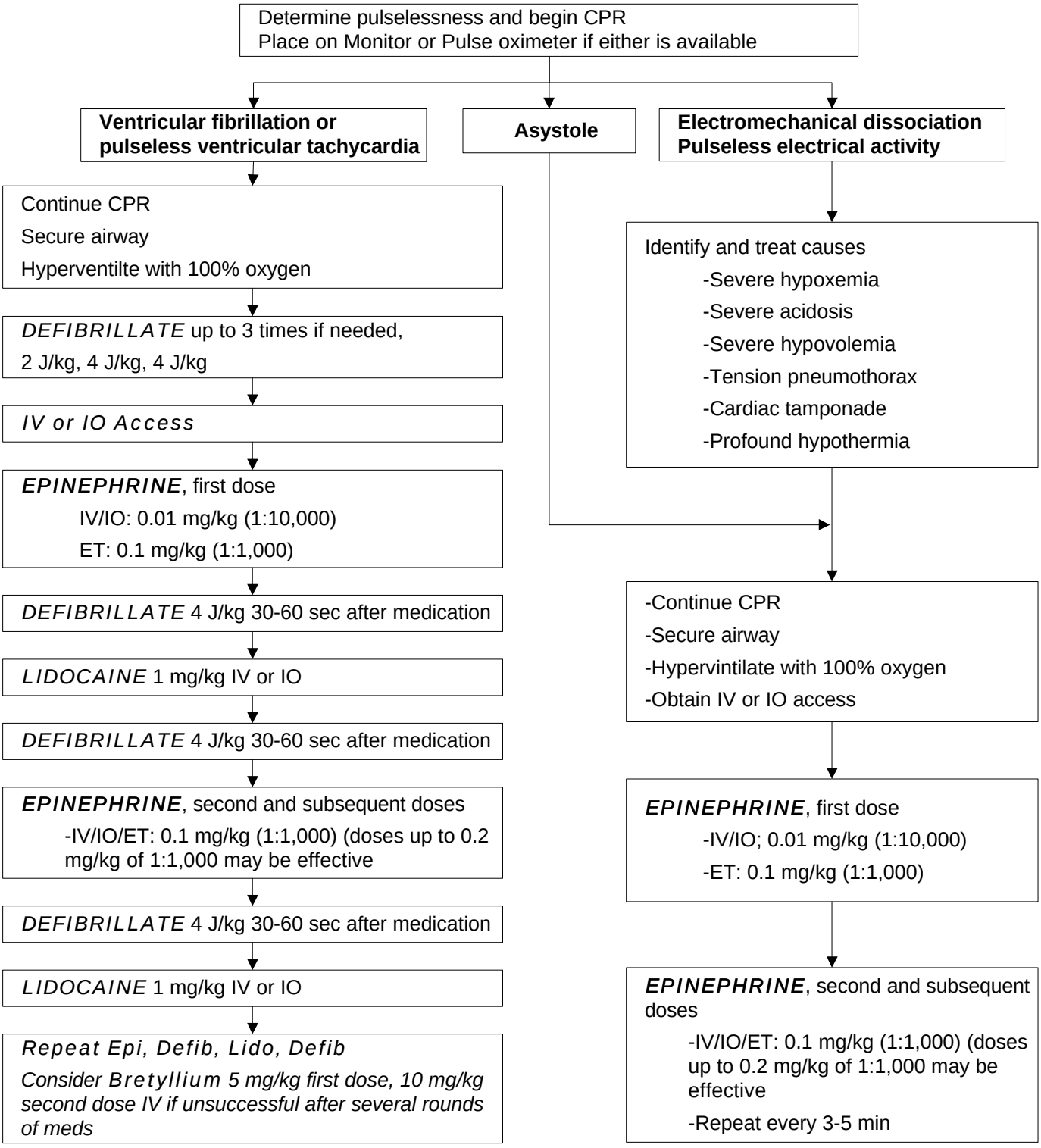
It is not expected that the primary care provider will have all of the suggested equipment or therapeutic agents at his/her disposal in the office. Sometimes the local EMS unit can supply necessary equipment or agents for stabilization. In other situations, such as an office located adjacent to an emergency department, equipment and therapeutic agents are readily available within minutes and thus are not required in the office itself.

It is hoped that this section will be very quickly reviewed prior to organizing and running a mock code, or even used as a rapid reference in that rare instance that a critically ill child presents to your office.

