Is there a Neurologist on this Flight?

Joseph I. Sirven, MD
Mayo Clinic
Associate Professor of Neurology
Chairman, Education

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Case Presentation

- 29 yo female presents complaining of seizures since 1987 after being kicked in the head during soccer
- Persistent episodes preceded by an aura of a sound followed by LOC with movements
- Evaluated at 3 epilepsy centers in WA
- No response to numerous AEDs

Case Presentation

Is this a seizure?

Considerable Attention to Medical Issues on Airlines

- **Automated External Defibrillator**
- **“ Economy Class Syndrome”**
- **“Air Rage”**

Who is in Charge of A Passenger's Health in an Emergency?

- **Captain**
  - **Asks for Medical Volunteers**
  - **Air to Ground Medical Consultation**

Who Supports Flight Crews in Medical Emergencies?

- American, United, Delta- In-house physicians
- Continental, USAir, America West, Southwest, ATA, Hawaiian, Alaska, British Airways, Japan Airlines, Quantas, China Airlines- MedAire
- Northwest- Mayo Clinic

What is the role of the Air to Ground Consultation?

- Assess emergencies
- Guide the use of the onboard Emergency Medical Kit
- Help decide if a diversion is needed

(unscheduled emergency landing)

Questions Pertinent to the Neurologist

- **How common are serious Neurological Symptoms aboard commercial aircraft?**
- **What is kept in the Emergency Medical Kits and is it appropriate?**
- **How common are Emergency diversions for Neurological symptoms?**
- **How well-trained are flight crews in handling neurological emergencies?**
- **How should Neurologists counsel their patients?**

Diversions as an Outcome

- **Either a serious medical problem requiring immediate hospitalization**
- **Inability to properly assess or handle an on-board patient**

Neurological Study- Methods

- **MIFAR database was examined from 1995-2000.**
  - **Age, flight, complaint, aircraft position, diversion, use of the EMK**

Neurological Symptoms

- Seizures
- Cerebrovascular symptoms
- Dizziness/Vertigo
- Confusion (not alcohol related)
- Headache
- Head/back trauma
- Numbness

Neurological Symptoms

- **Pain NOS**
- **Tremor**

Neurological Study- Methods

- **Incidence rates per year were calculated based on yearly passengers numbers from the ATA**
- **50,000,000 passengers per year**
- **9.74% of all US passengers**
- **12.04% of all miles flown**

Neurological Study- Methods

- **Diversions were tabulated**
- **Likelihood of diversions**
- **Cost of a diversion**

Neurological Study- Methods

- **Cost of a Diversion**
  - **Length of delay**
  - **Airport that the plane is diverted to**
  - **Dumping of fuel**
- **Extrapolation to US Airlines**

Neurological Study- Methods

- **Costs can vary from:**
  - **$15,000- $893,000**
  - **$50,000 was the average figure used:**
    - **Northwest, British Airways, Air Canada, Lufthansa, Air New Zealand, Quantas**
  - **Cost to fly a plane (ATA)**
    - **Gate- $23.74; $Taxi out- $30.97**
    - **Airborne- $ 52.52; $ Taxi in $ 31.78**

Neurological Study- Results

- **2042 medical incidents over 6 year period**
  - **4,003,809 flights**
  - **571,972 flights/year**
  - **52,022,571 passengers/year**
  - **1 case/day**

Neurological Study- Results

- Neurological (592 calls)- 28.9%
- Undefinable- 15.5%
- Cardiovascular- 13.4%
- Gastrointestinal- 9.8%
- Respiratory 8.4%
- Active infections 8%
- Diabetes 3.5%

Neurological Study- Results

- **Allergies- 3.4%**
- **OB- 2.55%**
- **Intoxication/Psychiatric- 2.55%**
- **Overt bleeding- 2%**
- **Loss of consciousness- 1.6%**
- **Death 0.4% (8 cases)**

Neurological Study- Diversions (Total N=312)

- **CV- 34.6%**
- **Neuro (83cases)- 26.6%**
- **Resp- 9.6%**
- **Loss of consciousness 7.6%**
- **GI- 6.7%**
- **Unknown 4.8%**
- **OB- 3.5%**

Neurological Study- Diversions

- Overt bleeding; Diabetes- 1.9% each
- Allergies- 1.2%
- Psychiatric 0.96%
- Active infections; death- 0.32% (1 each)

Neurological Study- Diversions

- Likelihood of diversion
  - LOC- 70%
  - Cardiovascular- 39.4%
  - OB- 23.9%
  - Respiratory- 17.3%
  - Overt Bleeding- 17.3%
  - Neurological- 14%

Neurological Study- Results

- **Dizzy/Vertigo- 354**
- **Seizures- 131**
- **Headache- 37**
- **Pain – 25**
- **CVA- 21**
- **Trauma- 10**
- **Confusion/Numbness- 6 each**
- **Tremor - 2**

