Is there a Neurologist on this Flight?

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Acknowledgements

- Dr. Orford, Stepanek, RIM
- Dr. Claypool, Emergency Medicine
- Dr. Zanick, Northwest Airlines
- Drs. Wingerchuk, Caselli, Bortz, Drazkowski, Neurology
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
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
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 (83 cases) - 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 Service 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?
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
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?
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?