Aeromedical retrieval

Aeromedical retrieval is the air transport of an acute patient using dedicated specially-fitted aircraft, with specialist retrieval teams and medical equipment.

Its origins lie within the military: the first ever recorded aerial evacuation of a wounded soldier, from the Serbian frontline, was in 1917. Australia has a proud history of having the longest active aeromedical service in the world with the foundation of the Royal Flying Doctor Service (RFDS) by Reverend John Flynn in 1928 in Cloncurry, Queensland.

Modern aeromedical retrieval has evolved to become a distinct specialist discipline and, as technology has progressed, so have the aircraft and the level of critical care that can be delivered during transport.

Despite advances in medicine and aviation, the tyranny of distance remains the principal challenge for rural and remote Australia. Acutely ill and injured patients may be a long way from tertiary hospital facilities, so they require a spectrum of retrieval care that begins with remote ambulance providers, rural doctors and nurses, and continues with the aeromedical retrieval team.

The fundamental principle of retrieval medicine is to maintain and enhance the care provided at each stage of the evacuation process.

Importance of communication

The single most important aspect of conducting successful and safe aeromedical retrieval is communication. For the referring GP, the ability to accurately convey the situation and the current and predicted requirements of the acute patient is crucial. Use of a systematic standardised manner of clinical communication (see box left) is increasingly recommended. Note that the last listed step – ensure full understanding – is vital.

The mainstay of aeromedical retrieval planning and activation is the telephone, with some increase in the use of alternative media technologies such as videoconferencing. The use of conference calls speeds up communication between parties and enhances agreement on a comprehensive clinical and logistical plan.

The risks of inadequate communication – or even worse, a misunderstanding of conveyed information – are high if the initial request for aeromedical retrieval is conducted in a non-standardised and disordered manner.

However, practical concerns determine behaviour and the critical nature of an unstable patient may mean there isn’t time for the treating doctor to leave the patient. In such cases, one possibility is to delegate the task of calling the retrieval team to an assistant using the same communication checklist.

The checklist is simple and can be easily implemented at your local hospital by all health professionals that may be required to manage a critical patient. Time spent in practising communication and the use of the standard checklist is likely to be the single most effective skill in the art of aeromedical retrieval of the critical patient.

### CASE HISTORY

You are a solo rural GP in a small town of 3000 people with a four-bed hospital. The nearest hospital with ICU and tertiary coronary care services is a three-hour flight away. Tony, 43, is brought to the hospital with acute chest pain for one hour and with signs of a large anterior STEMI on his ECG. After being given aspirin and IV morphine, he suffers a VF cardiac arrest that responds promptly to a single defibrillation after two minutes of CPR. Tony regains consciousness but still has chest pain. How would you prepare Tony for transport?
HOME TRUTH

- Use a systematic standardised method to communicate information to the aeromedical retrieval team and always check for comprehension of your concerns and requirements.

The ABCDE of preparing

Patient preparation

The fundamental question for the treating doctor is, “What definitive care is needed for this patient?” The answer will guide the resuscitation, stabilisation for transport, ongoing retrieval transport care and eventual destination of the retrieval.

To aid stabilisation of the patient before aeromedical evacuation, this definitive care can often be provided by the retrieval doctor. A common example is preparation of a patient with an acute ST elevation myocardial infarction (STEMI) who meets the criteria for acute thrombolysis. The earlier thrombolysis is delivered the better the outcome and the better the patient will tolerate the stresses of air evacuation.

Another example is preparing the injured patient with a traumatic pneumothorax. Definitive care involves recognition of the injury (which is vital as any pneumothorax will expand with rising altitude of air evacuation) and insertion of an intercostal catheter. Performing the catheter insertion in the local hospital before flight is far preferable, as conditions are generally more controlled and more assistance is available.

Air transport places certain physiological and psychologic stressors on the acute patient. A useful guide to help mitigate these stressors, always prepare the patient as if they are to have major surgery (see right).

The airway must be patent and breathing and circulatory status should be optimised. Venous access should be secured and adequate monitoring of vital signs, including urine output with a bladder catheter, begun. Ideally, the critical patient should be fasted. Adequate analgesia and judicious pre-flight sedation is vital for the anxious patient in pain. Fracture immobilisation will further assist adequate analgesia and reduce patient stress.

Once a patient is stabilised for transport, the same level of care should be maintained throughout the entire retrieval process until the definitive care location is reached. This has significant implications for staffing and fatigue issues in remote locations but the underlying principle remains the same.

Standard approach

For critically ill and injured patients, adequate preparation for transport uses the standard ABCDE approach.