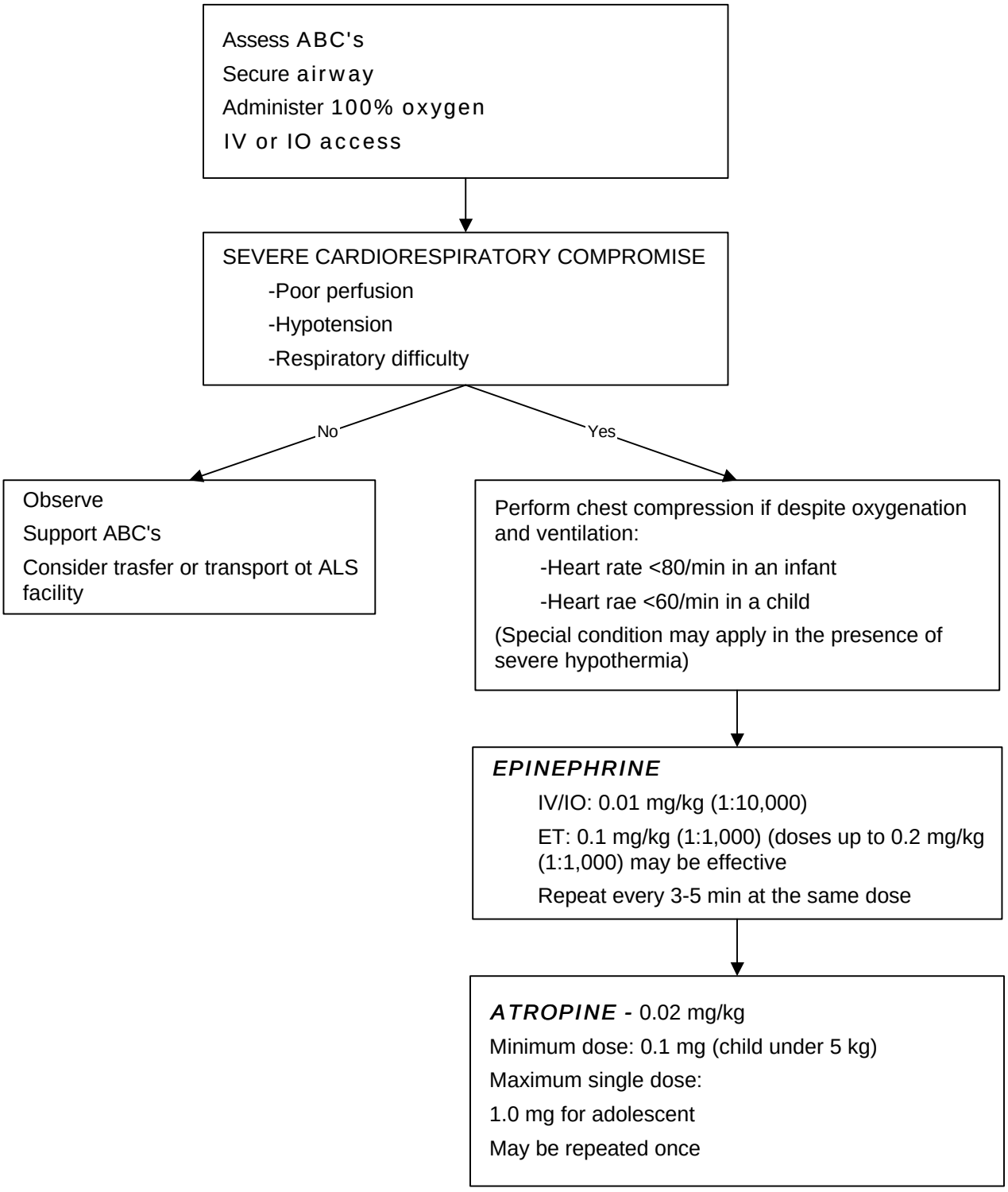
Basic Life Support

Maneuver	*Newborn*	*Infant (<1 yr.)*	*Child (1-8 yr.)*
AIRWAY	Extend neck; shoulder roll	Head tilt-chin lift (unless trauma present)	
BREATHING			
Initial	May require 30-40 cm H20	Two breaths at 1-1.5 sec/breath	
Subsequent	40-60/min at lower pressure	20 breaths/min	20 breaths/min
	(If patient asystolic, hyperventilate with 100% O_2)		
CIRCULATION			
Pulse Check	Brachial	Brachial/femoral	Carotid
When to compress	<60 or <60-80 and not responsive to bagging	<80	<60
Depth	ALL: 1/3 to 1/2 depth of the thoracic cavity		
Rate	120/min	At least 100/min	100/min
Compress/Ventil	3:1 (pause for ventil)	5:1	5:1
Location	Mid sternum	Lower 1/3 sternum	Lower 1/3 sternum
Technique	2 fingers or 2 thumbs encircling chest	2 or 3 fingers	Heel of one hand

Pulseless


Determine pulselessness and begin CPR
Place on Monitor or Pulse oximeter if either is available
Ventricular fibrillation or pulseless ventricular tachycardia
Asystole
Electromechanical dissociation Pulseless electrical activity
Continue CPR
Secure airway
Hyperventilte with 100% oxygen
DEFIBRILLATE up to 3 times if needed,
2 J/kg, 4 J/kg, 4 J/kg
IV or IO Access
EPINEPHRINE, first dose
IV/IO: 0.01 mg/kg (1:10,000)
ET: 0.1 mg/kg (1:1,000)
DEFIBRILLATE 4 J/kg 30-60 sec after medication
LIDOCAINE 1 mg/kg IV or IO
DEFIBRILLATE 4 J/kg 30-60 sec after medication
EPINEPHRINE, second and subsequent doses
-IV/IO/ET: 0.1 mg/kg (1:1,000) (doses up to 0.2 mg/kg of 1:1,000 may be effective
DEFIBRILLATE 4 J/kg 30-60 sec after medication
LIDOCAINE 1 mg/kg IV or IO
Repeat Epi, Defib, Lido, Defib
Consider Bretyllium 5 mg/kg first dose, 10 mg/kg second dose IV if unsuccessful after several rounds of meds
Identify and treat causes
-Severe hypoxemia
-Severe acidosis
-Severe hypovolemia
-Tension pneumothorax
-Cardiac tamponade
-Profound hypothermia
-Continue CPR
-Secure airway
-Hypervintilate with 100% oxygen
-Obtain IV or IO access
EPINEPHRINE, first dose
-IV/IO; 0.01 mg/kg (1:10,000)
-ET: 0.1 mg/kg (1:1,000)
EPINEPHRINE, second and subsequent doses
-IV/IO/ET: 0.1 mg/kg (1:1,000) (doses up to 0.2 mg/kg of 1:1,000 may be effective
-Repeat every 3-5 min

Bradycardia



Drug Delivery, Volume Administration and Vascular Access During Codes

Endotracheal Medication Delivery

Several drugs may be delivered via the endotracheal route; however, only epinephrine is used on a routine basis. The drug may be directly squirted into the opening of the endotracheal tube. Two to five mL of normal saline flush should be given immediately afterward. The patient must be bagged for several breaths prior to resuming chest compressions to prevent ejection of the drug and diluent back out the endotracheal tube by the increase in intrathoracic pressure.

Intraosseous Placement and Medication Delivery

A standard intraosseous needle or spinal needle with stylet, or 16 or 18-gauge hypodermic needle may be used. A needle with a stylet is preferred as it will prevent the needle from becoming occluded with bone on insertion. The needle should be placed about 1-2 cm below the tibial tuberosity on the medial surface of the tibia, perpendicular to the skin surface. The instrument should be supported in such a fashion that control is maintained when the needle is forced through the cortex of the bone and into the marrow. The needle usually is able to stand on its own. The needle may be aspirated for marrow (a thick bloody material), but if none returns this does not mean the needle is not correctly placed. The needle should be flushed with 3-5 cc of saline. If no swelling under the skin is observed and no fluid leaks around the needle, the needle is correctly placed.

All medications delivered via the intraosseous route should be followed by 3 cc of normal saline flush. All fluid should be administered in the form of boluses which are pushed through syringes; gravity will not provide sufficient force to allow fluid to drip from a bag.

Volume Administration

Fluid boluses are not included in pediatric asystole or bradycardia protocols as they have never been demonstrated to provide significant benefit. However, many patients have poorly functioning myocardium after return of spontaneous circulation during a code and volume administration will often improve cardiac output afterward. Also, children with hypovolemic shock secondary to severe GI fluid loss or overwhelming infections may be difficult to resuscitate without additional volume to improve preload to the heart. Therefore, 20 cc/kg of saline may be administered to an asystolic or bradycardic patient if 2 - 3 doses of Epinephrine have not resulted in return of spontaneous circulation.

Shock

Definition

Inadequate oxygen delivery to the tissues to meet their needs. May be caused by a number of different factors. Does not necessarily imply hypotension. A child will often be in shock long before hypotension develops.

