Quality Assurance and Flying Doctors: Safety and aviation at a mile high

Martin Laverty - RFDS Federation CEO
1 - Snapshot of the health of remote and rural Australians

2 - Service role of the RFDS as a nationwide federated aeromedical charity

3 - Safety and Quality Standards for health, aviation, RFDS and three specific areas of interest:

1) Accountabilities: Healthcare v aviation
2) Fatigue management: Healthcare v aviation
3) Patient hand over: Aeromedical uniqueness
1 - Snapshot of the health of remote and rural Australians
Rural and remote Australia

Remote Australia
...85% of continent
...4.5% of population
Life expectancy disparity

Healthcare in Australia 2012-13: Comparing outcomes by remoteness, COAG Reform Council
Child death disparity

Healthcare in Australia 2012-13: Comparing outcomes by remoteness, COAG Reform Council
Mental health service utilisation disparity

Healthcare in Australia 2012-13: Comparing outcomes by remoteness, COAG Reform Council
2 - Service role of the RFDS as a nationwide federated aeromedical charity
### The RFDS as at 30 June 2014

<table>
<thead>
<tr>
<th>Category</th>
<th>Daily</th>
<th>Annually</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff</td>
<td>1,307</td>
<td></td>
</tr>
<tr>
<td>Aircraft</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td>Aviation Bases</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>Patients Attended</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily</td>
<td>773</td>
<td>282,000</td>
</tr>
<tr>
<td>Annually</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aeromedical Evacuations and IHT</td>
<td>148</td>
<td>54,705</td>
</tr>
<tr>
<td>Healthcare Clinics</td>
<td>44</td>
<td>16,096</td>
</tr>
<tr>
<td>Telehealth Consultations</td>
<td>225</td>
<td>82,305</td>
</tr>
<tr>
<td>Aircraft Landings</td>
<td>206</td>
<td>75,314</td>
</tr>
<tr>
<td>Distance Flown (km)</td>
<td>72,358</td>
<td>26,410,611</td>
</tr>
</tbody>
</table>
22 base network
2013/14 Primary evacuation diagnoses
2013/14 Inter-hospital transfer demand

Royal Flying Doctor Service
The furthest corner. The finest care.
2013/14 Inter-hospital transfer diagnoses
Remote area clinics
Remote clinics
3 - Safety and Quality Standards for health, aviation, RFDS and three specific areas of interest
National Safety and Quality Health Services Standards

- Standard 1: Governance for Safety and Quality in Health Service Organisations
- Standard 2: Partnering with Consumers
- Standard 3: Preventing and Controlling Healthcare Associated Infections
- Standard 4: Medication Safety
- Standard 5: Patient Identification and Procedure Matching
- Standard 6: Clinical Handover
- Standard 7: Blood and Blood Products
- Standard 8: Preventing and Managing Pressure Injuries
- Standard 9: Recognising and Responding to Clinical Deterioration in Acute Health Care
- Standard 10: Preventing Falls and Harm from Falls
Aviation Safety Management Systems

Safety policy and objectives
- Management commitment and responsibility
- Safety accountabilities
- Appointment of key safety personnel
- Coordination of emergency response planning
- SMS documentation

Safety risk management
- Hazard identification
- Risk assessment and mitigation

Safety assurance
- Safety performance monitoring and measurement
- The management of change
- Continuous improvement of the SMS

Safety promotion
- Training and education
- Safety communication
1. Provision of Care ................................................................. 1

2. Communication ................................................................. 1
   2.1 Flight requests (between Caller and Duty RFDS Clinical Coordinator) .... 1
   2.2 Pre-flight (between Coordinators, Transport staff and Caller) ........ 2
   2.3 During transport (between Transport staff, Aircraft and Ground) .... 2
   2.4 At referring location (between Clinical staff and the Transport staff) .... 2
   2.5 With receiving hospital (between Transport staff and receiving Clinical staff) .... 3
   2.6 Escorting patients ........................................................ 3

3. Coordination ................................................................. 8

4. Priority ................................................................. 4
   Severity of illness ........................................................... 4
   Urgency for Aeromedical Evacuation .................................... 4

5. Flight Crew ................................................................. 4
   5.1 General ................................................................. 4
   5.2 Orientation, training and professional development ..................... 5
   5.3 Retrieval Doctor / Medical Practitioner .................................. 5
   5.4 Flight Nurse ............................................................ 6
   5.5 Pilots ................................................................. 6
   5.6 Communications staff ................................................ 7
   5.7 Drug & alcohol testing ............................................... 7

6. Aircraft ................................................................. 7
   6.1 General ................................................................. 7
   6.2 Aircraft design ........................................................ 7
   6.3 Oxygen ................................................................. 8
   6.4 Suction ................................................................. 8
   6.5 Electrical Power ....................................................... 9
   6.6 Communications ....................................................... 9