Neurological Study- Diversions

- **Dizzy/Vertigo- 43.3%**
- **Seizures- 37.3%**
- **Confusion- 4.8%**
- **CVA, Pain NOS- 6% each**
- **Headache, Trauma- 1.3% each**

Neurological Study- Diversions

- Likelihood of diversions
  - Confusion 66%
  - CVA 23.8%
  - Seizures 23.6%
  - Pain NOS 20%
  - Trauma 10%
  - Dizzy/Vertigo 10.1%

Rationale for Diversions

- 31 seizure diversions
  - 5 Status cases
  - 5 seizure clusters
  - 7 prolonged postictal
  - 3 injuries
  - 2 febrile convulsions
  - 9 diverted despite recovery

Rationale for Diversions

- Dizziness – 36 diversions- fear of LOC
- 5 with CVA- worsening of S/S
- 4 patients with confusion- 2 were having adverse effects to PD drugs
  - All were nonviolent
- Headache- seemed to be worsening

Neurological Study- Results

- **Cost to US Airlines/ year**
- **$5,928,567/ year (26.6%)**

Emergency Medical Kits

- 1986- FAA mandated EMK on planes
- 1994- Add protective gloves
- 1995- Extended to commuter flights
- 1998- Add automated external defibrillators

FAA Requirements on EMKs

Antihistamine

Aspirin

Atropine IV

50% dextrose

Epinephrine

Bronchodilator

Lidocaine IV

- NTG
- Non-narcotic analgesic

European Joint Aviation Authority

- Steroid
- Metoclopramide
- Scopalamine
- Lasix
- Digoxin
- Nalbuphine
- Diazepam
- Oxytocin

Flight Crew Training

- 30 minutes- few hours of training
- First aid
  - Neurological issues- just one of many policies

Previous Literature

- CAMI- 1992- Neurological Emergencies #1 complaint
- MedAire- Neuro is in the top 3
  - GI is #1
- No standards
- Airlines are not mandated to maintain records
- Only a handful of databases exist

Why are Neuro complaints more common?

- **Pressurization/ Relative hypoxemia**
  - **8.6- 11.77 psi**
    - **Results in alveolar O_2**
    - **59- 76.8 mm Hg at 35,000**
    - **6000-8000 feet at sea level**
- **Sleep deprivation**
- **Anxiety**
- **Dehydration**

Limitations

- Lack of followup
  - Previous study- 94% concordance
- Economic impact likely much higher
- Airlines may manage emergencies differently
  - Variable diversion rates

Implications for Practice

- Avoid alcohol
- Medication compliance
- Carry extra seizure and pain meds
- Postpone medication adjustments until travel is completed

What has changed in Neurological Therapeutics

- Acute Stroke Management
  - 3 hour time window
- Acute Seizure Management
  - Rapid treatment of seizure clusters
  - Prehospital Treatment of status epilepticus
- Acute Migraine treatment
  - Ergotamines, Serotonin agents

"Airline sues Medical Care Advisory Servive over advice in fatal stroke case"

- Associated Press October 12, 2001
- Diversion not recommended on a flight

  Houston – Newark

  Patient died from massive left MCA infarct

Implications for Research

- Prospective analysis with outcomes
- Do diversions make a difference in outcomes?
- Should an AED be added to the EMK?
- Should CVA diversions be increased?
- Should industry guidelines be established?

What about Flights crews?

FAA Medical Certificates

- No established medical history or diagnosis of:
- 1. Epilepsy
- 2. Disturbance of consciousness without a satisfactory explanation
- 3. Transient loss of CNS function
- 4. Neurological condition deemed unsuitable by the FAA

FAA Medical Certificates

- *Caveat*
- **If an individual has a single seizure, 10 years must pass from the date of the event**

MIFAR Case Studies

Case #1

- 35 yo male on flight from Paris to the Cayman Islands
- Flight position nearing the Florida coast 1-1/2 hour to landing
- Patient has 1 seizure that was witnessed.
- No previous history
- Do you continue or divert to Miami?

Case # 2

- 68 yo male en route MPLS to Seattle
- Pt develops inability to speak with right arm weakness. Pt has a h/o of A. fib. The episode lasted 1 hour and is now improving.
- Do you recommend diversion? 1 ½ hour to Seattle
- Do you use the EMK?

Case #3

- 19 yo female with history of seizures on Klonopin/Tegretol. Patient has locked herself in the bathroom. Mother not concerned.
- Detroit to LAX (1 hour to LAX).
- Do you divert?

Case #4

- Tokyo to New York
- Currently over the North Pole
- 77 yo male with Parkinson's is confused and yelling at his wife but he remains in his seat. Patient had recently increased his Sinemet while in Japan.
- How do you proceed? Divert to Alaska?