Etiologies

- Hypovolemic shock: Dehydration, blood loss
- Septic shock: Meningitis, Menigococcemia
- Circulatory shock: Congenital heart disease, Myocarditis

Pathophysiology

The most common cause of shock in children is hypovolemia related to severe dehydration as a consequence of vomiting, diarrhea and inadequate enteral intake. This is more common in newborns and infants who cannot always be rehydrated adequately orally. Septic shock is relatively rare in an otherwise healthy child; it is much more common in patients whose immune system is abnormal (AIDS, chemotherapy).

In both hypovolemic and septic shock the primary problem leading to tissue oxygen debt (shock!) is diminished intravascular volume resulting in decreased cardiac output. As cardiac output is the product of stroke volume (blood pumped with each beat) and heart rate, the body tries to compensate for the diminished stroke volume seen with hypovolemia by increasing the heart rate. If hypovolemia is severe, the cardiac output will remain low despite rapid heart rates. The patient will then attempt to maintain blood pressure by increasing vascular resistance. Extremities will be cool, with diminished capillary refill; however, blood pressure may be completely normal (compensated shock). Only when hypovolemia becomes overwhelming do compensatory mechanisms fail and the blood pressure falls (decompensated shock).

Signs and Symptoms

	Mild (5%)	Moderate (10%)	Severe (15%)
Behavior	Normal	Irritable	Irritable/Lethargic
Mucous membranes	Normal	Dry	Parched
Anterior fontanel	Flat	Variable	Sunken
Circulation	Normal	Tachycardia	Tachycardia, maybe hypotension
Urine	Slight increase in Specific gravity	Increase in specific gravity	Oliguria, increase in specific gravity

Treatment

1. **AIRWAY & BREATHING** — It is not helpful to support the circulation if the patient is not able to get oxygen into the lungs and subsequently into the bloodstream. Every patient in shock should be treated emergently with 100% oxygen.
2. **CIRCULATION** — Perform chest compressions if asystolic or bradycardic.

3. VASCULAR ACCESS	Obtain vascular access as rapidly as possible. If patient is in impending circulatory collapse or arrest, spend no more than 1 to 2 minutes attempting peripheral IVs. If unsuccessful in that time period and the patient is under 6 years old, place intraosseous needle for vascular access.
4. VOLUME	Administer 20 cc/kg of normal saline or lactated ringers as a volume bolus over several minutes.
5. REASSESS	Reassess the patient after each volume bolus.
6. VOLUME	Repeat 20 cc/kg fluid boluses until the patient demonstrates some signs of improving circulatory status (heart rate decreases, mental status improves, blood pressure normalizes). This may require as much as 60 to 100 cc/kg in children with severe shock. Early aggressive volume resuscitation has been shown to reduce mortality in septic shock!!
7. TREAT UNDERLYING CAUSE	Treat underlying cause of shock if able: Broad spectrum antibiotics if infection suspected.
8. NO INOTROPES	Inotropic support may be necessary in severe cases of shock, but should not be used until intravascular volume is restored and adequate monitoring can be done. There is no role for this treatment in office setting.
9. VOLUME OVERLOAD?	Do not worry about "**volume overload**" in unusual cases of cardiogenic shock, such as myocarditis. Volume support is always indicated in the initial therapy and rarely results in clinical deterioration. In cases of septic shock, volume administration may lead to pulmonary edema and respiratory deterioration. This does NOT mean too much fluid was administered; often it is an unfortunate but expected finding in the course of the disease process.

Anaphylaxis

Definition

An acute, often explosive, systemic reaction characterized by urticaria, respiratory distress, and vascular collapse. Anaphylaxis occurs in a previously sensitized person when exposed to the sensitizing antigen.

Urticaria: Local wheals and erythema in the dermis.

Angioedema: A similar eruption, but with larger edematous areas that involve subcutaneous structures as well as the dermis.

Acute urticaria and angioedema are essentially anaphylaxis limited to the skin and subcutaneous tissues.

Etiologies

Exposure to any number of potential antigens. Most common causes are foreign blood products, certain drugs, desensitizing injections and insect stings.

Food allergies (from eggs, shellfish, nuts or fruits) typically result in urticaria or angioedema, but may be severe and lead to anaphylaxis in some individuals after exposure to even very small amounts.

Pathophysiology

A Type I allergic reaction occurs when the antigen reaches the circulation. Histamine and other vasoactive substances are released when the antigen reacts with IgE on basophils and mast cells. These substances cause smooth muscle contraction and vascular dilatation.

Signs and Symptoms

Typically in 1 to 15 minutes the patient complains of a sense of uneasiness and may become agitated and flushed. Older children may complain of palpitations, pruritus and difficulty breathing. An urticarial rash may quickly appear. The patient's face, eyes and tongue may rapidly swell. Stridor and/or wheezing may also quickly become audible and severe.

These symptoms may develop over minutes to hours or, if very severe, may progress to respiratory and/or circulatory failure very rapidly.

Treatment: Severe Anaphylaxis

1.	BASIC AND ADVANCED LIFE SUPPORT	Always begin here if necessary. Assess Airway, Breathing and Circulation
2.	EPINEPHRINE	NO IV PRESENT: 0.01 cc/kg subcutaneously of 1:1,000 Epinephrine. Administer as rapidly as possible as this therapy, more than any other, reverses all effects of anaphylaxis and should be effective almost immediately. Should always be used if any respiratory or circulatory abnormalities are noted. If IV present and severe respiratory symptoms or circulatory collapse, 0.1 cc/kg of 1:10,000 Epinephrine
3.	VOLUME	If IV present, 20 cc/kg of lactated Ringers or normal saline.

Mild to Moderate: Urticaria and/or Angioedema

1.	EPINEPHRINE	0.01 cc/kg of 1:1,000 Epinephrine subcutaneously
2.	BENADRYL	1 mg/kg IV or IM
3.	STEROID	Methylprednisolone (Solu-Medrol®) 1-2 mg/kg IV or Decadron 1 mg/kg IM

Upper Airway Obstruction

The procedure for removal of a foreign body from the airway depends on the age of the child. For the child older than 1 year, the abdominal thrust is recommended; for the younger child, back blows followed by chest thrusts are the maneuvers of choice.

OVER 1 YEAR

The abdominal thrust, or Heimlich maneuver, is recommended for relieving airway obstructions in children older than 1 year. It can be performed with the child standing, sitting, or lying down. When the child is conscious, the thrusts can be delivered in any of these three positions. When the child is unconscious, deliver the thrusts while he or she is supine.

