Creation of Anesthesia Cognitive Aids to Improve Patient Safety

Aim of project

To create Anesthesia-based cognitive aid checklists to improve patient safety during critical events.

Background of project

Human error is inevitable.[1] With increased stress there is an increased likelihood of errors in memory and decision making.[2] The aviation industry has adopted the mandatory use of checklists for all aviation-related procedures in an effort to minimize risk in a high-risk environment. The use of a checklist is the standard protocol. The failure to use a checklist or completion of a checklist from memory is considered a violation of protocol and is, itself, an error.[3] During emergencies, the checklist also becomes a protocol for troubleshooting and provides a systematic approach to resolution of the situation.[4]

We implemented a similar process focusing on rare and/or critical events that may occur during surgery. When this type of event occurs, it is critical for the teams involved to react quickly, make the correct diagnosis, and use proper corrective actions. One missed step may have significant implications for patient outcome. However, regardless of the training and experience of the individuals involved, critical steps are easily missed secondary to the often chaotic nature of the crisis and may be improved by assigning a helper to be the reader of a checklist.[5]

The ease of access and use of these checklists is paramount to its successful implementation. An assortment of papers with a mixture of critical and extraneous information is unlikely to be useful in a crisis situation. When the information is logically organized with tabs that allow quick access to a clear algorithm of necessary steps to follow, then the checklist can readily be used to guide crisis management.

Planned intervention

After a review of the pertinent literature,[6,7] the following critical situations were identified as being appropriate for the use of a checklist:

1. Adult cardiac arrest/ACLS (including tachycardia with pulse, bradycardia, and acute coronary syndrome)
2. Pediatric cardiac arrest/PALS (including tachycardia with pulse and bradycardia)
3. Neonatal resuscitation after delivery or cesarean section
4. Anaphylaxis
5. Malignant Hyperthermia

1 Kohn LT, Corrigan JM, Donaldson MS, Editors; Committee on Quality of Health Care in America, Institute of Medicine. *To Err Is Human: Building a Safer Health System*. Washington, D.C.: The National Academies Press; 2000.

2 Sexton JB, Thomas EJ, Helmreich RL. Error, stress and teamwork in medicine and aviation. A cross-sectional study. *Chirurg*. 2000;71(6):suppl 138–142.

3 Helmreich RL. On error management: lessons from aviation. *BMJ: British Medical Journal*. 2000;320(7237):781.

4 Hales BM, Pronovost PJ. The checklist--a tool for error management and performance improvement. *J Crit Care*. 2006;21(3):231–235.

5 Burden AR, Carr ZJ, Staman GW, Littman JJ, Torjman MC. Does every code need a "reader?" improvement of rare event management with a cognitive aid "reader" during a simulated emergency: a pilot study. *Simul Healthc*. 2012;7(1):1–9.

6 *Cognitive Aid for Anesthesiology*. VA National Center for Patient Safety. Version June 2007.

7 Ziewacz JE, Arriaga AF, Bader AM, et al. Crisis checklists for the operating room: development and pilot testing. *J. Am. Coll. Surg*. 2011;213(2):212–217.e10.

6. Operating room or airway fire
7. Local anesthetic toxicity
8. Transfusion reaction

For each situation, the relevant literature and published guidelines were reviewed and synthesized into a single checklist of action items. Each algorithm was put into a standardized format in a clear and easy to read font, with particular action items made bold for emphasis. Action items were organized with the more important items listed first. Where drug administration was advised, the standard adult dose as well as weight based dosing was provided. Additionally, common differential diagnoses and treatment considerations were also included. Where an already published flowchart or diagram was felt to be useful, clear, and concise, it was included on the checklist.

In addition, a list of both IV medications, their standard preparation and concentrations, and standard dosing was added to the front of the binder for day-to-day use and as an aid to resident education.

A version number as well as last revision date was added to the page to help ensure that notebooks are kept updated as necessary. In addition, the authors responsible for developing each checklist were noted for future reference. Pre and post-implementation surveys are being conducted to gauge the helpfulness of this system and guide future improvements.

It is our expectation that the placement of these binders in every operating room and mobile anesthesia station will have the effect of improving both the speed and quality of the surgical team's responses to critical and unexpected events.

