

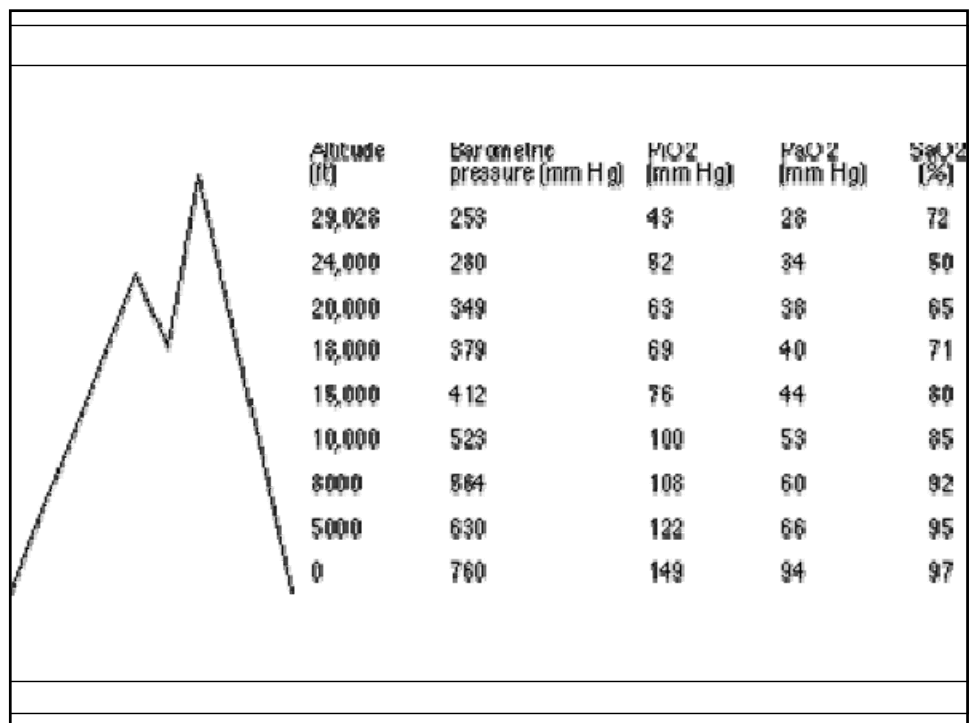
# **Why Do Medical Emergencies Occur at 35,000 Feet?**