7. Equipment ................................................................. 9
   7.1 General ................................................................. 9
   7.2 Minimum equipment to be carried at all times ........................... 10
   7.3 Pharmacological agents ................................................ 10
   7.4 Extra equipment to be available when required ......................... 10
   7.5 General requirements for electronic medical devices .................. 10
   7.6 Stretcher ............................................................... 10
   7.7 Loading systems ....................................................... 11

8. Monitoring ................................................................. 12

9. Documentation ............................................................... 12
   9.1 General ................................................................. 12
   9.2 Pre-flight assessment .................................................. 12
   9.3 Clinical taking decisions .............................................. 13
   9.4 In-flight clinical record ............................................... 13

10. Quality Improvement ...................................................... 13

Appendices ................................................................. 15
    Appendix 1 – Minimum equipment to be carried at all times ............ 25
    Appendix 2 – Minimum pharmacological agents carried at all times .... 26
    Appendix 3 – Additional retrieval equipment available .................. 27
4. Priority

4.1 Each mission will be tasked following assessment of the severity of the patient’s illness and the urgency for aeromedical evacuation. The crew mix will be appropriate for the level of care required.

Severity of illness

4.1.1 Sections record the severity of illness and monitor the clinical resources used.

Urgency for Aeromedical Evacuation

4.1.2 A priority system of 3 levels will be used to indicate the urgency of transport.

<table>
<thead>
<tr>
<th>Table 4 – Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Priority 1</td>
</tr>
<tr>
<td>Priority 2</td>
</tr>
<tr>
<td>Priority 3</td>
</tr>
</tbody>
</table>

4.2 Flight crews (pilots, doctors and flight nurses) will be rostered on in sufficient numbers to meet the anticipated demand. Suitable numbers of aircraft will be maintained in operational readiness to meet demand.
9.3 Clinical tasking decisions

9.3.1 Decisions regarding the transfer will be made and recorded and include:

- Priority of the case
- Crew selected to transfer the patient
- Operational considerations such as cabin altitude restriction, suitability of other patients on flight
- Special equipment, drugs or blood products required
- Whether the patient is to be handed over at the airport or hospital
- Who made these decisions
Appendix 1 – Minimum equipment to be carried at all times

The following list outlines the minimum equipment expected to be carried on an RFDS patient transport flight, in a medically dedicated RFDS aircraft.

Respiratory Support Equipment
- Oxygen masks, all ages
- Nebulisers
- Self-inflating bag-valve-mask manual ventilation assembly with a range of mask sizes
- Suction equipment
- Airways suitable for all ages, including oropharyngeal & nasal
- Intubation equipment, including aids for difficult airways
- Endotracheal tubes for all ages
- Laryngeal mask airways
- Humidification and filter systems for ventilated patients
- Cricothyroidotomy set
- Pleural drainage equipment including one way valves

Circulatory Support Equipment
- Aneroid sphygmomanometer & range of cuffs
- Vascular cannulae - peripheral
- IV fluids, giving sets, pressure cuff and other devices to infuse fluids and blood products
- Syringes and needles
- Intraosseous needles

Other equipment
- Nasogastric tube and bag
- Urinary catheters and bags
- Suturing instruments and equipment
- Thermal insulation
- Splints
- Rigid cervical spine collars
- Dressings and bandages
- Maternity packs
- Stethoscope
- Fetal (Doppler) stethoscope
- Temperature measuring device (electronic thermometer)
- Blood glucose test strips
10.3 Eclampsia

Theory

1. Eclampsia is a generalized tonic-clonic convulsion as a consequence of pregnancy induced hypertension or pre-eclampsia. It may occur pre-, intra- or post labour.
2. Eclampsia is associated with increased risk of maternal and foetal mortality and morbidity.
3. Proximal symptoms and signs include a sharp rise in blood pressure, severe headache, drowsiness or confusion, visual disturbances, reduced urine output +/- increased proteinuria, twitchiness, upper abdominal pain, nausea or vomiting.
4. Complications include abruptio, disseminated intravascular coagulation, brain haemorrhage, multiorgan failure involving cardiac, renal and hepatic systems.
5. Eclamptic seizures are rarely prolonged and respond well to magnesium sulphate, there is little need for other anticonvulsants and need for intubation and ventilation is also rare.
6. Be sure to consider other causes of seizures in your differential diagnosis.

