Royal Flying Doctor Service
WESTERN OPERATIONS

Transporting Your Patient

Guidelines for organising and preparing patients for transfer by air

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Reprinted 2015
ISBN: 978-0-646-93588-1
Version: 2.0
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Introduction >

The need to transport patients is a common feature of rural medical and hospital practice. The literature abounds with papers outlining the adverse outcomes which can occur during intrahospital and interhospital transport.

Problems arise from:

- inadequate diagnosis and initial management,
- poor preparation,
- failure to recognize potential complications during transport and
- the use of inexperienced or inappropriate escorts.

Rural practitioners should understand:

- the principles of preparation of patients for transport,
- the capabilities of different transport services in Western Australia,
- some special considerations in air transport of medical conditions,
- what should accompany patients being transferred and
- the medicolegal implications of patient transport.

Aims of Transport

The aim of transport is to get the right patients, to the right place, at the right time and in the right condition.

Transport is not an alternative to diagnosis and treatment.

The level of care should increase with each phase of a patient's management and transport, from the site of the first presentation to the definitive care hospital - a so-called "cascade of care".

Moving the patient is only part of the job. The history, examination and diagnostic findings as well as treatment records must also be transported, as these are essential for providing quality ongoing care at the destination.

Duty of Care

Medical practitioners have a duty of care to ensure that their patient is adequately stabilized, transported by an appropriate safe means, with competent escorts and relevant treatment.

It is not acceptable to hand over seriously ill patients to personnel who cannot manage the patient or commonly expected complications. As an example, transferring a patient with an acute myocardial infarction on a vehicle not equipped with a defibrillator or personnel trained in its use, could be regarded as negligent.

It should be clear who is responsible for the patient's care at all times.

Where a patient is seriously ill, doctors are expected to remain with them, or become involved with their transport, until they can be handed over to other appropriately experienced persons.

Role of the RFDS

The Royal Flying Doctor Service Western Operations (RFDS) provides an aeromedical transport service covering most of Western Australia. We undertake primary evacuations from isolated settings such as mine sites, road houses, stations and small communities with no health or medical services available. We also undertake a significant number of secondary transfers from district and regional hospitals.

Secondary medical transport is normally undertaken on a referral basis, with treating doctors usually referring patients to the RFDS if they require transport in excess of 100-200 kilometres (depending on region) and who require stretcher transport and medical care during flight.

Generally patients who can sit, do not require ongoing hospital care during transport, or are less than 2 hours by road, are deferred to other transport alternatives. An exception exists close to Perth where for time critical or complex cases, retrievals are available from inner rural areas such as Northam or Mandurah, or locations such as Rottnest Island.

Most RFDS transport services are provided in rural and remote Western Australia although some are distinctly metropolitan (for example, Rottnest Island). Most transfers are by air using fixed wing aircraft due to the distances involved. Some may be by road or helicopter (for example, the RAC helicopter based in Perth). We use jet aircraft for very long distance flights.

Aircraft and medical teams are geographically located in five centres across WA (at Derby, Port Hedland, Meekatharra, Kalgoorlie and Perth), with a Statewide Coordination Centre handling all calls located at Jandakot Airport in Perth.

The RFDS provides routine and emergency medical advice to thousands of callers in rural and remote areas, where there is no ready access to a doctor. This includes mine sites, road houses, indigenous communities, tourist locations, ships at sea and nursing posts. The range of clinical services provided by RFDS is outlined in the section 'About the RFDS'.

Communication & Referral

To refer your patient for transport you need to:

1. Assemble patient information
2. Call 1800-625-800
3. Refer your patient to us
4. Discuss the case personally
5. Ensure ongoing clinical care
6. Notify us of any changes

If you wish to arrange for your patient to be transferred, the most efficient process is outlined below.

1. Assemble patient information

Collate all relevant demographic and clinical information about your patient. The book of Flight Registration forms provided to every hospital, lays out the **information we are going to ask for** to assist in prioritizing your patient and arranging for treatment during transfer.

2. Call 1800-625-800

Call us yourself on the single free number 1800-625-800, to refer your patient for transport. The call will be answered by one of our Operations Centre staff, who will ask some core details, then pass your call on to one of our retrieval doctors. The RFDS doctor will be at the Base which would normally undertake the flight but when we are busy it may be an adjacent RFDS Base doctor.