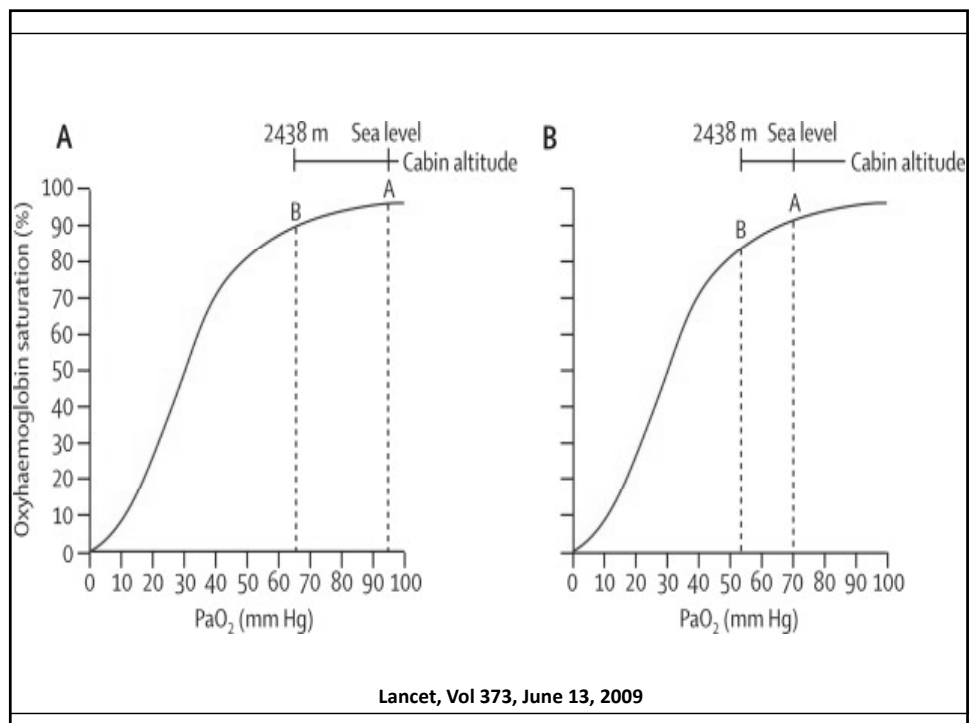
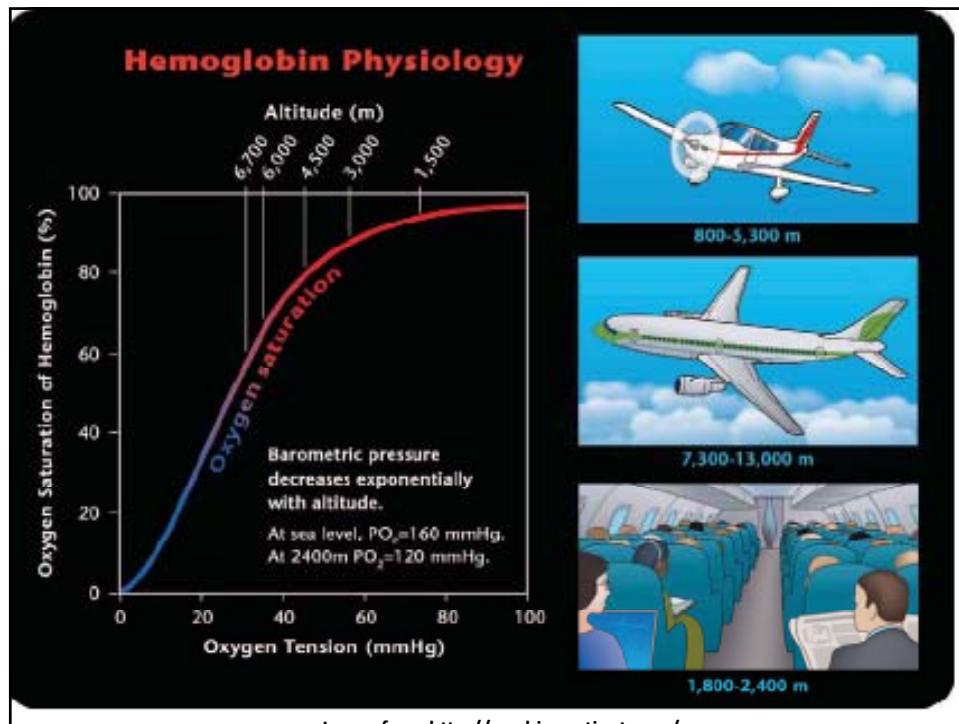
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**Professor and Vice Chair Clinical Affairs**  
**Dept. of Emergency Medicine**  
**The Ohio State University's Wexner Medical Center**

