• Jet Blue pilot incapacitation

http://youtu.be/mFslbrJwQ20
The Management of In-Flight Medical Emergencies

Dr Alexandra Muthu
Occupational & Aviation Medicine
Air NZ Aviation Medicine Unit
Aviation Medicine

- Effects of flying on health & health on flying
- Crew and ground staff
- Effects on individuals and groups
Aviation Medicine Unit
The Team

• Four doctors (3 FTE)
  – CMO Tim Sprott, Ben Johnston, Nicola Emslie, Alexandra Muthu
• Five nurses (4 FTE, 1 in CHC)
• One administrator
Services and Functions

• Passenger Health
  – Pre-travel clearances: MEDA (Paxcare, AvMed)
  – Gate clearances (MedLink, AvMed)
  – In-flight medical events (MedLink, AvMed)
  – Medical emergency planning and oversight

• Crew Health
  – Pilot medical certification
  – Industrial health hazards including Fatigue & Alertness
  – Alcohol & Drug issues (support, training and testing)
  – Rehabilitation, Sickness Absence and RTW planning
  – Travel health cover

• Occupational and Environmental Medicine
  – All Air New Zealand staff
Access latest version online
Overview

- Should I get involved?
- What type of medical emergencies happen on aircraft?
- What medical equipment do aeroplanes carry anyway?
- Do I get any help up here or am I on my own?
- What is my role?
- Do I have to make the decision about diverting a flight?
- How am I supposed to work in such a cramped space?
- Do I have medical indemnity cover?
- Take Home Messages
Air Travel

- 2 billion air travellers per annum
- Very safe mode of transport
- Increasing number with pre-existing medical conditions

- Fatigue and stress prior to trip
- Forgotten medications
- Interaction with alcohol
The Logistical Problems

• Limited Resources
• Environmental Effects
  – Reduced pressure
  – Conditions
  – Remote Location
  – Limited Space
• Expertise
• Legality
Altitude

- Cabin altitude is equivalent to 15% O\textsubscript{2}

- Gases expand and contract up to 30%
Overview

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Is there a Doctor on Board?

- ~50% of Air NZ flights have a medically trained person aboard.
Should I Get Involved?

“If asked to attend a medical emergency....a doctor must respond. This is both an ethical and legal obligation... If a doctor chooses not to attend he or she may be required to defend that decision in the event of a charge of professional misconduct or criminal prosecution”

“A doctor asked to look after a person in a medical emergency has a legal duty to provide the necessaries of life to that person”

MCNZ A Doctors Duty to Help in a Medical Emergency, Aug 2006
Should I Get Involved?

“Rarely there will be times when attending a medical emergency is impossible or unsafe for the doctor or the patient”

- Already attending another emergency
- Geographical location is such that someone else can respond more promptly
- Has been drinking alcohol or taken medication or other substances to a level that may adversely influence the doctors competence
- Personal safety of the doctor is at risk

MCNZ A Doctors Duty to Help in a Medical Emergency, Aug 2006
Should I Get Involved?

“There are different levels and areas of competence and a doctor may not have the necessary skills to assist with anything more than basic first aid in a medical emergency... If he doesn’t have the appropriate skills he will present himself as a citizen with some knowledge of emergency first aid. Nothing less would be acceptable”

MCNZ A Doctors Duty to Help in a Medical Emergency, Aug 2006
Should I Get Involved?

“Doctors have the right, *except in an emergency*, to refuse to care for a particular patient.”

NZMA Code of Ethics for the NZ Medical Profession, May 2008
Overview

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Medical Incidents: Rates

• All medical incidents:
  – 70.4 per million RPK
  – 159 per million passengers

• Emergencies:
  – Range from 5 to 100 per million passengers

Mahoney et al, Av Sp Env Med, Dec 2011
Symptom-Based Categorization of In-Flight Passenger Medical Incidents
Medical Incidents: The 4 A’s

- Altitude
- Age
- Anxiety
- Alcohol
Medical Incidents: Most Common

- Transient unconsciousness 41%
- Nausea / Vomit / Diarrhoea 20%
- Breathing difficulty 16%

Mahoney et al, Av Sp Env Med, Dec 2011
Symptom-Based Categorization of In-Flight Passenger Medical Incidents
Medical Incidents: Most Serious

- Unconscious with slow / no recovery 3.4%
- Chest pain 2.3%
- Seizure 1.1%
- Labour <0.1%

Mahoney et al, Av Sp Env Med, Dec 2011
Symptom-Based Categorization of In-Flight Passenger Medical Incidents
Air New Zealand In-flight Medical Emergencies From 1 May 08 - 31 May 09

- Accident Injury: 62
- Vasovagal: 35
- Gastro: 34
- Resp: 23
- Cardiac: 19
- ID: 19
- NOS: 17
- Neurological: 14
- Musculoskeletal: 8
- Psychiatric: 8
- Allergic: 8
- Surgical: 5
- Substance: 4
- Obs/Gynae: 4
- Other: 2
- Endocrine: 2
- Vascular: 2
- ENT: 1
- Dental: 1
- Urological: 1
Percentage of Causes for Inflight Medical Emergencies in British Airways (2000) and Air NZ (2008-9) Flights

