

# 78 year old patient in respiratory distress

Michael W. Donnino, MD

Associate Professor of Medicine, HMS

Attending Physician Emergency and Critical Care Medicine

Director of Center for Resuscitation Science

[mdonnino@bidmc.harvard.edu](mailto:mdonnino@bidmc.harvard.edu)

# Case

- 78 year old male admitted with pneumonia who had an episode of vomiting followed shortly thereafter by worsening respiratory status...
- When you walk into the room, you see an agitated patient with a respiratory rate of 30/min and oxygen saturation of 95% on non-rebreather mask
- Pt is pulling non-rebreather mask from his face and appears anxious

What Next?

# “Call Anesthesia”

# Intubation

- More than just a “procedure” in this high-risk population
- Need a multi-disciplinary, team-based approach

# Acute Respiratory Failure

- Commonplace but one of the “highest-risk” conditions that we routinely manage
- Complications:
  - Failed airway
  - Severe Hypoxia
  - Cardiovascular collapse/hypotension
  - Cardiac arrest



Contents lists available at ScienceDirect

# Resuscitation

journal homepage: [www.elsevier.com/locate/resuscitation](http://www.elsevier.com/locate/resuscitation)



Clinical paper

## Acute respiratory compromise on inpatient wards in the United States: Incidence, outcomes, and factors associated with in-hospital mortality<sup>☆</sup>



Lars W. Andersen<sup>a,b,c</sup>, Katherine M. Berg<sup>d</sup>, Maureen Chase<sup>b</sup>, Michael N. Cocchi<sup>b,e</sup>, Joseph Massaro<sup>f,g</sup>, Michael W. Donnino<sup>b,d,\*</sup>, for the American Heart Association's Get With The Guidelines<sup>®</sup>-Resuscitation Investigators

<sup>a</sup> Department of Medicine, Regional Hospital Holstebro, Aarhus University, Holstebro, Denmark

<sup>b</sup> Department of Emergency Medicine, Beth Israel Deaconess Medical Center, Boston, MA, USA

<sup>c</sup> Research Center for Emergency Medicine, Aarhus University Hospital, Aarhus, Denmark

<sup>d</sup> Department of Medicine, Division of Pulmonary and Critical Care Medicine, Beth Israel Deaconess Medical Center, Boston, MA, USA

<sup>e</sup> Department of Anesthesia Critical Care, Division of Critical Care, Beth Israel Deaconess Medical Center, MA, USA

<sup>f</sup> Harvard Clinical Research Institute, Boston, MA, USA

<sup>g</sup> Department of Biostatistics, Boston University School of Public Health, Boston, MA, USA

# Acute Respiratory Compromise

- Incidence: 45,000 cases/per year in-hospital the US (likely underestimate)
- In-hospital mortality: 39%

# Acute Respiratory Compromise

- Incidence: 45,000 cases/per year in-hospital the US (likely underestimate)
- In-hospital mortality: 39%
- However, 6% suffered cardiac arrest during the episode
- In-hospital mortality: 83%

# Acute Respiratory Failure → Cardiac Arrest

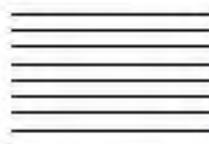
- Worst outcome as is oftentimes almost equal to in-hospital death
- Incidence:
  - Anesthesia Operating Rooms: 1 in 10,000
  - Emergency Department: 1-5%
  - In-hospital: 5-15%
- Possibly preventable
- Risk factors -

# Acute Respiratory Failure → Cardiac Arrest

- Worst outcome as is oftentimes almost equal to in-hospital death
- Incidence:
  - Anesthesia Operating Rooms: 1 in 10,000
  - Emergency Department: 1-5%
  - In-hospital: 5-15%
- Possibly preventable
- Risk factors - hypotension, hypoxia