Pre-flight and In-flight Management

1. Flights for patients with eclampsia will usually be priority 1, doctor accompanied.
2. First line seizure management
   - Nurse left lateral position.
   - Keep airway clear, suction if necessary.
   - Apply high flow oxygen.
   - Establish IV access.
3. Anticonvulsant therapy:
   - Magnesium sulphate 4g IV over 20 min followed by maintenance infusion of 1g per hour. (See infusion guidelines).
   - If a further seizure occurs an additional 2g can be given over 5 min.
   - If no IV access available, e.g. in a primary setting, MgSO₄ can be given IM, 4g each buttock.
   - As a second line IV diazepam in 2mg boluses (max 10mg) may be considered.
4. Monitor for evidence of magnesium toxicity (respiratory depression, loss of deep tendon reflexes, cardiac dysrhythmias) and have calcium gluconate available to treat.
5. Manage hypertension by parenteral means as described in guideline for severe pre-eclampsia, e.g. labetolol or hydralazine.
7. Expedite delivery in suitable facility.
8. Monitor for complications and where possible determine platelet count, uric acid, clotting function, renal and liver function tests.
9. In the unlikely event that a patient is intubated be aware that KEMH does not have the capacity to manage a ventilated patient, communication with receiving units is paramount. It may be that the patient should be transported to an adult intensive care facility (preferably SCGH) with a view to sending an obstetric and paediatric team there to deliver her. Ensure that this is all determined before your arrival in Perth.

References

King Edward Memorial Hospital; Clinical Guidelines, Section B, 2.2 Hypertension in Pregnancy, May 2009
Three specific areas of interest:

**Accountabilities:** Healthcare v aviation

**Fatigue management:** Healthcare v aviation

**Patient hand over:** Aeromedical uniqueness
Clinician accountability has been a focus of inquiries into health care failures:

Those who care for patients should be properly accountable for what they do.


Teamwork and communication failures are the leading cause of patient safety incidents in health care.


Despite the attention healthcare service failures have received internationally, and the subsequent focus on health-care professionals’ accountability, there is limited literature that explores the topic.

233 Responsibility of pilot in command before flight

(1) The pilot in command of an aircraft must not commence a flight if he or she has not received evidence, and taken such action as is necessary to ensure, that:

(a) the instruments and equipment required for the particular type of operation to be undertaken are installed in the aircraft and are functioning properly;

(b) the gross weight of the aircraft does not exceed the limitations fixed by or under regulation 235 and is such that flight performance in accordance with the standards specified by CASA for the type of operation to be undertaken is possible under the prevailing conditions; and

(c) any directions of CASA with respect to the loading of the aircraft given under regulation 235 have been complied with;

(d) the fuel supplies are sufficient for the particular flight;

(e) the required operating and other crew members are on board and in a fit state to perform their duties;

(f) the air traffic control instructions have been complied with;

(g) the aircraft is safe for flight in all respects; and

(h) the latest editions of the aeronautical maps, charts and other aeronautical information and instructions, published in AIP or by a person approved in writing, that are applicable:

   (i) to the route to be flown; and

   (ii) to any alternative route that may be flown on that flight;

are carried in the aircraft and are readily accessible to the flight crew.
Civil Aviation Regulations 1998

224 Pilot in command

(1) For each flight the operator shall designate one pilot to act as pilot in command.
Penalty: 5 penalty units.

(1A) An offence against subregulation (1) is an offence of strict liability.
Note: For strict liability, see section 6.1 of the Criminal Code.

(2) A pilot in command of an aircraft is responsible for:

(a) the start, continuation, diversion and end of a flight by the aircraft; and
(b) the operation and safety of the aircraft during flight time; and
(c) the safety of persons and cargo carried on the aircraft; and
(d) the conduct and safety of members of the crew on the aircraft.

(2A) A pilot in command must discharge his or her responsibility under paragraph (2)(a) in accordance with:

(a) any information, instructions or directions, relating to the start, continuation, diversion or end of a flight, that are made available, or issued, under the Act or these Regulations; and
(b) if applicable, the operations manual provided by the operator of the aircraft.

(3) The pilot in command shall have final authority as to the disposition of the aircraft while he or she is in command and for the maintenance of discipline by all persons on board.
Recent Australian literature on clinical fatigue management says:

Fatigue affects cognitive ability, particularly when health workers must make clinical decisions that involve managing complexity and coping with uncertainty.


Unclear if fatigued surgeons and surgical trainees are situationally aware of the effect fatigue has; such insight and awareness is critical for recognizing a tendency to be impaired and make appropriate decisions to minimize the risk of error, despite fatigue awareness being part of competency acquisition during surgical training.


Simulation study found fatigued surgeons had statistically worse performance at peg transfer and extracorporeal knot tying. Of relevance to whether fatigued doctors show ‘awareness and insight’ they found the more fatigue was self-reported, the less the loss of skills on one of the two simulators used.

