A Curriculum for Simulation in Pediatric Emergency Situations: Improving Pediatric Residents Skills and Self Confidence

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Management of cardiopulmonary events in children can be a challenge for pediatric residents due to the rarity of events and lack of skills training during residency. Literature[1234] suggests that residents have deficits not only in procedural skills, but also in the confidence and communication proficiency to successfully run a code. At the University of Florida, aside from PALS certification, there was no formal curriculum devoted to learning and maintaining code skills or enhancing self-confidence in these situations. We developed a year-long curriculum for our pediatric residents using simulation training and mock codes to reinforce these skills and develop resident self-confidence and communication during code scenarios, with the ultimate goal of improving patient outcomes. The simulation training curriculum breaks down the PALS guidelines into 7 modules: (1) Patient Assessment & Team Roles, (2) Airway Management & Respiratory Failure, (3) Compressions & Circulation, (4) Rhythm Recognition, (5) IV/IO Access & Medications, (6) Shock, (7) "Putting it all together". Residents are divided into groups of 5-8 and attend 30 minute training sessions which occur once weekly from 8:00-8:30 to review each module separately. Each module takes between 4-6 weeks to complete with the last module focusing on using the skills obtained throughout the year and running various patient scenarios. In addition, throughout the year, we hold 2-4 multidisciplinary mock codes per month which allow the residents an additional opportunity to practice and maintain their resuscitation skills.

References:

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Simulation Training Curriculum

Module 1: Patient Assessment & Team Roles
Module 2: Airway management & Respiratory failure
Module 3: Compressions & Circulation
Module 4: Rhythm recognition
Module 5: IV/IO access & Medications
Module 6: Shock
Module 7: Putting it all together/Simulation & Scenarios

Module 1-Patient Assessment & Team Roles
   I.   Primary Assessment & Team Roles
         a. Airway
               i. Movement of the chest or abdomen
               ii. Listen for breath sounds and air movement
               iii. Feel the movement of air from the nose or mouth
         b. Breathing
               i. Respiratory rate
               ii. Respiratory effort
               iii. Lung sounds
               iv. Pulse oximetry
         c. Circulation
               i. Skin color and temperature
               ii. Heart rate and rhythm
               iii. Blood pressure
               iv. Pulses
               v. Capillary refill
               vi. Brain perfusion (mental status)
               vii. Renal perfusion (urine output)
         d. Disability
         e. Exposure
   II.   Secondary assessment
         a. Focused history using SAMPLE
               i. S: signs and symptoms
               ii. A: allergies
               iii. M: medications
               iv. P: past medical history
               v. L: last meal
               vi. E: events leading up to illness
         b. Focused physical exam
   III. Team Roles
         a. Team Leader
         b. Assess the situation
         c. Identifies themself as code leader
         d. Assigns team roles
               i. Chest compressions (2)
               ii. Airway
               iii. IV access/Medications
               iv. Defibrillator
               v. Recorder

e. Ensures closed loop communication
f. Knowledge sharing
g. Constructive intervention

Module 2-Airway management & Respiratory Failure
I. Able to verbalize patient's head position for oxygenation and ventilation
   a. Head-tilt chin-lift (non-cervical neck injury)
   b. Jaw thrust (suspected or confirmed cervical neck injury)
II. Mag/Mask ventilation
   a. Attached BVM mask to bag
   b. Extend reservoir
   c. Verbalize that BVM is attached to an oxygen flow and turned on to maintain oxygen saturations > 94%
   d. Appropriate placement and size of BVM
       i. Apex-positioned on the bridge of the patient's nose
       ii. Base-positioned at patient's chin
   e. Ensure mask is adequately sealed to the patient's face using thumb and index finger on one hand in "E-C" clamp technique
   f. Provides two ventilatory breaths over one second at the end of each set of compressions using a compression to ventilation ratio of 30:2
   g. Visualization of chest rise
   h. Median time to endpoint
III. Intubation:
   a. Checks that suction is on and functioning before intubation
   b. Chose correct ET size
   c. Chose correct blade size
   d. Check laryngoscope light
   e. Patient pre-oxygenated before intubation
   f. Patient in sniffing position to intubate
   g. Use left hand to intubate
   h. Tube observed in trachea
   i. Median time to endpoint

Module 3-Compressions & Circulation
I. If pulseless, initiated and performed chest compressions
   a. Placed heel of the hand in the center of patient's chest. Placed other hand on top of the first with the fingers interlaced
   b. Pushes hard and fast at a rate of 100 compressions per minute
   c. Pushed with appropriate depth (infant 1.5 inches, child 2 inches, adult 2 inches)
   d. Allows for complete recoil after each compression
   e. Minimized interruptions of chest compressions
   f. Switched providers to avoid fatigue when there was provider fatigue or one cycle was completed (2 mins)
II. Defibrillation:
   a. Correct placement of chest pads
   b. Charges defibrillator
   c. Discharges defibrillator
   d. Clears the table

      e. Checks pulse after defibrillating

      f. Median time to endpoint

Module 4-Rhythm Recognition

    I.   Rhythm Recognition

        a. Bradycardia with a pulse

        b. Tachycardia with a pulse and poor perfusion

            i. Narrow complex

                  1. Sinus tachycardia vs SVT

           ii. Wide complex

                  1. Possible Vtach

                  2. Synchronized cardioversion

        c. Pulseless arrest

            i. VF/VT

                  1. Performs CPR and defibrillation

           ii. Asystole/PEA

                  1. Performs CPR

Module 5-IV/IO access & Medications

    I.   I/O placement

        a. Cleans I/O area

        b. Takes stylet out of line

        c. I/O stable in bone

        d. Flush I/O line

        e. Median time to endpoint

    II.   Medications

        a. Determines medication dosage using length based resuscitation tape

        b. Selection of drugs for RSI

    III.   Locations of items in the crash cart

Module 6: Shock

    I.   Recognize altered mental status and perfusion

    II.   Give oxygen and support ventilation

    III.   Establish vascular access

    IV.   Fluid resuscitation with 20 ml/kg boluses of isotonic fluid

    V.   Consider labs; VBG, ABG, lactate, glucose, ionized calcium, cultures, CBC

    VI.   Consider need for vasoactive drug therapy

Module 7-Putting it all together

    I.   Comfort and experience with critical pediatric resuscitation skills

        a. ability to lead and participate in resuscitation of critically ill patient

        b. resuscitation of respiratory failure requiring airway management

        c. resuscitation of shock requiring fluid resuscitation

        d. resuscitation of PEA

        e. resuscitation of bradycardia with hypotension

        f. evaluation and management of SVT and Vfib

        g. termination of resuscitation efforts