A – Airway (with cervical spine protection)

- A patent airway is the key goal.
- Use an oropharyngeal or nasopharyngeal airway, or consider intubation.
- If intubated, secure the endotracheal tube (ETT), note and document its position. Use air in the cuff not fluid. This is a change from traditional practice based on research showing air-filled cuffs are safer as the pressure can be measured with a manometer.
- If unable to achieve tracheal intubation, a laryngeal mask airway is acceptable.
- Consider possible spine and/or significant head injury and apply a cervical or towel rolls (more comfortable) to either side of the head.

B – Breathing

- Maintain adequate oxygen: all patients requiring oxygen on the ground will require more oxygen at higher altitude.
- Manual ventilation can be given and an Air Viva bag should be accessible.
- Ideally, insert an intercostal catheter for all proven haemo/pneumothoraces. Attach either a Heimlich valve (a flutter one-way valve to prevent air travelling back along a chest tube, see picture on opposite page) or emergency chest drainage bag eg Portex (Heimlich valve, pictured left)

C – Circulation

- Control any haemorrhage.
- Ensure IV access with a minimum of two cannulas (large bore if trauma or haemorrhage present).
- An intraosseous needle is acceptable as reliable access.
- Make sure lines are well-secured, with an accessible injection port and a needle-free system (if available).

D – Disability and Disturbed behaviour

An adequate trial of pre-flight sedation is vital and best conducted at the remote hospital/facility. Acute sedation during flight is risky (in terms of oversedation or failed sedation) with little margin for error. Disturbed patients can put the safety of staff, patient and aircraft at risk. Identifying and managing this issue prior to departure is essential.

- Document the level of consciousness using the Glasgow Coma Score (GCS).
- Report evidence of dementia, delirium or confusion to the transporting team.
- Warning the retrieval team in advance of any anxiety or aggression is paramount.
clinical pearl here is to consider acute nicotine withdrawal that may develop during a flight of significant duration (>one hour). Early institution of nicotine replacement therapy (21mg nicotine patch) can markedly reduce the need for sedation during retrieval.

- Fear of flying should be addressed with reassurance, explanation and education about the aeromedical retrieval process. Steps to mitigate stressors include use of antiemetics, safety restraints etc. Oral sedation (eg, diazepam) is acceptable (see below).

**E – Extended care considerations:** consider the need for other care specific to your patient’s illness:

- Adequate analgesia and/or sedation.
- Use of antiemetics (eg, prochlorperazine, ondansetron, metoclopramide).
- Spinal immobilisation eg, vacuum mattress.
- Immobilisation of fractures (eg, splinting with a backslab or traction splints).
- Tetanus prophylaxis/antibiotics/wound dressings.
- IV infusions refilled for journey (no burettes).
- Rationalise therapies and minimize number of infusions.
- Consider thermal control – space blankets, limit exposure.
- Secure all tubing and empty all drainage bags before flight.
- Minimise contamination – remove wet/soiled clothes.
- Complete documentation/transport notes.

**Special groups**

**The acutely agitated patient**

The aeromedical environment is likely to worsen acute agitation due to the combination of noise, vibration, motion sickness and claustrophobia. An agitated patient may compromise the safety of flight operations and the options for managing agitation in this setting are limited.

Therefore it is vital that prevention, with careful risk assessment and appropriate planning, be conducted to avoid risks to patient safety (by excessive restraint and/or sedation) without compromising the safety of retrieval staff. Assuming that the acutely agitated patient is suffering purely from a mental-health-related condition is a risky misconception.

When preparing an agitated patient for transport, look for any easily reversible causes of agitation such as pain, nausea, urinary retention, hypoglycaemia or nicotine withdrawal. Keep the patient fasted (at least for solids) within a practical timeframe of expected retrieval response in case deep sedation is required. Oral sedation is preferable using long-acting agents (eg, diazepam) and two IV access points are recommended for retrieval of all agitated patients. IV or IM sedation should be given only by competent providers trained in treating complications of oversedation, with appropriate monitoring and resuscitation equipment available.

Physical restraints should be used according to local health service policy. Never allow a patient to struggle against their restraints as there is a strong association with sudden death, particularly in the intoxicated patient. Physical security is paramount if there is clear safety risk to staff/patient and may require request of police assistance in remote areas.

**The obstetric patient**

Aeromedical transport of the obstetric patient can involve the antepartum, perinatal and postnatal phases of pregnancy. It may range from routine interhospital transfers of stable patients for elective reasons to emergency retrievals of critically ill mothers and/or their babies.

