



## EM CASES SUMMARY

### Episode 187 Crashing Anaphylaxis/AMAX4

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IF A PATIENT IS UNCONSCIOUS  
& NEEDING ASSISTED  
VENTILATION FROM ASTHMA  
OR ANAPHYLAXIS

**AMAX4**

**A**

#### ADRENALINE

1mcg/kg IV push dose or cardiac arrest dose.

**M**

#### MUSCLE RELAXANT

Single attempt must be best attempt.

**A**

#### AIRWAY

ETT with cuff for high pressures  
NOT LMA/Mask. FONA if required

**X**

**X**TREME VENTILATION  
**X**TRA BRONCHODILATORS  
**X**TRA VASOPRESSORS  
CONSIDER PNEUMOTHORAX

**4**

**4** MINUTES TO HYPOXIC  
BRAIN INJURY

## Anaphylaxis Definition

According to the World Allergy Organization (WAO)

1 *or* 2:

1. Acute onset laryngeal involvement, bronchospasm or hypotension after exposure to a known or highly probable allergens for that patient (minutes to several hours) even in the absence of skin symptoms
2. Acute onset of an illness (minutes to several hours) with simultaneous involvement of skin, mucosal tissue, or both

*and* 1 *or more* of the following

1. Respiratory compromise (dyspnoea, wheeze-bronchospasm, stridor, hypoxemia)
2. Reduced BP or associated symptoms of end organ hypoperfusion (eg hypotonia, syncope, incontinence)
3. Severe GI symptoms (eg severe crampy abdominal pain, repetitive vomiting, especially after exposure to non-food allergens).

*The key clinical clues of impending arrest secondary to anaphylaxis are any acute onset of a ) hypotension and/or b) bronchospasm and/or c) upper airway obstruction where anaphylaxis is considered possible, even if typical skin features are not present.*

## 7 Maximum Medications to consider in Crashing Anaphylaxis: Epinephrine, Rocuronium, Ketamine, Bronchodilators, Magnesium Sulphate, Vasopressors, Steroids

1. [Push dose epinephrine](#) 1mcg/kg IV push then 1mcg/kg/min and titrate
2. **Rocuronium** 1.2mg/kg IV push paralytic if patient is maintaining muscle tone
3. **Ketamine** 1-2mg/kg IV **induction agent** if patient is maintaining muscle tone; consider **ketamine infusion** 1-10 mg/kg/hr for it's bronchodilator properties
4. **Continuous bronchodilators** in circuit (salbutamol 0.5 mg/kg/h (max 15 mg/h) + ipatropium 3 x 250 mcg for a 1-hour continuous nebulization) or IV (eg IV salbutamol 10-15 mcg loading dose, then 5 mcg/min, increase by 5 mcg/min to a maximum of 20 mcg/min)
5. **IV Magnesium sulphate** 40 mg/kg to 75 mg/kg over 20 to 30 minutes (max 2.5 g)
6. **Noradrenaline +/- vasopressin** to target a perfusing BP
7. **IV steroids** [eg. Methylprednisolone 1 to 2 mg/kg (max 80 to 125 mg) or Hydrocortisone 5 to 8 mg/kg (max 400 mg)]

## Hyoxic respiratory arrest is the cause of death in the majority of pediatric fatal anaphylaxis cases

The majority of pediatric patients with severe anaphylaxis suffer a hypoxic respiratory arrest as a result of severe bronchospasm. **Hypoxic brain injury after respiratory arrest ensues within 4 minutes**, so the necessary treatments need to be coordinated and completed as efficiently and rapidly as possible. Chest compressions do *not* significantly alter the time to hypoxic brain injury as circulating oxygenated blood does not prevent hypoxic brain injury. The usual CABCs do not apply to this sub-population of crashing anaphylaxis patients with bronchospasm. Airway management is paramount. The old ABCs mnemonic applies.

**Simulation practice** is invaluable for teams to accomplish this goal of airway control and delivery of life-saving medications within 4 minutes.

**Food allergy is the most common trigger** of severe anaphylaxis with bronchospasm in pediatric patients.

## Endotracheal intubation via RSI is the airway strategy of choice and should not be delayed in the unconscious patient with suspected anaphylaxis

Endotracheal intubation via RSI is the airway strategy of **choice** and should not be delayed in the unconscious patient with suspected anaphylaxis as this strategy can handle the high airway pressures (50-100 cmH<sub>2</sub>O) associated with severe bronchospasm. **Supraglottic devices and BVM cannot handle the high airway pressures and therefore not recommended in this patient population.** An endotracheal tube with an inflated cuff is the only effective method to oxygenate an arrested anaphylaxis or asthma patient. ETT has the added benefits of preventing aspiration and avoid airway obstruction as a result of progressive upper airway edema. Time to full sedation should not delay the endotracheal intubation attempt in the arrested patient. The initial attempt at securing the airway should be done by the most experienced person in the room immediately. If the first attempt at endotracheal intubation fails ("can't intubate, can't ventilate), front of neck surgical access such as a cricothyrotomy should be performed immediately.

### Cricothyrotomy masterclass from EM Cases Summit Conference Video

<https://vimeo.com/857588266>

Initial breaths after securing the airway should be delivered via **manual bag compressions and lateral chest squeeze** after each breath delivered (rather than with a ventilator) while maximal medical therapy is continued. Once switched onto the ventilator,

use 6mL/kg volume, low I:E ratio, RR 8-12, no PEEP initially, and avoid breath stacking.

## The risk of obstructive hyperinflation and pneumothorax

If the airway maneuvers and medicines are not effective immediately, **consider pneumothorax and do not hesitate to perform bilateral finger thoracostomies if necessary.**

## The Max Mckenzie case

[https://www.youtube.com/watch?v=JlHgIT\\_MiGA](https://www.youtube.com/watch?v=JlHgIT_MiGA)

AMAX4 website [AMAX4 – Every Second Counts](#) includes more details of the AMAX4 algorithm, a pdf download lanyard card, lecture series and more.

## References

1. Cardona V, Ansotegui IJ, Ebisawa M, El-Gamal Y, Fernandez Rivas M, Fineman S, Geller M, Gonzalez-Estrada A, Greenberger PA, Sanchez Borges M, Senna G, Sheikh A, Tanno LK, Thong BY, Turner PJ, Worm M. World allergy organization anaphylaxis guidance 2020. World Allergy Organ J. 2020 Oct 30;13(10)
2. McKenzie, B. AMAX4 Lecture Series. Obtained from <https://www.amax4.org/lecture> September, 2023.