Conscious - Standing or Sitting

1.	ENCIRCLE CHEST	Stand behind the child, arms directly under the armpits, and encircle the chest.
2.	HAND PLACEMENT	Place the thumb side of one fist against the middle of the child's abdomen, slightly above the navel and well below the xiphoid.
3.	UPWARD HAND THRUSTS	Grasp the fist with the other hand and exert five quick upward thrusts. The fist should not touch the xiphoid or the lower margins of the rib cage, because force applied to these structures may damage internal organs.
4.	COMPLETE 5 THRUSTS	Deliver each thrust in a separate, distinct movement. Continue the thrusts until the foreign body is expelled OR five thrusts are completed. If the child still hasn't expelled the obstruction, breathe directly into the mouth three or four times. If the child loses consciousness, use the following instructions with the child lying down.

Unconscious – Lying Down

1.	PLACE SUPINE	Place the child supine. Kneel close to the child's side or straddle the hips while facing the child's head.
2.	JAW THRUST	Use a chin lift or jaw thrust to open the victim's airway.
3.	HAND PLACEMENT	Place the heel of one hand in the middle of the child's abdomen, slightly above the navel and well below the rib cage and the end of the xiphoid. Place the other hand on top of the first.
4.	UPWARD THRUST	Press both hands into the abdomen with a quick upward thrust. If necessary, perform up to five separate and distinct thrusts. Direct each thrust straight upward towards the child's head, *not* to either side of the abdomen.
5.	CHECK MOUTH AND REPEAT THRUSTS	After five abdominal thrusts, check mouth for foreign body. DO NOT blind sweep. Try mouth to mouth breathing three or four times. If the airway remains obstructed, go back to step 1 and repeat the process.

UNDER 1 YEAR

Back blows followed by chest thrusts are recommended for relieving airway obstructions in infants younger than 1 year.

1.	POSITION INFANT	Hold the infant face down, resting on your forearm. Support the infant's head by firmly holding the jaw. Rest your forearm on your thigh to support

the infant; the victim's head should be lower than the trunk.

2.	BACK BLOWS	Forcefully deliver five back blows between the infant's shoulder blades, using the heel of the hand.
3.	REPOSITION INFANT	After delivering the back blows, place your free hand on the infant's back, holding the head so that the infant is sandwiched between your two hands. One hand supports the neck, jaw, and chest, while the other rests on the back.
4.	TURN THE INFANT	Turn the infant, supporting the head and neck carefully, and position the victim face up across your thigh. The infant's head should remain lower than the trunk.
5.	CHEST THRUSTS	Make five quick downward chest thrusts in the lower half of the chest, approximately one finger's width below the nipple line. These thrusts are similar to external chest compressions used during CPR, but are performed at a slower rate. Check mouth for foreign body. DO NOT blind sweep. Breathe three or four times directly in the child's mouth. If the airway remains obstructed, go back to step 1 and repeat the process.

Croup - Laryngotracheobronchitis

Pathophysiology

Infectious croup is usually caused by a viral upper respiratory infection causing erythema and edema of the subglottic region. The vocal cords are also often edematous, with impaired mobility. Hypoxemia develops when upper airway obstruction becomes severe and results in decreased alveolar ventilation. Other signs of infection are often present—including low grade fever and congestion. In contrast, spasmodic croup is not usually associated with an infection. It occurs at night with sudden onset of dyspnea, barking cough, and stridor in a previously healthy child. It often recurs on 3-4 consecutive nights.

Etiology and Epidemiology

- Parainfluenza type I, III; Adenovirus, RSV, Influenza A
- Patients aged 6-36 months, seen in late fall and early winter

Diagnosis

- 1-2 days of prodromal URI, followed by hoarse voice, barking cough, stridor, often begins at night, typically have mild fever
- If ***severe***: retractions, delayed air entry, hypoxia
- *AP neck soft tissue radiograph:* Subglottic edema ("steeple sign") (rarely necessary as diagnosis usually made clinically; radiograph may "rule-out" other diagnoses)
- In all cases of stridor it is important to consider epiglottitis, which is always a life-threatening emergency (See Next Section). These patients are almost always toxic in appearance, they have a high fever and sudden onset of symptoms.

Treatment--Moderate to Severe

1.	HUMIDIFIED OXYGEN	Moistens and humidifies the airway
2.	NEBULIZED EPINEPHRINE	0.25 cc of standard 1:1000 IV epinephrine added to 2.5 cc of normal saline in the nebulizer. It is not necessary to use racemic epinephrine as it is more expensive and provides no additional clinical benefit over the L-isomer (used in the intravenous form).
3.	STEROIDS	Decadron 0.5 to 1.0 mg/kg IV or IM.
4.	RESPIRATORY FAILURE	Proceed to manage as with any form of respiratory failure. ABC's. Even though airway obstruction may be severe, most patients can be adequately bag-valve-mask ventilated. If intubation is necessary, may need to choose an endotracheal tube that is smaller by 0.5 to 1.0 mm than would normally be used for that aged patient.

Epiglottitis

Pathophysiology

Supraglottic and epiglottic cellulitis with massive edema resulting in sore throat, dysphagia, and muffled stridor due to decreased air flow. Total airway obstruction may occur and be life-threatening because of the difficulty placing an endotracheal tube through a swollen and closed larynx.

Etiology

H. influenza type B (by far the most common cause, but substantially decreased in incidence since the advent of the H flu vaccine), S. pneumoniae, S. aureus, group A and C beta-hemolytic streptococci. Seen increasingly in teen and adults due to H. Flu vaccine given to young children.

Diagnosis

Acute onset fever (usually quite high), sore throat, drooling, rapidly progressing to respiratory distress. Child appears ***anxious, toxic, air hungry, tachycardic.***

Radiography: Lateral neck view thumb-like epiglottis, thickened aryepiglottic folds. Differential: croup (see previous section), omega epiglottis, normal variant, thermal/caustic injury, angioedema, lymphoma, histiocytosis, hemorrhage, and direct trauma.

Treatment

Epiglottitis **always** represents a life-threatening medical emergency because of the risk of sudden upper airway obstruction. It is impossible to know when or if this obstruction will occur; therefore, the airway must be protected with an endotracheal tube once the diagnosis has been made (or even highly suspected).

1.	TRANSPORT	Immediately transport to the nearest emergency facility (911) and call ahead to notify them of this patients impending arrival.
2.	CONTROLLED AIRWAY VISUALIZATION	Arrange for direct airway visualization under controlled conditions (usually in the operating room). This involves mobilization of both anesthesia and ENT surgery.
3.	IF RESPIRATORY FAILURE	If complete airway obstruction occurs en route or in the office, begin basic life support. Despite the severity of the airway obstruction, bag-valve-mask ventilation is almost always still effective!! Emergency tracheostomy should be planned for, but is very rarely required.

