

## Appendix A

### Multidisciplinary Training Scenario:

8 months old infant with acute respiratory distress due to suspected viral infection was admitted to PICU 2 hours ago. Now respiratory rate has increased from 50 to 80 with decreased saturation on pulse oximetry from 95 to 85% with 3 L of oxygen via nasal cannula. 100% O<sub>2</sub> with tight sealed mask increased saturation up to 89%. Severe suprasternal and subcostal retraction are noted on your exam. Chest X ray on admission showed hyperinflated lungs without cardiomegaly. Nebulizer treatment with albuterol or racemic epinephrine was not helpful. She has not taken any food or fluid by mouth last 6 hours and receiving intravenous fluid.

#### A. Basic Airway Management

*Simulator: Saturation on pulse oximetry will improve to 97% with 100% oxygen with effective bag-valve-mask ventilation (with visible bilateral chest rise). Saturation will remain low if the team does not provide effective bag-valve-mask ventilation with 100% oxygen.*

Expected intervention

- Open airway with head tilt- chin lift or jaw thrust maneuver
- Choose right size mask
- Check oxygen source is turned on
- Apply mask correctly (cover nose and mouth, avoid to cover eyes)
- Provide bag and mask ventilation to have good chest rise
- Prepare for intubation

(Call for suction, oral airway, end-tracheal tube, check laryngoscope, medication: sedatives and paralytics)

*Simulator: After medication (sedatives and paralytics) are given, the patient will become apneic.*

#### B. Advanced Airway Management

*Simulator: After the mask is removed from the simulator or manikin's face, in 30 seconds the saturation will start to drop from 98 to 85 over next 30 seconds. It will improve after 5 rescue breaths up to 98%. This will stay next 30 seconds if the mask is removed from the face, and will start to drop from 98 to 85% over 30 seconds. This will be repeated until successful intubation and primary and secondary confirmation is performed.*

- Apply laryngoscope with left hand
- Achieve appropriate direct laryngeal visualization without rocking
- End-tracheal tube placement in trachea

(This will be detected with chest rise by a simulator, visible to a facilitator on the computer monitor screen)

- Avoid mainstem intubation

(This will be detected with unilateral chest rise by a simulator, visible to a facilitator on the computer monitor screen)

- Hold end-tracheal tube when a stylet comes out
- Primary confirmation
- Secondary confirmation with a colorimetric end-tidal CO<sub>2</sub> detector

(This information will be given to a team by a facilitator if tracheal intubation is confirmed by a simulator)

## Appendix B

Operational Definition version 3

### 1. Identify oneself

**Score 0** if no one identifies their roles.

**Score 1** if some of the team members identify their roles.

**Score 2** all of the team members identify their roles.

### 2. Call for help

This needs to occur within 15 seconds after arrival to the bedside. In order to get a score, the rater needs to hear someone's response.

**Score 0** if this was not timely done (delay>1 minute).

**Score 1** for incomplete action (one of the respiratory therapist or the physician is called in timely manner (<1 minute)

**Score 2** if both respiratory therapist and physician were called within 1 minute, and first person needs to be called within 15 seconds.

### 3. Put gloves on Hands

Gloves need to be worn before touching the simulator.

**Score 0** if no one wears gloves

**Score 1** if some of the members wear gloves

**Score 2** if all of the team members wear gloves

### 4. Open airway with head tilt- chin lift or jaw thrust maneuver- this needs to occur FIRST within 15 seconds.

This needs to occur within first 15 seconds after arrival to the bedside.

**Score 0** if not done

**Score 1** if partially done

**Score 2** if well done

### 5. Choose right size mask.

**Score 0** if large or small size of mask is chosen.

**Score 2** if right size mask is chosen.

### 6. Check oxygen source is turned on. If not, turn it on.

This needs to occur before applying a mask to the simulator's face.

**Score 0** if there is a significant delay

**Score 1** if the mask was applied before simulator's face

**Score 2** if the oxygen was turned on before the mask was applied to simulator's face.

**7. Apply mask correctly.**

**Score 0** if the mask was applied incorrectly (upside down, pushing the eye or not covering the chin)

**Score 2** if the mask was applied correctly.

**8. Provide bag and mask ventilation to achieve visible chest rise**

In order to get a score, the rater needs to see effective chest rise on the captured image.

**Score 0** if there is no effective chest rise

**Score 1** if there is some effective chest rise

**Score 2** if there is consistently effective chest rise

**9. Ask for blood pressure measurement during bag and mask ventilation**

This needs to occur after mask ventilation is started and before the participant notifies the team for intubation (item 11). The rater cannot give a score if this happens only after the participant notifies the team that he is going to intubate.