3. Refer your patient to us

Discuss your patient directly with one of our medical staff. Please be patient. We endeavour to obtain all the information we need in a single call including history, examination findings and vital signs, provisional diagnosis and drugs and treatment commenced. We will discuss with you any additional resuscitation measures, preparation for transport and liaise on an approximate time frame for transfer. Whilst we are unable to give a firm arrival time at this point, we should be able to provide an estimate of when your patient will be transferred.

Whilst helpful, it is not essential that you have a bed arranged at this time, especially for urgent patients. We would rather have your patient referred to us early, so that we can make plans for transfer, than hear about them later in the day when all our crews are committed to other tasks. If you have an urgent or seriously ill patient, we can arrange a destination bed for you whilst you are resuscitating and managing the patient and provide a “door to door” service. Our goal is to help you as much as possible.

4. Discuss the case personally

We do not like to accept third-party referrals from nursing staff or other doctors who are not involved in treatment of the patient. We need to obtain clear accurate clinical details about their current condition. Sometimes, in conjunction with you, we may need to make decisions about delays or alternate methods of transport. There are potential

medicolegal ramifications if we are not dealing with the treating doctor. Our retrieval doctors can be making judgements about flights which may take them and their crew away from their Base for many hours and even up to 2 days. We want to make that decision on the best information available.

Call us if there is a significant change in your patient's condition. We may be able to upgrade the priority or cancel the flight if they improve or can be transported by other means. Likewise we will call you if there is to be a significant delay with the transfer of your patient, so that we discuss options for alternate treatment or transport.

5. Ensure ongoing clinical care

Ensure there is adequate ongoing care until your patient is physically handed over to us.

If the patient is seriously ill, you may need to remain with them until our retrieval team arrives at your hospital, or escort them yourself to the airport for handover. We should all aim to achieve a high quality of continuing care and clinical handover.

If your patient is relatively stable or routine, you can expect that we will liaise with hospital nursing staff on arrangements to have the patient brought to the airport, with appropriate documentation and escorts, to meet our ETA.

6. Notify us of any changes

Change in clinical condition
If there is a change in your patient's condition, please call 1800-625-800 and ask to speak to a doctor (not the non-clinical operations centre staff).

Changes to treatment or interventions
If you commence some special treatment, drugs or other procedures, please let us know in case it influences what we bring or how we undertake the flight.

Change to destination
If the destination hospital changes, please let us know so there is no confusion at the destination end when we organise a road ambulance to the hospital.

Cancellations
If you decide not to transfer the patient or to send them by other means, please let us know promptly, so that we do not spend time planning or undertaking the flight.

Relatives
We do not normally carry relatives except one relative or guardian for a child. Requests for a relative to travel depend on load factors such as the number and weight of patients and crew on the aircraft and must be made in advance.

Ongoing clinical advice
If you need ongoing advice about your patient, you can call and be put through to one of our doctors, or even the doctor on the aircraft heading to you.

Feedback
If there are any compliments or complaints we are keen to hear from you so that we can continue to improve our services. The Medical Director or deputy can be contacted 24 hours a day by phone through the 1800 number. Or you can send a confidential fax to 9417 6319 or email to medical@rfdswa.com.au

Priorities and Time Frames

There are **three priorities** for the initial triage of flight requests.

With multiple concurrent requests, the order of cases is further refined by taking into account specifics of the case and the resources available at the referring location.

All patients are allocated a priority for air transport by our medical staff in accordance with National RFDS Guidelines for air transport. There are three broad categories based on the urgency of the case.

Priority 1 and 2 flights cover those emergency and retrieval flights where time is an important factor in the patient's management. When there are multiple patients waiting, those with Priority 1 will be undertaken before those with Priority 2, which in turn will precede those with Priority 3.

At any time there may be multiple patients waiting, who are all grouped as Priority 2. Our medical staff will then make an individual comparison of all outstanding cases; to triage them within these broad categories and determine who will be transferred first. This may mean for example, that for equivalent patients in a District Hospital and a Regional Hospital, the smaller hospital patients will be transferred first.