Wheezing: Status Asthmaticus/ Bronchiolitis

Pathophysiology

Narrowing of the mid to small airways resulting in difficulty with exhalation. During inspiration, negative intrathoracic pressure "pulls" the small airways open. During exhalation, the positive intrathoracic pressure tends to compress the already narrowed airways. This leads to air-trapping in the lungs and dead space (area of lung that is filled with gas but does not exchange with fresh air with each breath). Dead space results in ventilation/perfusion mismatch and hypoxia. In the most severe cases hypercarbia and respiratory failure may develop.

Airway narrowing is caused by a combination of mucus plugging, airway wall edema and smooth muscle bronchial wall constriction. Treatment, therefore, is aimed at reversing all these processes.

Etiology

Asthma implies an inherent abnormality of the airway. Asthma may be triggered by the following: allergies, cold air, exercise, environmental irritants (smoke), and most commonly, viral upper and lower respiratory tract infections of almost any etiology.

Bronchiolitis, by definition, implies an infection of the bronchioles. The most common cause is RSV; however, many other viral agents may cause it as well.

Differentiation

Because Asthma typically implies some degree of bronchoconstriction, the term is usually reserved for children over 1 year of age (as they have developed smooth muscle in the walls of the small airways) or for those who have had multiple bouts of wheezing. Bronchiolitis usually refers to viral URI's associated with wheezing (in children under one year of age).

The distinction is often blurred between these two processes as Asthma is commonly triggered by viral infections (even RSV) and many patients who have bronchiolitis clearly respond to bronchodilators indicating smooth muscle development in their small airways.

Therefore, treatment for the two processes is very much the same. This is especially true when the wheezing is severe.

Treatment of Severe Wheezing

1.	ABC'S	ABC's, as always, first and foremost.
2.	OXYGEN	Administer 100% oxygen.
3.	ALBUTEROL NEBULIZED	Albuterol 2.5 mg (0.5 cc of concentrated Albuterol) in 2.5 cc saline nebulized (may use 5 mg if ineffective) Repeat every 10 to 20 min (may give back to back if very severe wheezing; limited only if HR >180-200).
4.	STEROIDS	Solu-Medrol® 2 mg/kg IV bolus or Decadron® 1 mg/kg IM if no IV
5.	IPATROPIUM NEBULIZED *OR*	Atrovent® (Ipatropium) 250 mcg in 2.5 cc saline nebulized (500 mcg if > 10 yo) (useful if mixed with Albuterol neb).
5.	ATROPINE NEBULIZED	Atropine (if Ipatropium not available) 0.03-0.05 mg/kg nebulized. (use 0.4 mg/cc = IV form of Atropine; add normal saline to nebulizer to make total volume 3cc)
	IF BRONCHIOLITIS LIKELY	***If the patient is under 1 year of age and Bronchiolitis is suspected,*** nebulized epinephrine 0.25 cc of 1:1000 in 2.5 cc saline (has been shown

to be more effective than albuterol in several studies)

Pending Respiratory Failure

1.	PICU REFERRAL	Consult with pediatric critical care expert; call EMS as soon as possible to transfer to nearby ED
2.	CONTINUOUS ALBUTEROL	Continuous albuterol nebulization - 0.3 mg/kg/hr or give albuterol nebs back to back to back, etc.
3.	AMINOPHYLLINE	Aminophylline 6 mg/kg IV over 10 min; Infusion at 1 mg/kg/hr
4.	RESPIRATORY FAILURE	ABC's as always with basic and advanced life support.

Status Epilepticus (generalized tonic-clonic seizures)

Definition

Continuous seizure activity, or intermittent seizure activity without recovery of consciousness between seizures, that lasts for more than 30 minutes.

Pathophysiology

A. Abnormal cortical electrical discharge emanating from an abnormal focus in the brain which in turn spreads across the entire cortex resulting in loss of consciousness and generalized tonic-clonic motor activity.

B. Most common causes in children:

- Febrile illness in patients 1 to 5 year old (Approximately 25%)
- Idiopathic seizure disorder (first presentation of epilepsy) (Approximately 25%)
- Head trauma with possible increased intracranial pressure and/or hemorrhage
- Hyponatremia in children under 6 months of age who receive too much free water
- Hypoglycemia
- Intracranial infections: Encephalitis more common cause that bacterial meningitis (which rarely presents with seizures)
- Calcium and magnesium abnormalities are extraordinarily rare

C. Patients are typically unresponsive; the motor activity is almost rhythmic and can not be stopped by holding an extremity

D. The seizure itself is rarely detrimental to the patient; theoretically, the brain will develop nutritional deprivation and become permanently injured after 45 minutes to 1 hour of absolute, continuous seizure activity. ***This is extremely rare*** and only occurs when patients have prolonged seizures related to underlying problems (trauma, infection, severe electrolyte disturbances).

E. Airway and breathing often appear to be compromised as breathing is noisy and irregular, and the patient may be appear dusky. RESPIRATORY FAILURE OR SEVERE HYPOXIA ARE RARELY CAUSED BY THE SEIZURE ITSELF. Respiratory failure occurs much more commonly secondary to respiratory depressive effects of medications used to treat the seizure.

Goals of Therapy

A. Prevent complications from extraordinarily prolonged seizures

B. Prevent secondary complications from the cause of the seizure (i.e. prolonged hypoglycemia)

C. Prevent complications from side effects of the treatment of status epilepticus

Treatment

1. ABC'S — Rapidly assess and manage airway, breathing and circulation. As stated above, the airway is often intermittently obstructed and the breathing irregular. The patient is often mottled and cool. Usually no intensive airway or circulatory support is necessary unless apnea or severe shock

		are present.
2.	INCREASED ICP	If increased intracranial pressure is suspected (intracranial hemorrhage, tumor, head trauma), treat immediately by intubation and hyperventilation. Call EMS immediately and consult trauma center or pediatric intensivist.
3.	OXYGEN	Apply oxygen via face mask or nasal cannula. Pulse oximeters often work poorly in patients in status epilepticus. A blood will likely demonstrate metabolic acidosis and/or mild hypercarbia, which usually require no treatment.
4.	PREVENT INJURY	Prevent patients from harming themselves. Never place any objects in the mouth or nose.
5.	EMS	Notify EMS as soon as possible
6.	DETERMINE CAUSE	Look for common causes of status epilepticus. Check: Temperature Glucose if hypoglycemia suspected Sodium if hyponatremia suspected
7.	ESTIMATE DURATION	Estimate duration that the patient has been in status epilepticus.
8.	DRUG THERAPY NECESSARY??	If seizure has lasted longer than 10 to 15 minutes, begin treatment with anticonvulsants.
9.	ATTEMPT IV	
10.	IV SUCCESSFUL	Lorazepam (Ativan®): 0.1 mg/kg IV push OR Phenobarbital 10 mg/kg IV slow push Avoid diazepam (Valium®) IV if possible (may give 0.1 mg/kg, but has greater association with respiratory depression than Ativan®). Repeat a single dose of either medication if seizures persist.
11.	IV NOT SUCCESSFUL	Valium® 0.5 mg/kg RECTALLY up to 20 mg