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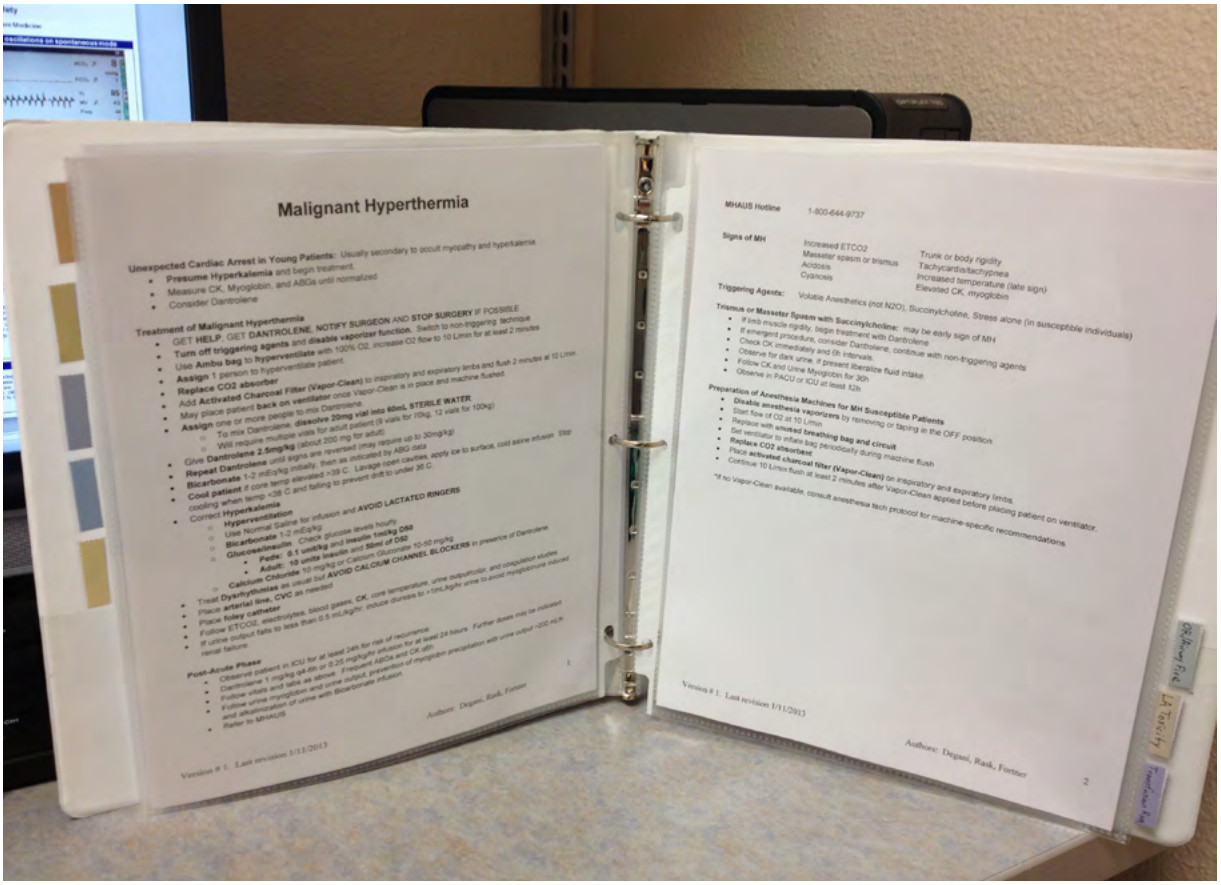


Neonatal Resuscitation

Possible etiologies

Meconium aspiration
Maternal hypotension
Congenital (diaphragmatic hernia)
Maternal narcotics/sedatives
In-utero asphyxia

General Resuscitation

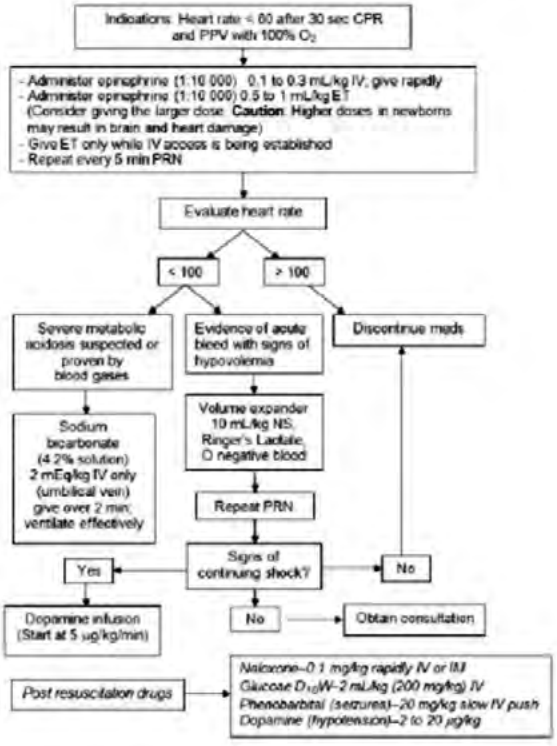
- **Prevent heat loss** with transfer to warmer
- Suction **mouth and nose**.
- **Dry** and **stimulate**
- Give **supplemental oxygen** if needed