**Score 0** if the participants did not discuss the blood pressure, and did not ask to measure the blood pressure.

**Score 1** if the participants discussed or mentioned about blood pressure before the notification of intubation.

**Score 2** if participants ask to measure blood pressure before the notification of intubation.

**10. Decide to intubate the trachea**

This need to occur within 60 seconds after bag and mask ventilation is started.

**Score 0** if the team did not decide intubation.

**Score 1** if the team decides intubation more than 60 seconds after bag and mask ventilation is started.

**Score 2** if the team decides intubation within 60 seconds after bag and mask ventilation is started.

**11. Notify the team for intubation**

This needs to be verbalized and the rater needs to hear someone's response.

**Score 0** if this does not occur.

**Score 1** if this was not verbalized, but the team moves toward intubation (general agreement without vocalization).

**Score 2** if this was clearly vocalized by one of the team members.

**12. Call for Suction**

**Score 0** if the suction was not called.

**Score 1** if the suction was called but not prepared correctly.

**Score 2** if the suction was called and was prepared correctly.

### **13. Call for Oral Airway**

**Score 0** if the oral airway was not prepared.

**Score 1** if the oral airway was prepared but not a correct size, or oral airway was inserted before sedative/narcotics was given.

**Score 2** if the correct size oral airway was prepared.

### **14. Call for Endotracheal Tube**

**Score 0** if the endotracheal tube was not prepared before the induction.

**Score 1** if the endotracheal tube was prepared without stylet.

**Score 2** if the endotracheal tube was prepared with stylet.

### **15. CORRECT SIZE endotracheal tube is called**

3.5 or 4.0 either with cuff or without a cuff needs to be called.

**Score 0** if less than 3 or greater than 4.5 endotracheal tube was called.

**Score 1** if 3.0 or 4.5 endotracheal tube was called.

**Score 2** if 3.5 or 4.5 cuffed or uncuffed endotracheal tube was called.

### **16. Call for Laryngoscope**

**Score 0** if laryngoscope was not prepared before induction.

**Score 1** if laryngoscope was not called, but prepared.

**Score 2** if laryngoscope was called and prepared.

### **17. Call for ETCO2 detector**

The call needs to be vocalized clearly to the team and the rater needs to see the equipment being prepared.

**Score 0** if ETCO2 detector was not called and was not prepared.

**Score 1** if ETCO2 was not called but it was prepared by a team member.

**Score 2** if ETCO2 was called and prepared by a team member. (Give score 2 if it was confirmed verbally when it was not called verbally initially).

### **18. Wear mask with eye protection**

**Score 0** if the mask was not worn.

**Score 1** if the mask without eye protection was worn.

**Score 2** if the mask with eye protection was worn.

**19. Call for sedative/narcotic medication**

**Score 0** if no sedative/narcotics was not called before induction.

**Score 1** if sedative/narcotics was called but not prepared to the bedside timely.

**Score 2** if sedative /narcotics was called before induction.

**20. Call for paralytic medication**

**Score 0** if no paralytic medication was called.

**Score 1** if paralytic medication was called but not prepared to the bedside timely.

**Score 2** if paralytic medication was called and given.

**21. Confirm an intravenous access is functional**

This needs to be vocalized clearly and the rater needs to hear someone's response.

**Score 0** if this was not checked.

**Score 1** if this was checked verbally.

**Score 2** if this was checked by flushing IV with saline flush.

**22. Confirm team crew at specific task**

A person to assist airway management and provide cricoid pressure, a person to push medication, and a person who watches vital sign changes are at least in place. The leader needs to confirm these roles.

**Score 0** if the each person was not in position.

**Score 1** if in between Score 0 and 2.

**Score 2** if the each person (resident, nurse, respiratory therapist) was in position.

**23. Ask for blood pressure cycle measurement before induction**

This needs to be vocalized clearly and the rater needs to hear someone's response.

In the high fidelity simulator group, this should be set up on monitor screen as per request.

**Score 0** if no blood pressure measurement request was made before induction.

**Score 1** if one time (non-cycled) blood pressure measurement was requested just before induction, or the cycled blood pressured measurement was requested after sedative/narcotics was given, or cycled blood pressure measurement was requested before induction at every 5 minutes or less often.

**Score 2** if blood pressure cycle measurement was requested before induction at every 2-3 minutes.

**24. Ask for cricoid pressure when sedative/narcotic is given**

This needs to be verbalized clearly and the rater needs to see the cricoid pressure is applied after sedative/narcotic is given, and before the paralytic is given.