<http://dx.doi.org/10.1016/j.jemermed.2016.11.060>



**Original  
Contributions**



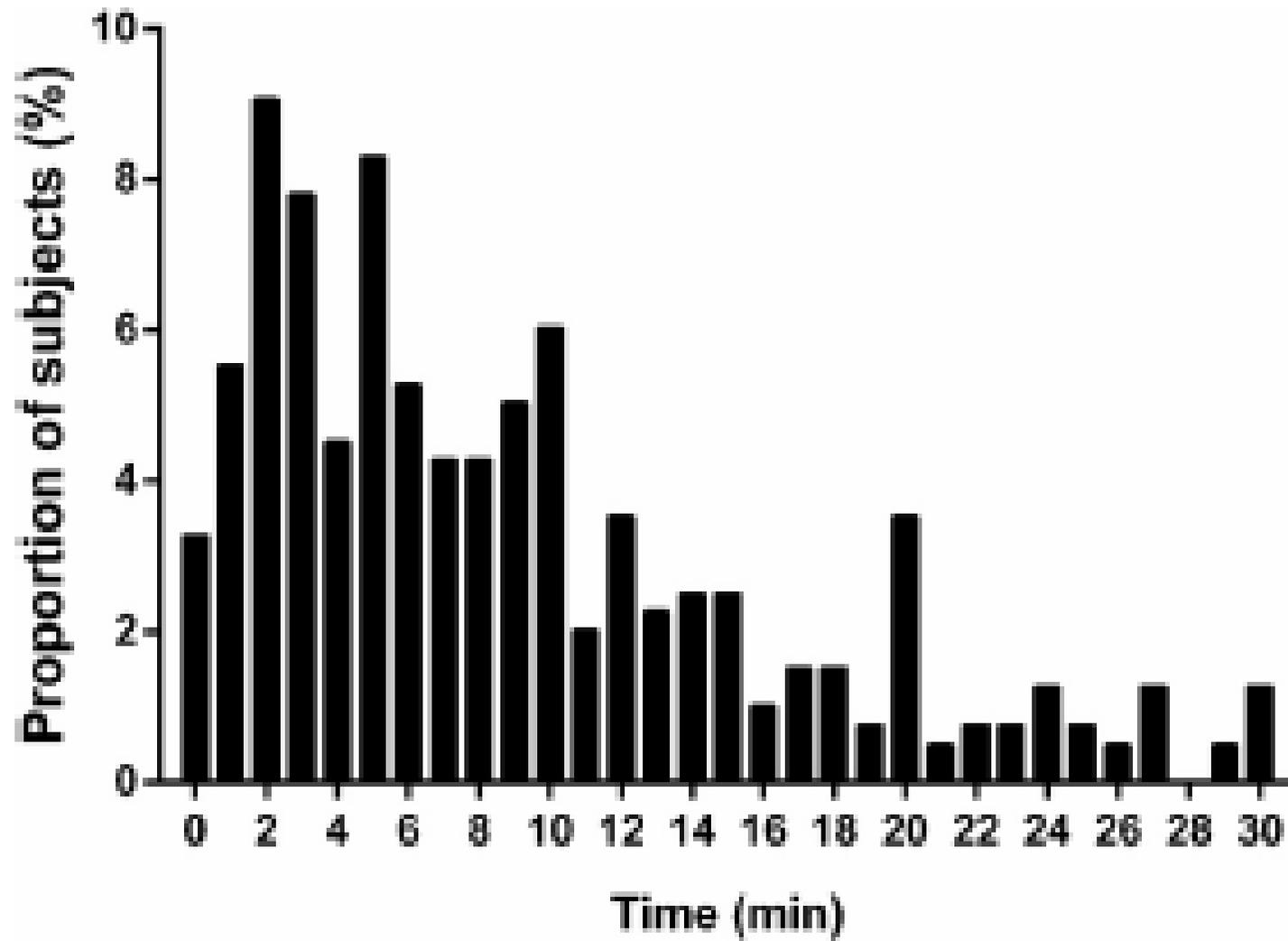
**ACUTE RESPIRATORY COMPROMISE IN THE EMERGENCY DEPARTMENT: A  
DESCRIPTION AND ANALYSIS OF 3571 EVENTS FROM THE GET WITH THE  
GUIDELINES-RESUSCITATION® REGISTRY**