- Accident Injury
- Vasovagal
- Gastro
- Resp
- cardic
- ID
- NOS
- Neurological
- Musculoskeletal
- psych
- allergic
- Surgical
- Substance
- other
- obs gynaec
- Endocrine
- Vascular
- ENT
- Dental
- Urological
Reported In Flight Medical Incidents (last week)

- Vomit
- Faint / Dizzy / Nausea / SOB
- Headache/Sinus
- Trauma
- Skin / Allergy
- Other

Number of Passengers

- IFE
- Oxygen given
Diagnostic impressions for Cardiovascular cases (NZ)

- Angina / Ischemic heart disease: 40%
- Chest pain not specified (atypical): 23%
- Cardiac arrhythmia not specified: 10%
- Swollen ankle / edema: 10%
- Death: 7%
- Atrial fibrillation / flutter: 4%
- Elevated blood pressure / hypertension: 3%
- Postural hypotension: 3%
Diagnostic impressions for Respiratory cases (NZ)

- Shortness of breath / dyspnea: 50%
- Asthma: 37%
- Chronic obstructive pulmonary disease: 13%
Diagnostic impressions for Neurological cases (NZ)

- Syncope / Fainting: 51%
- Seizure / convulsion: 13%
- Headache: 9%
- Neurological disease, other: 9%
- Weakness/tiredness general: 9%
- Other non-specified: 7%
- Vertigo / dizziness: 1%
- Transient cerebral ischaemia: 1%
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Take Home Messages
What Medical Equipment is On-Board?

- Oxygen, oxygen, oxygen
- AED
- Specific Purpose Kits
- Physician’s Kit
- Cabin Crew Operating Manual
In-flight Oxygen

Emergency oxygen supply is for flight-related emergencies
  – E.g. Sudden decompression
  – Must not rely on this for pax
  – Limited supply of medical $O_2$

• Must be pre-arranged
  – Oxygen concentrators
  – Nominal cost for pax
  – Not provided on ground (HK)
Emergency Oxygen

- 2 or 4 L/min
- Total 311 L
Mortality Kit
First Aid Kit
AED Defibrillator
Biohazard Kit
Physicians Kit

- Protocols on Use
- Info Booklet
- Cabin Crew Operating Manual
Physicians Kit Contents

• 2 Unsealed Modules:
  – Syphgmo
  – Stethoscope

• 5 Sealed Modules:
  – Blue (airway support)
  – Red (iv equipment)
  – Green (asthma meds, catheter, glucometer)
  – Yellow x2 (drugs)
Rationale

• Regulations (delivery pack)
• Likelihood of use (salbutamol)
• Risk of doing harm (cricothyroidectomy kit)
• Lifesaving vs “Nice to have” (adrenaline)
• Logistics (insulin)
• Weight (fluids)
• Purpose (manage to diversion/destination not long term care)
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• Take Home Messages
What Help is Available?

• MedLink called if:
  – Oxygen administered
  – Physician’s kit opened
  – Doctor called
  – Diversion possible
MedLink: In-flight Medical Support Service
All of our info is just a click away
## Patches 4.1

**Friday, May 07, 2010 17:20 Zulu**

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<th>Zulu</th>
<th>Category</th>
<th>Destination</th>
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*Midnight 52 - Month to date: 5/6 - Year to date: 11785*
MedLink DVD

Air New Zealand Patch
Overview

- Should I get involved?
- What type of medical emergencies happen on aircraft?
- What medical equipment do aeroplanes carry anyway?
- Do I get any help up here or am I on my own?
- **What is my role?**
- Do I have to make the decision about diverting a flight?
- How am I supposed to work in such a cramped space?
- Do I have medical indemnity cover?
- Take Home Messages
Roles and Responsibilities

- Trained in CPR & AED
- Can call MedLink
- Can administer GTN, Ventolin and Epipen under certain circumstances
Roles and Responsibilities

- In charge!
- Diversion decision rests with PIC alone
- Are informed when Physicians Kit used
- Can call MedLink
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• Take Home Messages
Should we Divert?

• Isolation and limited medical facilities
  – Medical outcomes poorer

• Diversions:
  – Flight safety impact
  – Location, fuel, weather, medical facilities at destination
  – Stressful
  – Disruptive to other pax
  – Costly: to the airline and other pax
Anatomy of a Medical Event

Event Point -> Contact Point -> Decision Point

Origin -> Advice -> Diversion -> Destination
Total Number of ANZ Medical Flight Diversions from 1998 - 2009
CRISIS IN MID-AIR

Most frequent medical reasons for diverting a plane

- Cardiac
- Neurological
- Respiratory
- Gastrointestinal
- Cardiopulmonary arrest

Per cent
## US In-Flight Diversion Data

<table>
<thead>
<tr>
<th>Category</th>
<th>Total No</th>
<th>Incidence (%)</th>
<th>Likelihood of diversion (%)</th>
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<tr>
<td>Neurologic</td>
<td>626</td>
<td>31</td>
<td>17</td>
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<tr>
<td>Cardiovascular</td>
<td>274</td>
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<td>17</td>
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<tr>
<td>Infection</td>
<td>165</td>
<td>8</td>
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</table>

Cost per diversion: $US 50k  
Total cost: $US 8.9m
Overview

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• **How am I supposed to work in such a cramped space?**
• Do I have medical indemnity cover?
• Take Home Messages
Issues with Environment
Where can you go?