## Fatigue management: Healthcare v aviation

**RFDS Central Operations Flight Risk Assessment Matrix (FRAM)**

<table>
<thead>
<tr>
<th>Physical Symptoms</th>
<th>Mental Symptoms</th>
<th>Emotional Symptoms</th>
<th>SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical appearance</td>
<td>Poor concentration</td>
<td>More quiet and withdrawn</td>
<td>1 point per</td>
</tr>
<tr>
<td>Yawning</td>
<td>Disorganisation</td>
<td>Lack of motivation</td>
<td>symptom</td>
</tr>
<tr>
<td>Headache</td>
<td>Poor communication</td>
<td>Increased stress levels</td>
<td></td>
</tr>
<tr>
<td>Eye rubbing/eye</td>
<td>Lack of situational awareness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>twitching</td>
<td>Poor information processing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nausea</td>
<td>Poor memory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor coordination</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extreme drowsiness</td>
<td>Poor decision making</td>
<td></td>
<td>4 points</td>
</tr>
<tr>
<td>Heavy eyes</td>
<td>Increased errors</td>
<td></td>
<td>per symptom</td>
</tr>
<tr>
<td>Micro-sleep/head</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nodding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Falling asleep</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## 2 - Fatigue management: Healthcare v aviation

### Risk Factors

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Risk Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilot fatigue (Maximum 8 points)</td>
<td>b/f</td>
</tr>
<tr>
<td>Night 2200-0100</td>
<td>1</td>
</tr>
<tr>
<td>Night 0100-0600</td>
<td>2</td>
</tr>
<tr>
<td>Pilot employed &lt;12 months</td>
<td>1</td>
</tr>
<tr>
<td>TS with DZ/XXSH/XXRA @ Departure/Destination</td>
<td>2</td>
</tr>
<tr>
<td>Severe turbulence forecast @ Departure/Destination</td>
<td>2</td>
</tr>
<tr>
<td>En route SIGMETs for severe turbulence</td>
<td>1</td>
</tr>
<tr>
<td>Destination weather &lt; alternate minima</td>
<td>2</td>
</tr>
<tr>
<td>X-wind equal to or greater than 20 kts</td>
<td>1</td>
</tr>
<tr>
<td>Night flight outside of glide range to a lit strip</td>
<td>1</td>
</tr>
<tr>
<td>MEL Degraded Operating Platform</td>
<td>1</td>
</tr>
<tr>
<td>MERCY Flight declared</td>
<td>2</td>
</tr>
<tr>
<td><strong>Destination Considerations:</strong></td>
<td></td>
</tr>
<tr>
<td>High vermin risk OR High vermin risk @ night</td>
<td>1 2</td>
</tr>
<tr>
<td>Terrain hazard @ night OR Terrain hazard @ night (and nil EGPWS data)</td>
<td>1 2</td>
</tr>
<tr>
<td>Circling approach / night visual circuit required</td>
<td>2</td>
</tr>
</tbody>
</table>

### Total Risk Score

**Assessment Matrix**

<table>
<thead>
<tr>
<th>Total Risk Score</th>
<th>Risk / Decision Guide</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 4</td>
<td>Normal Operations</td>
</tr>
<tr>
<td>5 to 7</td>
<td>Caution (see Note 1) Additional Risk Mitigation required</td>
</tr>
<tr>
<td>8 to 9</td>
<td>Extreme Caution (see Note 2) Review risks and modify task and/or additional Risk Mitigation required</td>
</tr>
<tr>
<td>10+</td>
<td>CRITICAL SAFETY DECISION REQUIRED (see Note 3)</td>
</tr>
</tbody>
</table>
Many hospitals do not have clearly defined handover policies and procedures, and their practices fall short of those recommended.


Since the introduction of NSQHS Standards, and despite much work being done by health services for the purpose of accreditation, no Australian health service has published a report in a peer-reviewed journal on how its handover practices compare to Standard 6. It is likely that all Australian health services will need to make significant changes to their handover practices based on the new national Standards and that lessons learned at one health service could be useful to others.


Bedside handover is the single handoff method reported that both unites nursing staff with patients and increases patient safety.

RFDS definition of bedside
Typical RFDS patient handover points

1. Initial contact with either RFDS or Tasking by patient, care giver, or health service.
2. RFDS assess and assign urgency.
3. Appropriate flight and healthcare team dispatched.
4. Patient retrieved.
5. In flight care.
6. Flight returns, and patient transferred to ground transport.
7. Patient hospital presentation.
Handover by distance: RFDS Remote consultations and Medical Chests

- 225 per day/82,305 per year
- GP styled diagnostic and treatment
- Ongoing RFDS patient relationship
- Prescribing to Medical chest
Future agenda for Safety and Quality

- Accreditation against national standards
- Health outcome reporting
- Expanded rural health and aeromedical medical, nursing, and allied health training
- Possible flight crew fatigue rules applied to health professionals
- Continuous air safety improvements