Carl Mathias Karlsson, BS,\*† Michael W. Donnino, MD,\*‡ Hans Kirkegaard, MD, PHD, DSC,†  
Michael N. Cocchi, MD,\*§ Maureen Chase, MD, MPH,\* and Lars W. Andersen, MD, MPH, PHD \*†|| for the American  
Heart Association's Get With the Guidelines-Resuscitation® Investigators

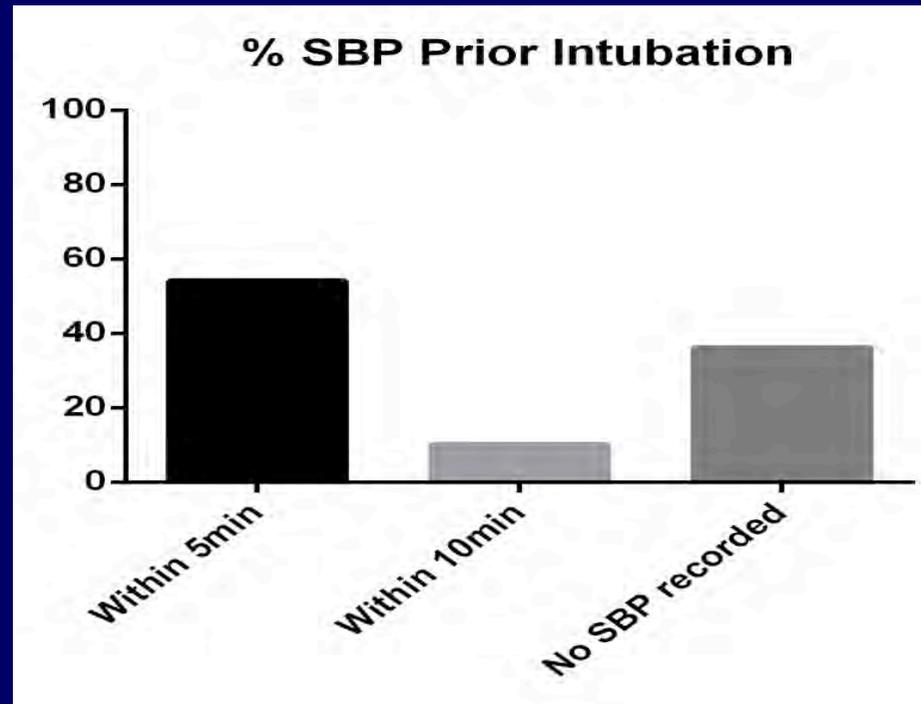
\*Department of Emergency Medicine, Beth Israel Deaconess Medical Center, Boston, Massachusetts, †Research Center for Emergency  
Medicine, Aarhus University Hospital, Aarhus, Denmark, ‡Department of Medicine, Division of Pulmonary, Critical Care, and Sleep Medicine,  
Beth Israel Deaconess Medical Center, Boston, Massachusetts, §Department of Anesthesia Critical Care, Division of Critical Care, Beth Israel  
Deaconess Medical Center, Massachusetts, and ||Department of Anesthesiology, Aarhus University Hospital, Aarhus, Denmark

Reprint Address: Lars W. Andersen, MD, MPH, PhD, Research Center for Emergency Medicine, Aarhus University Hospital, Nørrebrogade 44,  
Bygning 30, 1. sal, 8000 Aarhus C, Denmark

# Time from Intubation to Cardiac Arrest



# Hemodynamics not always considered and intervention was rarely given



- Only 10% of patients with ARF received a fluid bolus
- None of pre-intubation hypotensive patients received a fluid bolus

Is This Preventable? What Should We Do?

# Optimize Pre-Oxygenation

- Non-rebreather versus BVM
- Non-invasive ventilation
- Other evolving concepts – high-flow nasal oxygen

# Hemodynamic Management

- Optimize hemodynamic status
  - Fluids (almost always initiate fluid bolus)
  - Pressors (push dose versus infusion if needed)
- Ensure optimal monitoring prior to intubation and continuing

# Post-intubation Care

- Ensure tube placement (ETCO<sub>2</sub> – ideally, quantitative)
- Continue to optimize hemodynamics – remember that any push dose pressor has short half-life!
- Post-intubation monitoring – continuous ETCO<sub>2</sub> +/- arterial line
- Arterial blood gas within 15-30 minutes and optimize ventilator settings
- Sedation plan (pre-planning plus ‘right’ choice)