- Exit row
- Galley area
Overview

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• What is my role?
• Do I have to make the decision about diverting a flight?
• How am I supposed to work in such a cramped space?
• **Do I have medical indemnity cover?**
• Take Home Messages
Indemnity

“In consideration of your voluntarily agreeing to provide emergency in-flight medical treatment/advice at the request of Air New Zealand, the company agrees to indemnify you against any liability, claims, suits proceedings that may arise or result from any medical malpractice, error or mistake you commit in good faith in the course of providing the emergency medical treatment/advice and which is not covered by any insurance you may maintain”
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• Take Home Messages
Take Home Messages

• The airline and passenger appreciate your willingness to assist
• You have an ethical and professional obligation to assist
• In-flight medical incidents are common but most are minor in nature
• A comprehensive standardised medical kit is on board all long haul aircraft
Take Home Messages

• Use the expert medical advice, available via Sat-phone
• Use the cabin crew who are trained and experienced
• Use other available spaces if required
• You are indemnified by Air NZ for care given in good faith
Common In-Flight Emergencies and their Management
The Medical Problems

• Serious problems
  – Seizure, Unconsciousness
  – Cardiac Arrest
  – Premature Labour
  – Anaphylaxis, Choking

• Typical Problems
  – The 4 A’s: altitude, age, anxiety, alcohol
  – Collapse, Angina, SOB
  – Indigestion, motion sickness, gastroenteritis
  – Fear of Flying
  – Burns and injuries
Anaphylaxis

- Not common but very dramatic
- If allergy known pax may administer own Epipen
• Epipen
• Adrenaline 1mg/1ml
• Promethazine Inj 25mg and Tabs 10mg
• Hydrocortisone Inj 100mg/2ml (solucortef)
• Salbutamol nebulcs 2.5mg
Abdominal pain

• Don’t forget gas!
• Renal colic
• Females aged 10-60y consider pregnancy

• Buscopan (20mg)
• Tilcotil (20mg)
• Diclofenac (75mg)
• Morphine (10mg)
Chest Pain

Myocardial Infarction

- Oxygen
- Aspirin 300mg
- GTN spray
- Morphine
- Metoclopramide

- Have the AED handy!
Hypoglycaemia

- Blood glucose testing equipment
- Oral glucose sachets (2)
- GlucaGen IM HypoKit (1)
- Dextrose Inj 50%/10ml (5)
Seizures

- Common
- Causes include: epilepsy, fever, hypoglycaemia, drug use, alcohol withdrawal

- Airway support equipment
- Oxygen
- Diazepam Inj 10mg/2ml
- Glucocard blood sugar monitoring
Infection

- The only infection that requires treatment prior to landing is meningitis

- Benzyl-penicillin
  - 3g stat dose (Adults)
  - 60mg/kg (Children)
Premature Labour

• MEDA guidelines
  – >5h flight to 36^{+0} weeks
  – <5h flight to 38^{+0} weeks

• In-flight deliveries by definition therefore are likely to be premature

• More at risk of cord prolapse
  – Hypoxic baby

• Thankfully very rare!
• Baby born on flight

http://youtu.be/OC1rgiNfeWI
Inhibition of labour

• Salbutamol by infusion
  – 2.5mls of 0.5mg/1ml in 500ml N saline

• We will be trying very hard to put the plane down but if delivery imminent…

• Keep calm (!)
• Cord clips
  – NB CC not trained to cut cord
• Syntometrine 1ml IM (3rd stage)
Practical tips

- Plastic bag(s) on floor/chair if possible
- Placenta and birth products into biohazard bag
- Keep baby warm
- Monitor blood loss
Psychosis

- Diazepam Inj 10mg/2ml (5)
- Haloperidol Inj 5mg/1ml (4)
Pulmonary oedema

- Oxygen and re-breather mask
- Frusemide Inj 20mg/2ml (5)
- Morphine Inj 10mg/1ml
- Glyceryl Trinitrate spray
- Urinary catheterization set
Asthma

- Oxygen
- Salbutamol nebul 5mg
  - also available inhaled form
- Hydrocortisone Inj 100mg/2ml (solucortef)
- Adrenaline 1mg/10ml (epinephrine)
- Spacer device
Airway management

- **Ventilation** more important than Intubation
- Position
- Bag and mask
- Guedel airways
- ETT
- LMA
LMA: tips for insertion

- Deflate
- Lubricate
- Insert
- Inflate: saline
- Ventilate
Analgesia

- Tilcotil Inj 20mg/2ml (tenoxicam)
- Diclofenac Inj 75mg/3ml or 50mg Tabs (voltaren)
- Morphine
- Hyoscine Inj 20mg/1ml (buscopan)
Contact Details

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