## **What's Different at Altitude?**



**Toto, I've a feeling we're not  
in Kansas anymore**

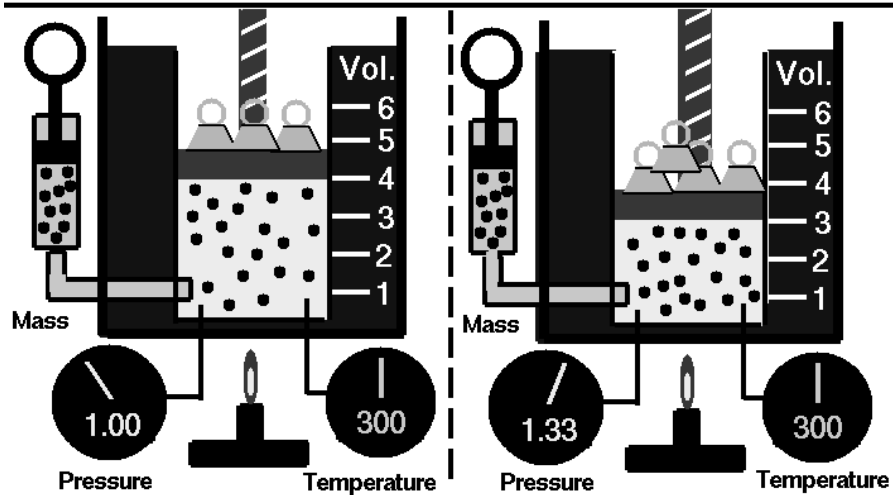






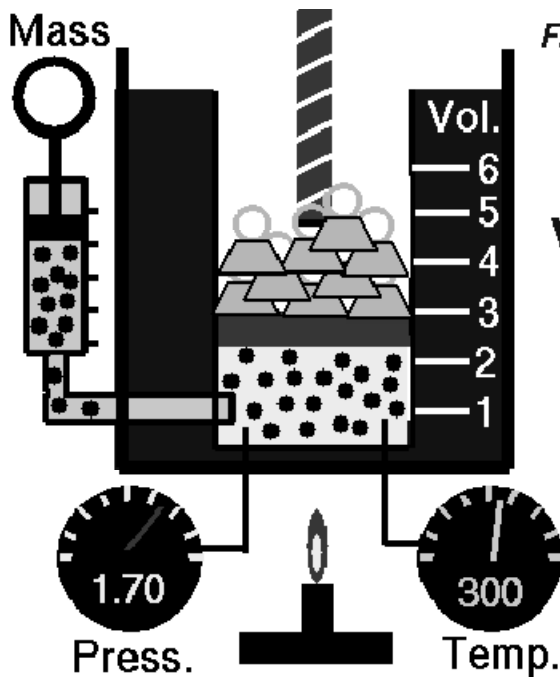
## Boyle's Law

Glenn  
Research  
Center

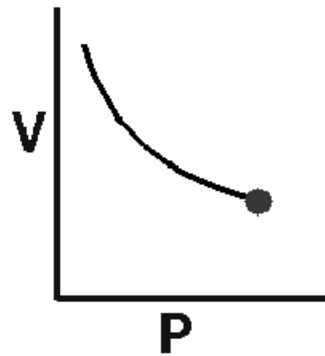


For a given mass, at constant temperature, the pressure times the volume is a constant.  
 $pV = C$

Mass



*Frozen: Mass & Temp.*



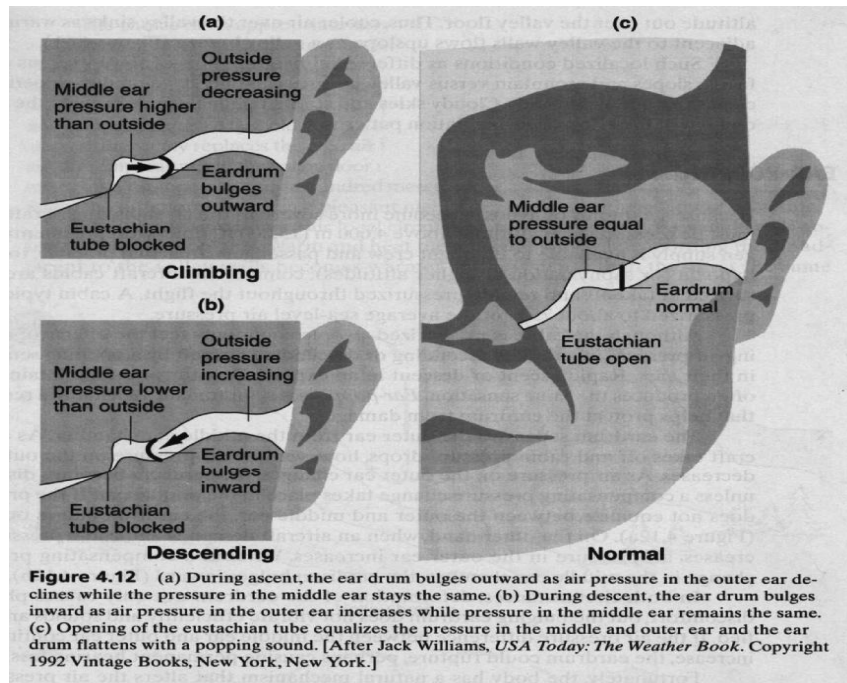
## During Ascent.....