If Meconium is present

- For **vigorous infant**: Nasal and oral suction only
- If **non-vigorous infant**: Intubation and ETT suction

If Respiratory Distress or **Bradycardia (<100 beats/min)**

- **CALL FOR HELP**
- Start **positive pressure ventilation** with **PEEP**
  - **100% FiO2**
  - Rate of **40-60 breaths/min**
- Consider **Intubation** (see ETT size chart at right)
  - **Miller 0-1 blade** for full term
  - **Miller 00-0 blade** for premature
- For **severe bradycardia (<60 beats/min)** start **chest compressions**.
  - **2 thumbs on sternum** with fingers encircling chest
  - **3 compressions for 1 breath (3:1 ratio)** with 120 events/minute
    - **If arrest suspected from cardiac cause**, use 15 compressions and 2 breaths (15:2 ratio)



Infant Weight	ETT size	ETT measurement at lip
< 1000 g	2.5	7 cm
1000-2000 g	2.5-3	8 cm
2000-3000 g	3-3.5	9 cm
> 3000 g	3.5-4	10 cm

Epinephrine Dosing

IV: 0.01-0.03 mg/kg/dose
ETT: 0.05-0.1 mg/kg/dose

1:10,000 0.5-1 mL/kg via ETT

Version # 1. Last revision 1/12/2013

Authors: Degani, Rask

Operating Room Fire

Management of OR Fire

- **ALERT** all personnel in the OR and **halt the procedure**
- **Pat out** or **smother** small fires on the surgical field
- **Take off drapes and blankets** from patient and check for smoldering
- **Decrease FiO2 as much as possible**

If Fire Continues

- **GET HELP**
- **Active fire alarm**, notify fire department
- **Get fire extinguisher**. Know ahead of time where fire extinguisher is located.
- **Disconnect ventilator circuit** to prevent backwards propagation of fire into anesthesia machine
- **Switch to Ambu controlled ventilation** on room air if possible until fire controlled.
- **Evacuate the patient** if necessary, on the operating room table if possible.
- After exit, **close doors to OR** and **turn off piped gases, air conditioning, and ventilation** to isolate the OR.
- **Notify staff** in other operating rooms

After Fire Controlled

- **Check** for burns, bleeding, smoke inhalation, or other injuries
- **Replace damaged equipment**

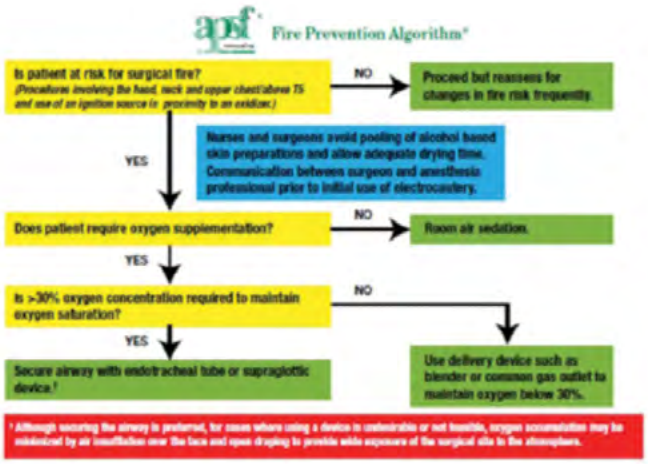
In Case of Airway Fire

- **Immediately remove the endotracheal tube**
- **Stop flow of all airway gases**
- **Remove sponges** or other flammable material from airway
- **Pour saline** in airway
- **Re-establish ventilation** with room air, if possible.
- **Examine ETT** to make sure no fragments may have been left.
- **Consider rigid bronchoscopy** to assess injury
- Obtain **chest x-ray**

Prevention of Airway Fires

- Anesthesia and surgical team articulate plan for ETT laser
- FiO2 < 0.3 optimal
- Confirm no N2O being used
- Discuss safe distance of laser from other objects
- Wet towels on face
- Bucket of water available
- Airway fire protocol reviewed

Prevention of OR Fires



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