# Acute Respiratory Failure Checklist

Table 1. Intubation care bundle management

---

Pre-intubation

1. Presence of two operators
2. Fluid loading (isotonic saline 500 ml or starch 250 ml) in absence of cardiogenic pulmonary edema
3. Preparation of long-term sedation
4. Preoxygenation for 3 min with NIPPV in case of acute respiratory failure ( $FiO_2$  100%, pressure support ventilation level between 5 and 15  $cmH_2O$  to obtain an expiratory tidal volume between 6 and 8 ml/kg and PEEP of 5  $cmH_2O$ )

During intubation

5. Rapid sequence induction: etomidate 0.2–0.3 mg/kg or ketamine 1.5–3 mg/kg combined with succinylcholine 1–1.5 mg/kg in absence of allergy, hyperkalemia, severe acidosis, acute or chronic neuromuscular disease, burn patient for more than 48 h and medullar trauma
6. Sellick maneuver

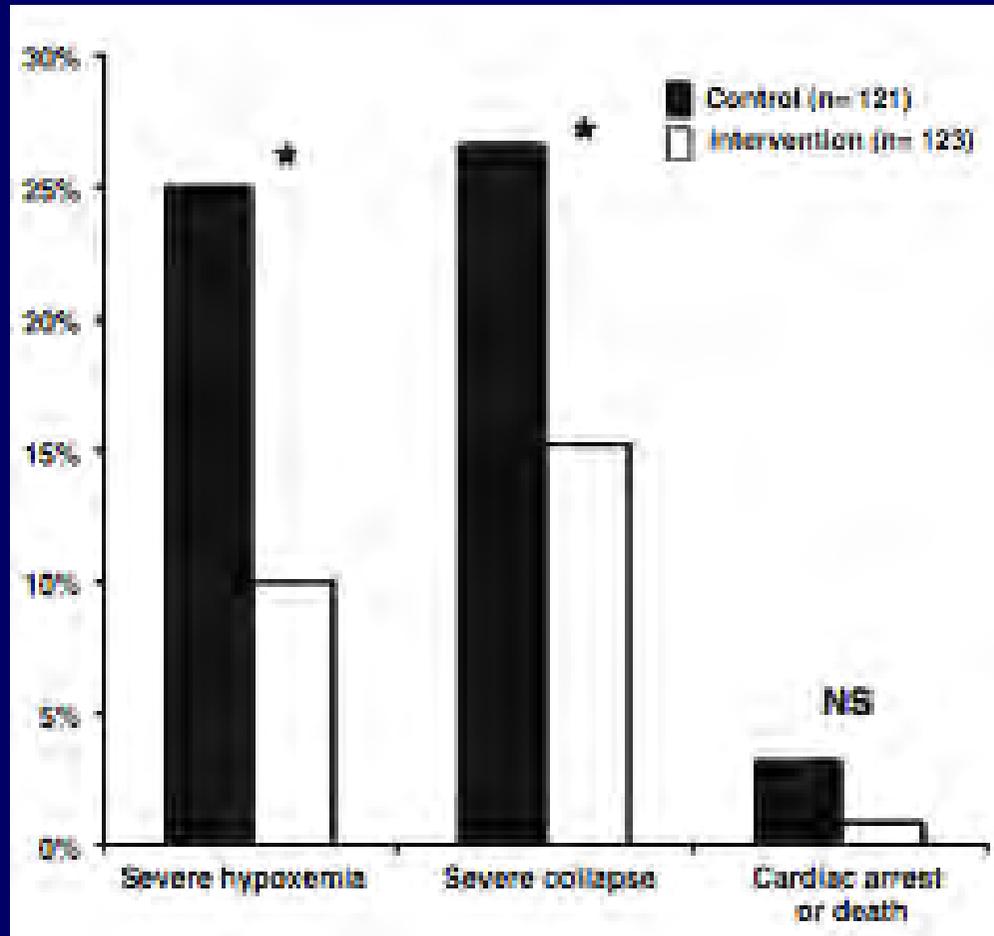
Post-intubation

7. Immediate confirmation of tube placement by capnography
8. Norepinephrine if diastolic blood pressure remains  $<35$  mmHg
9. Initiate long-term sedation
10. Initial “protective ventilation”: tidal volume 6–8 ml/kg of ideal body weight, PEEP  $<5$   $cmH_2O$  and respiratory rate between 10 and 20 cycles/min,  $FiO_2$  100% for a plateau pressure  $<30$   $cmH_2O$