- Bigger stomach bubble, intestinal gas
- TM bulges outward
- Sinus pressure increases
- Pneumothoraces get worse



## During descent.....

- Stomach bubble gets smaller
- Sinuses are squeezed
- TM retracts inward





## **Cabin Environment**

- **Low oxygen: heart and lung issues**
- **Low atmospheric pressure: ear and sinus**
- **Low humidity: asthma, dehydration**
- **Cramped space (29 x 17.5 inch seats): DVT risk?**
- **Turbulence: air sickness**



## **Stress of Flying in 2012**

- **Emotional stress**
- **No food (hypoglycemia)**
- **Plenty of EtOH**
- **Exposure to infectious diseases (URI, flu, SARS, TB, etc)**
- **Older and sicker people are flying**

## **Special Risks**

- **Thromboembolic disease**
- **Risk within two weeks of flight**
- **Adi et al in 2004 meta analysis questions whether there is truly an increased risk of thromboembolic disease; possibly if >8 hours and other risk factors**

## **Scuba Diving**

- **Because dive tables are calibrated for sea level, decompression sickness (“bends”) following scuba diving is possible even if dive tables were followed if diver chooses to take commercial flight too soon after dive (8000ft cabin pressure)**
- **.....or how our landlocked hyperbaric unit at Ohio State University in Columbus manages to treat decompression sickness every year**

## **Top 10 In-flight Medical Emergencies**

- **Chest Pain**
- **Syncope**
- **Asthma**
- **Head Injury**
- **Psychiatric issues**
- **Abdominal issues**
- **Diabetes complications**
- **Allergic reactions**
- **Obstetrics emergencies**
- **GYN emergencies**

**Number of people in commercial airplanes at any one time in U.S.**

**100,000**

## **Frequency of in-flight emergencies on U.S. flights**

- 1 per 33,600 to 39,600 passengers
- 30 to 33 in-flight medical events per day



**“This is your captain speaking.  
Is there a physician on board  
this flight”?**



**What medical equipment is  
available on commercial aircraft?**

- **Automated external defibrillator on all flights with at least one flight attendant**
- **Emergency Medical Kit (EMK) or Enhanced EMK (depending on airline)**

## Basic Emergency Medical Kit (EMK)

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>• <b>Diagnostic Equipment</b> <ul style="list-style-type: none"> <li>– BP Cuff</li> <li>– Stethoscope</li> </ul> </li> <li>• <b>IV Equipment</b> <ul style="list-style-type: none"> <li>– Needles (18G, 20G, 22G)</li> <li>– IV Catheters</li> <li>– Tourniquet</li> <li>– IV tubing, connectors</li> <li>– Alcohol, tape, gloves, etc</li> <li>– IV Fluids (NS 500 ml)</li> </ul> </li> <li>• <b>Airway</b> <ul style="list-style-type: none"> <li>– BVM</li> <li>– OPA's</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• <b>Medications</b> <ul style="list-style-type: none"> <li>– Acetaminophen (Tylenol)</li> <li>– Aspirin</li> <li>– Nitroglycerin tablets</li> <li>– Albuterol inhaler</li> <li>– Benadryl</li> <li>– Epinephrine IM</li> <li>– Epinephrine 1:1000</li> <li>– Atropine</li> <li>– Lidocaine</li> <li>– Dextrose</li> </ul> </li> </ul> |
|--|---|

## Enhanced EMK (XMK)

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>• <b>Additional Medications:</b> <ul style="list-style-type: none"> <li>– Calcium chloride</li> <li>– Diazepam (Valium)</li> <li>– Digoxin</li> <li>– Lasix</li> <li>– Hydrocortisone</li> <li>– Metoprolol</li> <li>– Nalbuphine</li> <li>– Naloxone</li> <li>– Promethazine (Phenergan)</li> <li>– Sodium bicarbonate</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• <b>Additional Equipment</b> <ul style="list-style-type: none"> <li>– Biolog heart monitor</li> <li>– Laryngoscope &amp; tubes</li> <li>– Urinary catheter</li> </ul> </li> </ul> |
|---|---|