It is not uncommon for mothers who have had emergency deliveries and their newborns to need retrieval for complications in the acute-to-subacute post-partum period. This special patient transport group is unique in that two patients need care and although their medical needs are closely intertwined, they have specific physiologic requirements to be maintained and optimised to improve obstetric outcomes.

Protocols for retrieval differ between states and may, for example, involve a perinatal consultant as well as the Adult Retrieval Service and NETs (Newborn and Paediatric Emergency Transport Service) if delivery is imminent.

Practical tips for the rural GP preparing an antepartum obstetric patient for retrieval include placing second- and third-trimester patients in left lateral tilt position to reduce gravid uterine compression of inferior vena cava and securing large bore reliable IV access (see next page).

Antenatal history and relevant information should be collected to allow retrieval planning. Any nausea and vomiting should be treated aggressively prior to the flight with metoclopramide or ondansetron.
HOW TO TREAT

THE GEMS

- Communication is the key to timely and successful aeromedical retrieval.
- When possible, definitive care should be provided by the rural doctor to ensure adequate stabilisation before flight.
- The acutely agitated patient requires careful planning and an adequate trial of sedation preflight. Consider nicotine withdrawal as a contributing factor.
- If intubated, use air in the cuff, not fluid: air-filled cuffs are safer in flight.
- An actively contracting pregnant woman is at higher risk of delivery than one who is not. Tocolysis should be instigated before flight if not contraindicated.

Resources

Resources (recorded lectures on modes of transport, patient preparation for transport and psychiatric aeromedical retrieval) are available at www.youtube.com/user/rfdsstar/feed

Delivery best avoided

Preterm labour

Obstetric retrievals in general require consideration of two patients, with one having no direct physical access for assessment and management. The underlying principle of the traditional aeromedical retrieval adage, “Avoid delivery in the aircraft at all costs”, is to undertake an in-utero transfer of the unborn baby, utilising the mother as the best possible transport incubator.

When is the best time to transport a mother in preterm labour? This is controversial in some respects and much of current practice is extrapolated from the delivery suite and hospital care. Many transport guidelines stipulate the need to assess cervical dilatation, rupture of membranes and adequacy/frequency of uterine progression before deciding on aeromedical transport of the preterm labouring mother.

For example, the implications are that if a woman is >7cm dilated with strong contractions, the decision should be to leave her at her current location to deliver, with a subsequent neonatal retrieval for her and the newborn.

This common strategy is based on the assumption that delivery on the aircraft is to be avoided at all costs. However, RFDS experience has repeatedly shown that the strategy of relying on cervical dilatation assessments (often by inexperienced staff) as the basis for retrieval decisions is flawed. Anyone who has worked in acute obstetrics for any length of time – even at an undergraduate level – knows that cervical assessment in labour can be quite variable and operator dependent.

In general, a reasonable guiding principle is that a preterm baby should be kept in utero for transport, if it is safe to do so – even if that means a small risk of in-flight delivery. However, some perinatal conditions (eg, active uteroplacental bleeding, severe chorioamnionitis and eclampsia) are best managed with delivery as soon as possible.

An actively contracting woman must be considered at higher risk of delivery than one who is not. Tocolysis should be instigated if not contraindicated (eg, severe preeclampsia, placental abruption, intrauterine infection, lethal congenital or chromosomal abnormalities, advanced cervical dilatation, and evidence of fetal compromise or placental insufficiency).

Common protocols in Australia focus on the use of oral nifedipine or salbutamol infusions. The other benefit of labour suppression with tocolytics is to allow adequate maternal steroid administration to facilitate fetal lung maturation.

CASE OUTCOME

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You speak with the nearest cardiologist and administer thrombolysis with an IV bolus of tenecteplase (Metalyse). You also contact the aeromedical retrieval team and arrange for retrieval using the iSoBAR checklist.

In preparation for transport, you secure two IV lines, place defibrillation pads on Tony’s chest and prepare cardiac resuscitation drugs (such as adrenaline and amiodarone) in labelled syringes.

Tony’s repeat post-lysis ECG shows resolution of the ST elevation, and you administer IV metoclopramide to prevent nausea during transport. Tony suffers another VF arrest and, despite 10 minutes of CPR and three defibrillations, he remains in VF.

The retrieval team arrive and immediately assist by allowing endotracheal intubation without interruption to chest compressions. After further resuscitation spontaneous circulation returns but Tony does not recover consciousness. Therapeutic hypothermia with ice packs and chilled IV saline is started and continued on the flight to the tertiary hospital.

Tony is taken to the cardiac catheter suite on arrival and a left coronary artery occlusion is stented. He is ventilated in ICU for 24 hrs, then rewarmed and extubated. Tony makes a full recovery without any neurologic deficit.