---

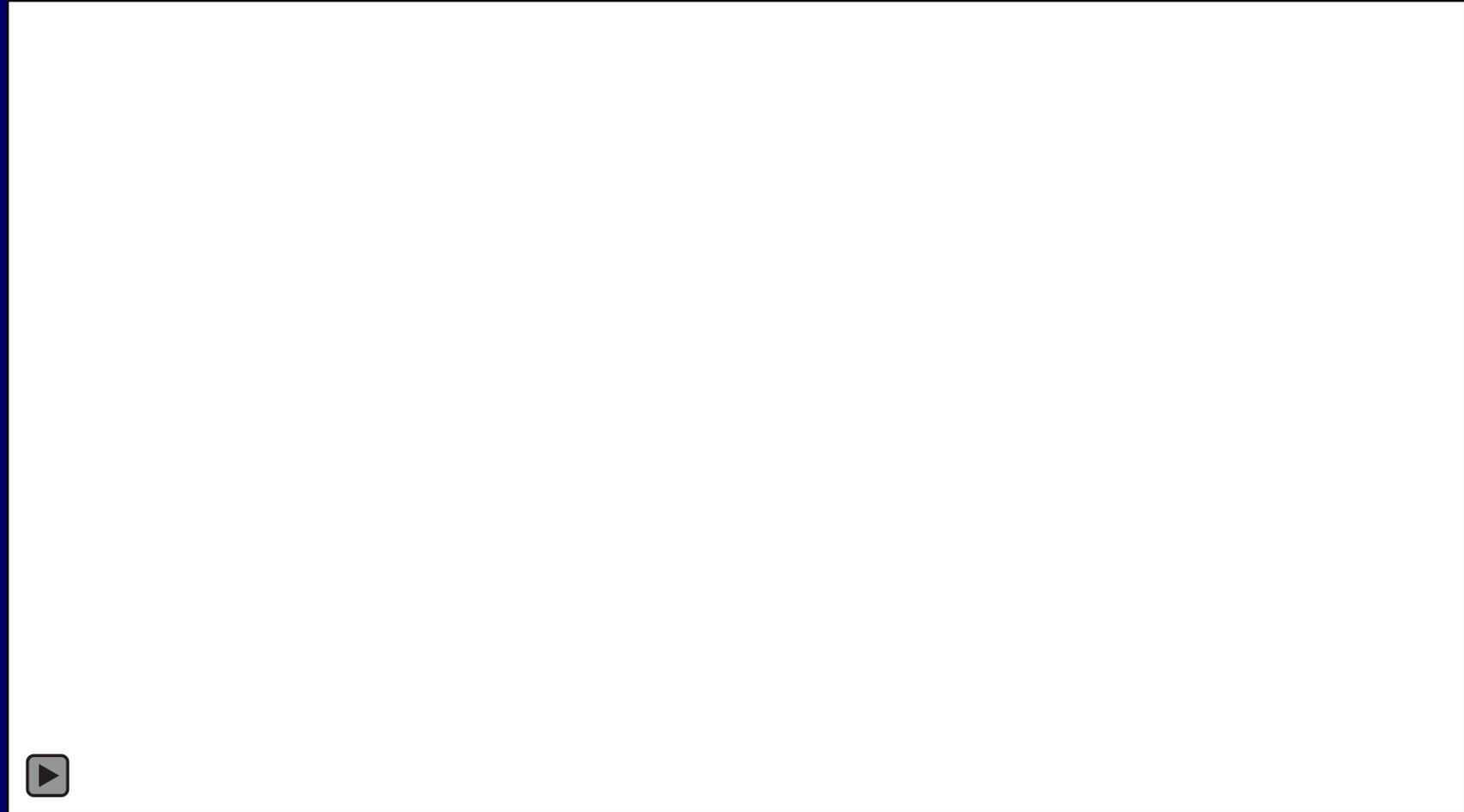
*NIPPV* non-invasive positive pressure ventilation, *PEEP* positive end expiratory pressure, *FiO<sub>2</sub>* inspired oxygen fraction