## **Airline Specific**

- **Additional Medications:**

- Antivert
- Solumedrol
- Haldol
- Ativan
- Morphine

- **Additional Equipment:**

- Glucometer
- Tourniquet
- Burn dressings
- Steri-strips
- Disposable scalpel
- Emergency tracheal catheter

## **What medical training do flight attendants have?**

- Proper use of AED's
- CPR
- Location, function, and intended operation of emergency medical equipment
- Recognizing Emergency Medical Kit (EMK) contents

## **Do commercial airlines have access to medical resources on the ground?**

- **STAT-MD Communications Center, University of Pittsburgh Dept. of Emergency Medicine**
  - 24/7 emergency physicians
- **MedAire, Inc, Phoenix, Arizona**

## **When volunteering assistance:**

- **Identify yourself and medical qualifications. Some airlines require proof**
- **Obtain as complete a history as possible, given constraints of situation**
- **Request an interpreter if needed**
- **Inform the flight crew of your clinical impression**
- **Request diversion of aircraft if situation serious**
- **Talk to on-ground medical support staff and respect their expertise and advice**
- **Document as much as possible**
- **Do not use any treatment that you do not feel confident with**

## **Decision to divert**

- **Very expensive: \$3,000.00 to \$100,000.00**
- **13 percent of in-flight medical incidents in 2000 resulted in diversion**
- **Ultimately the captain's decision**

**The good news.....**

## **FAA Study in 2000**

- **69 percent of in-flight medical events in US were attended by health care professional**
  - 40% physicians
  - 25% nurses
  - 4% paramedics
  - 31% flight attendants, families, bystanders, etc.
- **79 percent agreement between in-flight medical diagnosis and subsequent hospital diagnosis**
- **Passenger condition improved 60 percent of the time**

## **Cabin Fever: Providing Care in the Air**

**John F. Plant, JD, CPHRM**  
**Assistant General Counsel-Health Sciences**  
**The Ohio State University's Wexner Medical Center**

# Overview

- **Why does this matter in 2012?**
  - **MedAire survey showed rate of medical emergencies on planes rose to 35 incidents for every 1 million passengers in 2006**
  - **Reasons: Increased life expectancy, large number of passengers flying with preexisting conditions, etc.**
  - **Majority of physicians have reported to have been confronted with an in-flight emergency at some point in their careers**

# Overview

**What do you need to know?**

- **The Law:**
  - **Good Samaritan Laws**
  - **Aviation Medical Assistance Act of 1998**
  - **International Flights and Resulting Legal Issues**
- **Ethical Obligations:**
  - **Code of Medical Ethics**
  - **American Medical Association Guidance**
- **Real World Situations and Implications**

# State Law

## Good Samaritan Law Overview:

- Created in the 1960s to encourage individuals to help others in need w/o the fear of liability if something adverse happens
- Currently exist in all 50 states
  - Example: In Ohio, the law is located in ORC Ann. § 2305.23.
- Does *not* create a duty or legal obligation to treat!
  - Rather, GS law provides *immunity* from civil damages for personal injuries which may result to the individual if the medical professional decides to deliver of emergency care
  - MN, VT, and RI are the only states which have an affirmative duty to assist a person in need.
    - See Minn. Stat. § 604A.01, Vt. Stat. tit. 12, § 519, R.I. Gen. Laws § 11-56-1.

# State Law

## Good Samaritan Law Overview:

- If you do choose to provide care, most states only create a duty to stabilize the patient to the best of your ability until someone of comparable capability can take over.

# State Law

## Good Samaritan Law Basics:

- To qualify for the GS Law's protections, you must have no pre-existing duty to treat the individual
- Factors for determining lack of duty:
- There is no previous physician/patient relationship.
  - Exception: If your patient is on your flight by chance, as long as you are not there in your capacity as their physician, there is no duty to treat.

# State Law

## Good Samaritan Law Basics:

- You have no compensation arrangement with patient and will not bill them afterwards.
- There is no duty inherent to your assumed role.
  - Example: There *would* be a duty to treat if you volunteered to be part of the medical staff at a marathon, but there *would not* be a duty to treat if you're just running in it.