**Score 0** if no cricoid pressure was given.

**Score 1** if cricoid pressure was applied at any time before direct laryngoscopy after sedative/narcotics was given.

**Score 2** if cricoid pressure was applied all the time after sedative/narcotics was given.

**25. Stop bag and mask ventilation at the CORRECT TIME for tracheal intubation**

Assisted bag and mask ventilation should be stopped when the patient is completely apneic, if the oxygen saturation is above 97 %.

**Score 0** if bag and mask ventilation was stopped while the patient was spontaneously breathing.

**Score 2** if bag and mask ventilation was stopped after the patient's spontaneous respiration stopped.

**26. Hold laryngoscope with left hand**

The laryngoscope should be held with a left hand at the time of insertion into the pharynx.

**Score 0** if the laryngoscope was held in right hand when endotracheal tube was inserted through oral cavity.

**Score 1** if the laryngoscope was initially held in right hand and swapped to left hand before endotracheal tube was inserted through oral cavity.

**Score 2** if the laryngoscope was held by left hand throughout the course.

**27. Be able to visualize vocal cord**

After the each intubation, the participant will fill out the sheet with glottic exposure score. Please evaluate based on the score (if visualization is not full, no score will be given).

**Score 0** if the participant stated that he/she was not able to visualize the vocal cord.

**Score 1** if the participant stated that the vocal cord visualization was not good.

**Score 2** if the participant stated that he/she was able to visualize the vocal cord well.

**28. Intubation in trachea**

This is confirmed if there is a lung expansion on the simulator debrief log.

No score will be given if the first attempt was failed (e.g. esophageal intubation).

Half of the score will be given if mainstem intubation occurs.

**Score 0** if first attempt was failed.

**Score 1** if mainstem intubation occurs.

**Score 2** if correct tracheal intubation was performed.

**29. Primary confirmation of tracheal intubation**

This score will be given if bilateral chest rise and auscultation over chest confirmed air movement. This score will be given if mainstem intubation is found by unilateral chest rise and/or breath sounds and the tube is adjusted.

**Score 0** if esophageal intubation or mainstem intubation was missed.

**Score 1** if mainstem intubation was recognized but was not adjusted to a right placement.

**Score 2** if esophageal intubation was detected by primary confirmation, or mainstem tube placement was detected and adjusted to a right placement, or a correct tube placement was confirmed by primary confirmation.

**30. Secondary confirmation with a colormetric end-tidal CO2 detector**

The score will be given if ETCO2 detector is attached and at least one bag tube ventilation is provided. The verbal feedback “the color is yellow” will be provided by a facilitator if the tracheal tube is in place.

**Score 0** if no ETCO2 detector was attached to bag-tube system.

**Score 1** if ETCO2 detector was attached but no response was asked, or color change was asked before positive pressure ventilation was given.

**Score 2** if ETCO2 detector was attached to bag-tube system and positive pressure ventilation was given, then the color change was asked.

**31. Stabilize endotracheal tube until it is secured**

The score will be given if the participant is holding the tube until the tube is secured, or the participant asked the helper to hold the tube while the participant is securing the tracheal tube. No score will be given if the tube was not held by anyone, or becomes unstable or dislodged.

**Score 0** if the tube was not held until the tube was taped.

**Score 2** if the tube was held until the tube was taped.

**32. Call for chest X ray**

Chest x ray needs to be requested verbally. In order to get a score, the rater needs to hear someone’s response.

**Score 0** if the X ray was not called.

**Score 2** if the X ray was called.

**33. Confirm endotracheal tube placement by chest X ray**

In order to get a score, the subject needs to ask the result of the X ray regarding 1. Tube position, 2. Pneumothorax 3. Lung field.



**Score 0** if no question was asked regarding the X ray result.

**Score 1** if some of the elements (tube position, pneumothorax, lung field) are asked.

**Score 2** if all elements were asked.

**34. React to hypotension after intubation**

Score will be given if the participant recognizes the hypotension after the tracheal intubation (for high fidelity simulation, it will show up on the screen, and for low fidelity simulation, it needs to be asked by a participant), and order a fluid bolus.

**Score 0** if no hypotension was recognized and bolus fluid was not given.

**Score 1** if tachycardia was recognized and bolus fluid was given.

**Score 2** if hypotension was recognized and bolus fluid was given.

**Global rating for BASIC Pediatric airway management (Global)**

1	2	3	4	5	6	7
Novice Airway skills require Significant improvement		Advanced novice Airway skills require moderate improvement		Competent most airway skills require minor improvement		Excellent few if any airway skills that only require minor improvement

**Global rating for ADVANCED Pediatric airway management (Global)**

1	2	3	4	5	6	7
Novice Airway skills require Significant improvement		Advanced novice Airway skills require moderate improvement		Competent most airway skills require minor improvement		Excellent few if any airway skills that only require minor improvement