Diabetic Ketoacidosis

Pathophysiology

Relative insulin deficiency with counterregulatory hormone (epinephrine, cortisol) overproduction in an effort to increase serum glucose. This results in:

- Ketoacidosis from cellular breakdown of fat rather than glucose for fuel
- Osmotic diuresis with hypovolemia and lactic acidosis from poor perfusion

When glomerular filtration rate falls because of hypovolemia serum glucose rises rapidly with development of an even greater hyperosmolar state. The brain develops "idiogenic osmols" (at least theoretically) to equilibrate with serum osmolarity and prevent brain shrinkage

Goals of Therapy

Replace fluid deficit, correct hyperglycemia and hyperosmolarity, maintain serum electrolytes within normal values, and correct ketoacidosis.

Complications of treatment

A. Elevated intracranial pressure. Etiology is uncertain, but may be associated with rapid shifts in water into the brain when fluid deficits are corrected.

B. Electrolyte abnormalities:

- Sodium- Usually low
- Potassium – Initially may be high due to acidosis, but quickly falls to low levels when acidosis is corrected.
- Phosphate – Low, but is almost never a clinical problem

Treatment

1.	ASSESS	ABC's, neurologic evaluation, AVPU (**A**lert, responds to **P**ainful stimuli, responsive to **P**ain; **U**nresponsive)
2.	COMA?	If severely neurologically depressed (GCS less than 8), consult with pediatric intensivist and consider rapid transfer to tertiary center. DO NOT BOLUS WITH INSULIN OR FLUID.
3.	SHOCK?	Significant dehydration is common, severe shock is rare. If hypotensive or in profound circulatory failure, resuscitate until circulation stable.
4.	EMS	Access EMS; transfer to emergency department or inpatient unit as soon as possible.
5.	LABS	Lab studies (those of which are available in the office): Accucheck, Urine (dip for glucose, ketones, blood, protein,) Electrolytes, CBC, Serum ketones, Serum osmolarity, pH (venous or arterial)
6.	IV	Place peripheral IV
7.	VOLUME	Administer 10cc/kg of normal saline over 30 minutes to 1 hour (should administer 20 cc/kg or more only if circulatory failure or severe shock).
8.	INSULIN	No insulin is necessary for 1 to 2 hours after first fluid bolus is administered; therefore, it is not necessary to administer insulin in the office if transfer is eminent. If transport is delayed, or if there is a long transport time before arrival at a hospital, begin regular insulin at 0.1 units/kg/hour via continuous infusion if possible. **An insulin bolus is almost never necessary as** this may result in serum glucose falling rapidly and in turn predispose the patient to worsening

	cerebral edema. If the office is not able to prepare an insulin infusion and two hours have passed since fluid was given, administer 0.1 unit/kg of insulin IV bolus. Follow glucose levels closely afterward. Subcutaneous insulin will be irregularly absorbed as the patient's perfusion changes and may result in unpredictable changes in serum glucose.
9. VOLUME REPLACEMENT	Continue fluid administration with maintenance fluids for age and weight, plus replace total fluid deficit (usually 10% body weight) with normal saline evenly over 48 hours. Add potassium to the IV fluid only when the serum potassium is known. Add dextrose to the IV fluid when the serum glucose falls to less than 250-300 mg/dl
10. REPEAT GLUCOSE TESTING	Follow glucose testing hourly as goal is to decrease serum glucose 50-100 mg/dl/hr. If the patient remains under your care for an extended period of time, remember to repeat glucose to determine effects of therapy.
11. DETERIORATES	If at anytime during treatment neurologic condition deteriorates profoundly, consider treatment for increased intracranial pressure (intubation, hyperventilation and mannitol).

Closed Head Injury

Pathophysiology

Head trauma is very common in children. Most injuries are minor and result in no severe damage to the brain. Occasionally, however, intracranial injury may be severe.

The degree of brain injury relates to the force of the blow to the skull. For example, high speed motor vehicle crashes are more likely to result in severe injury than are minor falls. Some minor injuries do result in slowly expanding intracranial hemorrhage or brain swelling.

In severe cases, intracranial hemorrhage or brain swelling leads to the development of increased intracranial pressure, with resultant decreased cerebral perfusion. Focal neurologic signs, or a depressed level of consciousness may result.

Assessment

1. ABC's first, as always
2. Rapid neurologic exam comprised of the following
    - Level of consciousness: AVPU or Pediatric Glasgow Coma Score.
    - Brain stem reflexes: cough, gag, pupillary response to light, corneal reflexes
    - Complete neurologic exam to check for any focal abnormalities in motor strength, sensory exam, coordination

Who Needs a Head CT

No sign or symptom is associated with 100% accuracy in predicting a positive finding on head CT. The following data are from a study published in 1987 of 98 children with closed head injury (GCS = Glasgow Coma Score).

- GCS of 12 or less, altered consciousness on admission, loss of consciousness for five minutes or more, unequal pupils, blood in the external auditory canal or behind the tympanic membrane and focal abnormalities on neurologic exam are each significantly associated with abnormal findings on CT
- The presence of vomiting or seizures was NOT more likely to be associated with abnormal CT findings
- All patients with posturing had abnormal CT findings
- No clinical findings, alone or in combination, accurately identified all patients with abnormal findings on CT

Treatment of Elevated Intracranial Pressure

1.	ABC'S	As always evaluate and treat first. Hypoxia or hypotension may lead to secondary brain injury.
2.	EMS	Access EMS as soon as possible.

Teaching Families – Recognizing, Managing and Preventing Emergencies at Home

Introduction

Primary care providers have many roles in EMSC. In addition to providing emergency care when needed, a primary provider can also serve as child advocate, coordinator of care, and educator. Providers can teach children and families how to recognize emergencies, how to respond to them appropriately, and how to prevent them from happening.