## State Law

### Good Samaritan Law Basics:

- Focus of GS law is the level of care required to be provided during delivery of emergency care to an individual
  - Generally, as long as you use reasonable care based on the resources that you have available to you at the time, you will likely be protected by GS laws
  - Almost all states only allow for a care provider's "ordinary negligence" to be immune from civil action
    - Example: During emergency treatment, you must only act as reasonable health care provider would under those circumstances and if something goes wrong, that's considered "ordinary negligence" and will be acceptable

## State Law

### Good Samaritan Law Basics:

- If the care provider's actions are "grossly negligent", they will likely not be covered by the GS law
  - Example: If your care is unreasonable and your actions rose to the level of being willful, wanton or even malicious, then you will not be protected by the GS laws and your behavior will likely be subject to suit

# State Law

## Good Samaritan Law In Practice:

- Example of ordinary negligence which *will* be covered by GS law:
  - You are a psychiatrist. A fellow diner is unconscious at a restaurant and you perform CPR. You believe that compressions to rescue breathing ratios are 15:2, as you learned 10 years ago in medical school. In fact, the recommendations have changed and now you are supposed to use a 30:2 ratio. The patient expires.

# State Law

## Good Samaritan Law In Practice:

- The GS law should protect this situation.
  - You are not liable for the death as you performed CPR to the best of your professional ability, despite the change in the recommendations which you had no reason to be aware of.

# State Law

## Good Samaritan Law In Practice:

- Example of gross negligence which will **NOT** be covered by GS law:
  - You are a psychiatrist. A fellow diner is unconscious at a restaurant and you begin to perform CPR to the best of your ability. You suddenly stop in the middle of the first round of compressions because you finally realize where you recognize the patient from- he was your high school bully! You find this to be a perfect opportunity for revenge, so you stop altogether. The patient expires.

# State Law

## Good Samaritan Law In Practice:

- The GS law would not protect this situation if the patient expired as a result of your willful and wanton negligence.
  - Keep in mind that you had no obligation to ever offer the patient assistance (except in VT, MN and RI).
  - However, since you did begin treatment and then intentionally stopped due to a malicious reason, you may be liable for gross negligence in the death of the patient if the continued CPR would have saved his life, as the GS law would not be available to protect you.

# **State and Federal Law**

- **Interaction of State and Federal Law:**
  - **Generally:**
    - When an action takes place in a state, that state's law will govern.
    - If a federal law covers the same topic or action covered by a state's law, the federal law will apply (called "preemption").

# **State and Federal Law**

- **Interaction of State and Federal Law:**
  - **Good Samaritan Law:**
    - Here, all Good Samaritan laws are state laws and they apply to many types of aid to a stranger, including medical aid and otherwise.
    - There is a federal law called the Aviation Medical Assistance Act which applies when someone provides medical aid to a passenger on a domestic flight.
    - Therefore, the federal law applies as long as its conditions are met and state GS laws are preempted.

# Federal Law

Aviation Medical Assistance Act of 1998:

- Located in 49 USC § 44701 Note
  - Federal law which covers the provision of medical aid by a medical professional on all US domestic flights and international flights on domestic carriers
  - Uses the same standards of care as those discussed in the state GS law.

# Federal Law

Aviation Medical Assistance Act of 1998:

- Located in 49 USC § 44701 Note
  - A medical professional will not be liable for damages arising out of the acts/omissions while providing or attempting to provide help in an in-flight medical emergency *unless* the individual is guilty of gross negligence, which is a conscious and voluntary disregard for reasonable care of a patient which caused foreseeable grave injury or harm to them or willful misconduct, which is an action done either with knowledge that serious injury probably will result or with a wanton and reckless disregard of the possible results.
  - The airline will also be exempt from liability when they ask for an on-board medical professional's assistance and allowed the volunteer to attend to the passenger, as long as the airline had a good faith belief that the individual who volunteered was a "medically qualified professional".