# Pre- Post- Intervention



(Jaber S. Intensive Care Medicine 2010)

Wait – there is not enough time in an emergent situation for a checklist



Captain Sullenberger: Hey, uh...this is Cactus 1549 – hit birds and have lost thrust in both engines...returning back towards LaGuardia



Approximately 10-15 seconds after the bird strike, the co-pilot begins the “double engine failure” checklist

# ACUTE RESPIRATORY FAILURE CHECKLIST

## PREPARE PATIENT

- Apply monitoring devices (Defibrillator, spO<sub>2</sub>)
- Apply EtCO<sub>2</sub> monitoring (With RT)
- Pre-oxygenate the patient with 100% oxygen per non-rebreather, bag-valve mask ventilation with high-flow oxygen, or NIV
- If unresponsive, establish oral airway
- Remove headboard from bed
- Check and document vital signs (BP, pulse, RR, spO<sub>2</sub>)
- Ensure IV access (Prepare for potential fluid bolus)
- Initiate fluid bolus and vasopressors if needed to optimize hemodynamics
- Confirm K+

▪Phenylephrine in pharmacy bag  
▪Levo and Dopa in code cart

## PREPARE EQUIPMENT

- Have bag-valve mask hooked up to oxygen and turn on to 15 L/minute or greater
- Prepare suction
- Place airway box and bougie at head of bed
- For known difficult airway, notify RT to access difficult airway cart
- Consider avoidance of propofol
- Prepare post-intubation sedation plan
- Initiate transfer plan to ICU

▪Etomidate and Ketamine located in pharmacy bag

## PREPARE TEAM

- Identify:
- Team Leader
  - Anesthesia / ED Attending
  - Respiratory Tech
  - CC Nurse
  - Pharmacy
- If needed request Emergent Surgical Airway: Call Operator Services at 2-1212 and identify that you are requesting an Emergent Surgical Airway. Be prepared to provide the following information:
- Location (floor, room)
  - East or West Campus
  - Your Name
  - Your call back Number

## POST-INTUBATION CARE

- Verify tube placement with BOTH auscultation and continuous ETCO<sub>2</sub>; document
- Document lip line
- Re-check and document vital signs (BP, pulse, RR, spO<sub>2</sub>)
- Optimize RR considering autopeep vs acidosis
- Continue fluid therapy and/or vasopressors as needed
- Continue to monitor and document vital signs
- Ensure expedient transfer to ICU

**IN EVENT OF DIFFICULT INTUBATION CRICOTHYROIDOTOMY KIT IS LOCATED IN BOTTOM OF CODE CART**



However, Captain Sullenberger turned on the auxiliary engines within seconds and the co-pilot never actually finished the checklist before they hit the water...

# Acute Respiratory Failure → Cardiac Arrest

- Worst outcome as is oftentimes almost equal to in-hospital death
- Incidence:
  - Anesthesia Operating Rooms: 1 in 10,000
  - Emergency Department: 1-5%
  - In-hospital: 5-15%
- Possibly preventable
- Risk factors - hypotension, hypoxia

code  
**PRE-EMPT**

**P** ▶

**R** ▶

**E** ▶

**E** ▶

**M** ▶

**P** ▶

**vitals/resuscitate)**

**T** ▶ **Transfer to the ICU rapidly  
(if not there)**



Beth Israel Deaconess  
Medical Center



HARVARD MEDICAL SCHOOL  
TEACHING HOSPITAL

# Conclusions

- Acute respiratory distress/failure/compromise is a common occurrence
- Intubation during acute respiratory distress is more than just an “airway procedure” and a team-based approach is essential
- The key elements of success:
  - Optimize pre-oxygenation
  - Optimize hemodynamics
  - Anticipate difficult airways
  - Good post-intubation care
  - Consider “PRE-EMPT” or similar approach