Recognizing Emergencies at Home

It is essential that parents can recognize a true pediatric emergency. Fortunately, infants and children are not likely to suddenly become seriously ill. Usually, children give parents some early warning that they are ill. The time of the day that the child is experiencing an emergency may dictate where the child goes for medical care. True emergencies that need to be treated in the emergency department at any time include:

- ***uncontrolled bleeding***
- ***labored breathing***
- ***cyanosis***
- ***convulsions/seizures***
- ***stupor/coma***
- ***head injury with transitory loss of consciousness or persistent confusion***
- ***ingestion of a known poison***
- ***major dental injury (displaced tooth)***
- ***obvious broken bones***
- ***fresh burns that blister and ooze clear fluid***

Accessing EMS

Easy access to the EMS system is essential and can be facilitated with the universal emergency access number **911**. It draws on computerized data bases to automatically identify the telephone number and location of the caller. This enables the EMS system to route the calls to appropriate facilities that will send assistance even if callers cannot communicate due to their conditions, language barriers, or other reasons. If the area is not serviced by **911**, parents should know the number of a nearby ambulance service or county Emergency Medical Service (EMS). Parents need to know about the emergency care that is available for children in their community. Questions that primary care providers should be able to answer for parents are:

1. Do ambulances in the community have equipment and supplies for children?
2. Are paramedics and EMT's properly trained to take care of children?
3. Is the local hospital prepared to take care of pediatric emergencies?
4. Are the most severely ill and injured children taken to specialized centers?

True Emergencies

Health care professionals train for years to distinguish between emergent and non-emergent situations. We must be mindful of the layperson who may have problems judging the severity of an illness or injury. It is important to remember that it is better for parents to err on the side of overreacting to the injury or illness rather than waiting until the child is critically ill. Emphasizing marked changes in behavior (lethargy, hyperactivity) rather than associated symptoms (cough, fever) may help parents to recognize pediatric emergencies. Written material addressing pediatric emergencies is very helpful for parents in reinforcing this information.

First Aid Education

First aid education should be provided to children and families. Topics may include:

1. Controlling hemorrhage
2. Responding to a choking spell or other respiratory difficulty
3. Helping the child who is experiencing a seizure
4. Dealing with a suspected fracture
5. Responding to a severely injured child
6. Managing high fevers
7. Caring for minor and moderate burns
8. Evaluating, cleansing, and bandaging a laceration, deep abrasion, or bite wound
9. Caring for eye injuries
10. Ingestions and poisonings

Home First Aid Kit

It would also be helpful for parents to have a home first aid kit. Contents might include:

1. A list of emergency phone numbers (including poison control center)
2. Adhesive strips, gauze, adhesive tape, bandage rolls
3. Antibiotic ointment
4. Acetaminophen preparations appropriate for the child's age
5. Hydrocortisone cream
6. Eye patches
7. Diphenhydramine
8. Sling
9. Elastic bandages
10. Suction bulb
11. Thermometer
12. Cotton balls
13. Hydrogen peroxide
14. Tweezers, scissors

Injury Prevention

Injuries from trauma are the leading killer of children in America. In fact, more children die from trauma related injuries each year than all other diseases combined. Oftentimes, trauma causes irreversible injury: once the damage is done, there is not much we can offer, despite all the recent advances in medical care. Clearly, the best treatment of trauma is to prevent it. Primary care providers can offer important information to children and families regarding injury prevention.

An effective method of teaching injury prevention to caretakers is through a developmental perspective. Each developmental stage carries unique risks that make children susceptible to injuries. It is important to reinforce to parents that certain injury prevention and safety issues overlap or continue throughout all stages of development. An excellent reference for injury prevention and health promotion is Green, M. (1994). Bright Futures. Guidelines for Health Supervision of Infants, Children and Adolescents Arlington, Virginia: National Center for Education in Maternal and Child Health.

Anticipatory Safety guidance - Infants (0-12 months)

1. Use car seats that are secured and the correct size. Do not place infant car seat facing backwards in front seat due to the risk of injury if the airbag is activated. Infants need to remain rear-facing in the back seat until they are one year old AND 20 pounds.
2. Ensure that baby's crib is safe: mattress is firm, fits snugly, no stuffed animals, pillows, or heavy quilts or blankets; do not put baby on soft surface such as pillows, couch, waterbed
3. Put baby to sleep on side or back
4. Set hot water heater thermostat $<120^{o}$ F
5. Test water temperature before putting baby in bath
6. Never leave baby alone with a young sibling or pet
7. Never leave baby alone in tub of water or on a high surface
8. Keep home, day care, and car smoke-free
9. Install smoke detectors and check periodically
10. Avoid overexposure to the sun
11. Don't drink hot liquids or smoke while holding baby
12. Keep sharp objects, small toys, and objects, plastic bags, latex balloons away from baby
13. Keep all poisonous substances, medications, cleaning supplies, paints, beauty aids out of sight and reach
14. Use safety locks on cabinets, drawers; keep safety caps on all medications
15. Do not use infant walkers at any age
16. Empty buckets, tubs, small pools immediately. Put lid down on toilets. Ensure all swimming pools are enclosed and locked
17. Do not leave heavy objects or hot liquids on tables with tablecloths that can be pulled down
18. Keep plastic plugs in electrical sockets
19. Install gates at the top and bottom of stairs
20. Lower crib mattress
21. Avoid dangling electrical and drapery cords
22. Learn first aid and cardiopulmonary resuscitation (CPR)
23. Get on the floor and check for hazards

Anticipatory Safety guidance - 1 to 5 years old

1. Switch to toddler size car seat. Continue rear facing until the child weighs at least 20 pounds. Forward facing seat should have the shoulder straps in the highest space on the seat. When the child's head is higher than the back of the seat, switch to a high back booster seat. Children should not be placed in regular seat belts until they can sit with the legs bent at the knee on the seat and the shoulder belt fits well across the chest. Children should never wear a lap-only style belt. Children to age 13 should always ride in the back seat.
2. Reexamine hot water heater for temperature
3. Supervise toddlers constantly whenever they are around water; teach the child how to swim
4. Apply sunscreen before toddlers go outside to play
5. Turn handles toward the back of the stove; keep toddler away from hot stoves, fireplaces, irons, curling irons, space heaters, electric tools
6. Keep cigarettes, lighters, matches, and alcohol away from toddler
7. Confine toddler's outside play area within fences or gates
8. Supervise toddlers when they are using the stairs
9. Keep toddlers away from moving machinery, lawn mowers, overhead garage doors, driveways, street, fans
10. Ensure toddler is wearing a helmet when riding in a seat on an adult bicycle or when riding on a tricycle or bicycle
11. Teach child to use caution when approaching animals, especially if they are unknown or eating
12. Never underestimate the ability of a toddler to climb: put the crib mattress at lowest rung, keep knives and hot liquids off tables
13. Ensure that toddlers wear a life vest if boating; inflatable flotation devices do not make a toddler safe in the water
14. Ensure that guns, if in the home, are locked up and that the ammunition is stored in a separate place
15. Never leave the child alone in the house or in a car
16. Ensure that playgrounds are safe
17. Supervise all play near streets and driveways
18. Establish and reinforce consistent, explicit and firm rules for safe behavior