## Federal Law

Aviation Medical Assistance Act of 1998:

Hypothetical:

- **Q:** You and your spouse are headed to Las Vegas to celebrate your 10 year anniversary. Before you boarded the plane, you both split a celebratory bottle of champagne. Once on board, you ordered three Bloody Marys. Midway to Nevada, you hear over the intercom, "Is there a doctor on board? If so, please make yourself known to the flight attendants!" Should you identify yourself and offer to provide care to the passenger?

## Federal Law

Aviation Medical Assistance Act of 1998:

- **A:** *It is important to keep in mind that on a domestic flight, you will be outside of the protections of the AMAA and may be liable if the patient suffered harm as a result of the grossly negligent care you provided or when your actions qualify as willful misconduct. While the physician is in the best position to know how much alcohol they can ingest before the quality of care they will provide will be "unreasonable" or if attempting to help would show a willful disregard for the patient's well-being, in general, it would probably be advisable to stay seated.*

# Federal Law

## Aviation Medical Assistance Act of 1998:

- If the physician did provide care after drinking and the patient did sue, their alcohol consumption may be used against them in order to prove their care was negligent. If the quality of care provided was unreasonable or grossly negligent, they may not get the protections of the statute and may be liable for the damages suffered by the patient as a result of the care rendered.
- Since there is no affirmative duty to provide aid, the physician will avoid liability altogether by remaining seated and not alerting the flight attendant.

# Federal Law

## Aviation Medical Assistance Act of 1998:

- Liability details for airlines:
  - While an individual will be relieved from liability so long as they provide care without gross negligence, airlines still have a duty of care.
  - When an airline obtains or attempts to obtain medical treatment for a passenger by soliciting the help of a medically-trained person, their duty of care to the passenger does not stop there.

# Federal Law

## Aviation Medical Assistance Act of 1998:

- Liability details for airlines:
  - Example:
    - If a medically-qualified individual states that they believe the passenger will be okay, the airline cannot rely solely on that assurance.
    - An airline must still follow its policy for when they decide to divert an aircraft to obtain medical care, regardless of the opinion of the individual providing care
    - If the airline fails to follow their internal policies or industry standards when making that decision, they may be liable to the passenger for breaching the duty of care owed to him or her.

# International Law

- International Law and Considerations
  - When you're flying domestically or internationally with a domestic US air carrier, the Aviation Medical Assistance Act governs.
  - However, when you fly with a foreign air carrier internationally, other important laws come into play in terms of obligation to help and the resulting physician and airline liability for doing so.

# **International Law**

## **International Law and Considerations:**

- According to the New Zealand Medical Journal, as many as 350 requests for in-flight medical assistance occur per day world-wide.
  - A majority of these flights originate/disembark in places outside the reach of US law.

# **International Law**

## **International Law and Considerations:**

- Which laws come into play?
  - Governing law will most likely be the law of the country in which the airline is based
  - May have several other jurisdictional options, but case law testing these options is sparse:
    - Ticket may specify jurisdiction
    - Where the aircraft is registered
    - Where the air carrier is domiciled
    - The country the plane was over at the time of the incident
    - The country of residence for the passenger
    - Jurisdiction required by a court or through an agreement b/w passenger and defendant

# International Law

## International Law and Considerations:

- Indemnification:
  - Some international carriers- Air France, SwissAir- indemnify the medical professionals who are requested to provide care by the airline care by making them “occasional employees”.
  - This means if anything goes wrong, the airline will step in to save the care provider and answer for any liability or settlement reached with the passenger.
  - You may request written confirmation of their indemnification before proceeding.

# International Law

## For care providers on international flights:

- Various international jurisdictions:
  - The common law countries listed below generally have no duty to provide aid and have protections for those who do so reasonable:
    - Canada
      - Differs between the providences, but generally no duty to treat
      - Quebec has a “duty to rescue” law similar to VT, MN and RI
    - Great Britain
      - Similar to the US approach in that there is no duty to treat and if a medical professional chooses to do so, the courts will look favorably upon the person
    - Australia
      - Differs between territories but duty to treat only exists in the Northern Territory

# International Law

For care providers on international flights:

- European countries are typically civil law jurisdictions (those arising out of the Napoleonic Code) which have an affirmative duty to rescue someone and no statutory protections for the care provider when you do. If you do not help, you may be criminally liable for failing to do so. Any protections from liability for those who do help are generally given to the individual by the courts.
- Spain
- France
- Germany
- Italy
- Russia

# Ethical Considerations

Ethical duty to respond to a patient in distress:

- AMA's Guidance:
  - Principles of Medical Ethics VI:
    - "A physician shall, in the provision of appropriate patient care, *except in emergencies*, be free to choose whom to serve, with whom to associate, and the environment in which to provide medical care".
  - Code of Medical Ethics Opinion § 8.11:
    - "Physicians are free to choose whom they will serve. The physician should, however, respond to the best of his or her ability in cases of emergency where first aid treatment is essential. Once having undertaken a case, the physician should not neglect the patient."

## **Ethical Considerations**

**Ethical duty to respond to a patient in distress:**

- **Neither are legally binding and, as with the GS laws, the decision to become involved with a passenger in distress is always the physician's.**

## **Cabin Fever Anecdotes:**

- **On US Air Flight 1723 from Chicago to Charlotte on Tuesday, November 3, 2009, the cabin transformed into an emergency room. Amistaff's Chief Nursing Officer, James Ostmann, Sr. RN, MBA, rescued an 81 yr old French-speaking diaphoretic woman suffering a potential heart attack and stroke after she grabbed her chest and motioned pressure.**
- **With neurological deficits on the left-side of her body and color draining her face, Ostmann knew the patient's condition was rapidly deteriorating. Pilots phoned MedLink for medical consultation and received authorization for Ostmann to open the medical resuscitation kit.**

## **Cabin Fever Anecdotes:**

- **Alongside a French-speaking, Medical-Surgical nurse from a Florida hospital, Ostmann reported the patient's conditions to officials on the ground. With an IV bag hung from the carry-on compartment and oxygen tank resting in a seat, Ostmann and the flight crew created a mobile ER. Ostmann initiated the IV and eased the woman's chest pain with Nitroglycerin, keeping her vitals stabilized through landing.**

## **Cabin Fever Anecdotes:**

- **Of the experience, Ostmann later said:**
  - **"The crew handled the medical emergency with such composure. From 35,000 feet, US Air was able to ground our plane within 20 minutes. When dealing with stroke victims, time is of utmost importance with the tissue plasminogen activator's limited 3-hour window. The fully equipped medical cart was color coded expediting treatment for the passenger. I hope to receive authorization to follow up with the attending hospital to check on her condition."**

## Cabin Fever Anecdotes:

- Dr. Matthew Rhoa was on the first leg of an international flight, he was just settling in for a nap when a flight attendant came on the public address system to ask, “Is there a doctor on the plane?” He didn’t answer for the first call, as he was a OB/GYN and he didn’t believe he’d be able to help, as he later said “There’s never a need for a Pap smear at 30,000 feet”.
- This second time the call came, he answered, and at the back of the plane he found two anxious parents with their 18-month-old toddler, who had a cast on her broken leg and was crying inconsolably. The girl’s toes were blue. Limbs can often swell in flight, and it was clear that the cast was much too tight. Dr. Rhoa slit the cast and pried it open. The girl stopped crying at once.

## Cabin Fever Anecdotes:

- Afterwards, Dr. Rhoa said, “I have been riddled by guilt to this day,” and he now promptly answers every call for medical help on a plane. “I never want that feeling again of a kid suffering like that when I could have done something sooner”.
- ***Moral of the story: As a physician, you can likely deal with the issue and if you cannot, then simply do not provide care you’re not qualified to do.***

# Conclusion

1. **On domestic US flights, there is no duty to treat a fellow passenger.**
2. **There may be an ethical obligation to treat a fellow passenger experiencing a medical emergency.**
3. **If you decide to treat a passenger while on a domestic flight, you are immune from civil liability as long as the care provided is not grossly negligent or with willful misconduct.**
4. **If you're flying internationally on a non-US carrier, while it may be unclear if you have a duty to treat, it appears that foreign courts will provide protections/immunities for the benevolent physician who provides reasonable care.**