Anticipatory Safety guidance - 5 to 11 years old

1. Ensure that the child wears a seat belt in the car at all times. Children should ride in the backseat until age 13.
2. Teach the child about safety rules for the home. Conduct fire drills and devise a fire escape plan. Lock up electrical tools, poisons, matches. Discuss what to do in the event of a fire or emergency
3. Teach child about safety rules when going to and from school. Teach pedestrian and neighborhood safety skills
4. Teach rules about bicycle safety. Teach correct signals for traffic safety (right, left turns). Ensure child always wears a safety helmet when riding a bike
5. Discuss playground safety
6. Teach the child about sports safety, including the need to wear protective sports gear such as mouth guards or face protectors
7. Do not allow the child to operate motorized equipment such as power lawn mowers or farm equipment

Anticipatory Safety guidance - 12 to 19 years old

1. Wear a seat belt in the car; insist that passengers wear seat belts; follow the speed limit. Children should ride in the rear seat until the age of 13.
2. Learn how to swim
3. Do not drink alcohol, especially when swimming, boating, or driving; plan to have a designated driver if drinking
4. Always wear a helmet when on a motorcycle, all-terrain vehicle, or bicycle
5. Wear appropriate protective gear at work and follow job safety procedures
6. Do not carry or use a weapon of any kind

Office Equipment List

The following list includes supplies above and beyond what any standard clinic or office would normally carry (i.e. gauze pads, alcohol wipes, etc.)

Airway Management

- Oxygen source with flowmeter
- Simple face masks - infant, child, adult
- Pediatric and Adult masks for assisting ventilation
- Self inflating bag with reservoir - 500 cc and 1000 cc
- Suction - wall or machine
- Suction catheters-Yankauer, 8, 10, 14F
- Oral airways (infant to adult sizes)
- Nasal cannulas-infant, child, and adult sizes 1-3
- Optional for intubation
  - Laryngoscope handle with batteries
  - Miller blades-0,1,2,3
  - Endotracheal tubes, uncuffed-3.0, 3.5, 4.0, 4.5, 5.0, 6.0, 7.0, 8.0
  - Stylets-small, large
  - Adhesive tape to secure airway

Fluid management

- Intraosseous needles-15 or 18-gauge
- IV catheters, short, over the needle 18, 20, 22, 24-gauge
- Butterfly needles - 23 gauge
- IV boards, tape, alcohol swabs, tourniquet
- Pediatric drip chambers and tubing
- D5 ½ normal saline
- Isotonic fluids (normal saline or lactated Ringer's solution)
- Optional: Central lines [over guidewire catheters] 3, 4, 5F

Miscellaneous

- Blood pressure cuffs – preemie, infant, child, adult
- Nasogastric tubes - 8, 10, 14F
- Sphygmomanometer manual

Optional

- Portable monitor/defibrillator (with settings <10)
- Pediatric defibrillation paddles
- Pediatric ECG skin electrode contacts (peel and stick)
- Pulse oximeter with reusable (older children) and non-reusable (small children) sensors
- Device to check serum glucose
- Strips to check urine for glucose, blood, etc.

Office Medications List

Medications

- Aqueous Epinephrine - 1:1000 *AND* 1:10,000 [1:1000 = 1 gram/1000 cc or 1 mg/cc and is available as both 1 cc glass vials which must be cracked and 30 cc multiple dose vials] [1:10,000 = 1 gram/10,000 cc or 0.1 mg/cc comes as a 10 cc Bristojet]
- Atropine sulfate
- Dextrose in water - 50%
- Sodium bicarbonate - 1 meq/cc (approximately)
- Lorazepam or diazepam
- Phenobarbital
- Antibiotics, parenteral [Ampicillin, Gentamycin, Ceftriaxone]
- Methylprednisolone or Dexamethasone
- Naloxone (1 mg/cc)
- Activated charcoal
- Albuterol concentrated for inhalation (5 mg/cc) [Also supplied premixed with 2.5 mg/2.5 cc]
- Lidocaine 2% (20 mg/cc)
- Benadryl (50 mg/cc)

Mock Code Log Form

Date/Time	***Scenario (Age/Diagnosis):***	***Participants***
Evaluation Form Completed (y/n):	***Comments***:	

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Date/Time	***Scenario (Age/Diagnosis):***	***Participants***
Evaluation Form Completed (y/n):	***Comments***:	

Emergency Drug Doses

DRUG	COMES AS	DOSE (WT.)	DOSE (VOL)	ADMINISTER
Epinephrine 1:10000	0.1 mg/cc	0.01 mg/kg	0.1 cc/kg	
Epinephrine 1:1000	1 mg/cc	0.1 mg/kg	0.1 cc/kg	
Atropine	0.1 mg/cc	0.02 mg/kg	0.2 cc/kg	
Na Bicarbonate	1 meq/cc	1 meq/kg	1 cc/kg	
Dextrose 25%	0.25 gm/cc	0.5 gm/kg	2 cc/kg	
Mannitol	250 mg/cc	0.5 gm/kg	2 cc/kg	
Adenosine	3 mg/cc	0.1 mg/kg	0.03 cc/k	
Lidocaine	40 mg/cc	1 mg/kg	0.025 cc/k	
Narcan (Naloxone)	0.4 mg/cc	0.1 mg/kg	0.25 cc/k	
Defibrillation	2 joules / kg			
	Repeat at 4 Joules / kg			
Cardioversion	0.5 Joules / kg			
			PATIENTS WEIGHT	

Mock Code Evaluation Form

	Yes	No	Comments
Clinical			
Airway assessed initially			
Breathing then assessed			
Circulation assessed			
Initial interventions			
Protocol followed for the chosen “case”			
Patient reassessed frequently			
Secondary Survey (head to toe exam)			
Organization			
All supplies requested were available			
Supplies were found quickly when requested			
Broselow tape used			
Arrest form available and/or used			
Personnel knew how to use equipment properly (O2 tanks, etc.)			
Protocols available and/or used			
Communication			
Leader communicated effectively			
Events recorded accurately			
Roles were assigned			
Office staff reported to EMS			
EMS communicated needs/plans with office staff			
Other comments			

Code Chart

Patient_____ **Date/Time**_____

Physician_____ **Nurse** _____ **Other** _____

Nurse_____ **Nurse** _____ **Other** _____

Time	Intervention	Medication/Dose/Route	HR	RR	BP	Temp	P Ox	O_2	CPR

Code start time	Transferred to
EMS Time Called	Physician referred to
EMS Time Arrived	Diagnosis
EMS Time Departed	
Paramedic	IV/Size/Location
IO Size/Location	ETT/Size