Priority 1
Life-threatening emergency

Flight departs in the shortest possible time (subject to weather and essential safety requirements).

Priority 2
Urgent medical transfer

Flight departs promptly (within performance criteria) with flight planning requirements met on the ground.

Priority 3
Elective transfer

Flight tasked to make best use of resources and crew hours. Once tasked, departs within performance criteria set.

Aircraft and crews are tasked on the basis of clinical urgency, not just the order in which they were requested, nor the most convenient flight arrangements.

Our goal is to have an aircraft and team depart within 1 hour from the first call for Priority 1 patients, and within 4 hours of the first call for Priority 2 cases. However, this is dependent on our level of resources and fluctuating peaks of demand.

What Happens Behind the Scenes?

Dealing with your Flight Request

Call identification

When you call on our 1800 number, it is identified in our Operations Centre communications system as an evacuation or medical advice request and will be answered as quickly as possible. During the middle of the day we may have large numbers of calls occurring which could cause a brief delay. During the night we have less staff on duty and a sudden surge in calls may also cause short delays.

The Coordinator who initially answers your call is not clinically trained but experienced in the logistics of tasking and coordinating aeromedical flights. They will ask you if your call is just for medical advice, or a definite flight request. (We handle hundreds of medical advice calls from remote settings every week.)

Basic information

If your call is a flight request, they will ask for eight core pieces of information. These include who you are and where you are calling from (so we can call back). They will also ask for basic details about your patient to assist in identifying them (name, age and a working diagnosis), their weight (important for loading), their location and destination (if known).

Transfer to retrieval doctor

The Coordinator will then transfer your call to the Duty Doctor at the Base which is most likely to undertake the flight. As a minimum there is always one doctor available at any time at each of our five operating centres. Ideally it will be the staff at the Base closest to you which will handle the request and will be tasked to transport your patient. However, if aircraft are out on long flights or duty medical staff are caught up with other flight requests, you may be put through to a retrieval doctor at another nearby Base.

Our goal is to ensure that you can make a single call, and provide all of the information in that one call to arrange transfer of your patient. Western Australia is fortunate to have effectively a "single call, single service" system for medical retrieval, with aviation operations, coordination centre and clinical staffing all under the one umbrella.

Call us early!

There are usually multiple flight requests being handled at any one time. Therefore the earlier you call us and provide all the necessary clinical information, the more promptly we can arrange the transfer.

If you call us early, we are more likely to be able allocate your patient to an evacuation flight which may be planned or already underway in your region. A delay of merely 30 minutes can mean an aircraft departs on a flight in the opposite direction and will not return for 4-6 hours. Or it may mean that we depart from within your region with only one patient on board and will be unable to return for perhaps 6-12 hours.

We can carry two stretcher patients on most flights but the RFDS Statewide Coordination Centre can only arrange this if we know about your patient.

Assessing the flight request

During your discussion with our retrieval doctor, we will liaise with you on a number of aspects of the request.

Air transport criteria

We are generally only able to allocate our aircraft and teams to patients who require long distance stretcher transport with medical or nursing care during the trip. If your patient can travel by other means (for example, road ambulance, private vehicle, public transport, commercial flights) then we may have to decline your request.

Priority

Your patient will be assigned to one of three broad priority categories. We will liaise with you on this and the approximate time frame for transfer. If you believe the time frame is not suitable for your patient you have the opportunity to negotiate this with our medical staff based on clinical grounds.

In general, if we have an aircraft and crew available we will evacuate your patient as soon as possible. The priority system is necessary for ranking patients in order of clinical urgency when we have multiple requests waiting. If your patient has a low priority and we have significant other urgent demands, we will also discuss with you whether options for alternate means of transport are suitable.

Destination
Government funding arrangements and our resource limitations require patients to be transferred to the nearest suitable hospital able to provide care, not just to a hospital of choice. We ask you to justify the requested destination if it is not the nearest suitable hospital, or does not normally have the capacity to manage cases such as yours.

Crew required
Our medical staff will make an assessment of the crew required to transfer the patient. Many cases such as acute surgical, obstetric and mental health will be transferred with a Flight Nurse alone. However unstable, undifferentiated or complex patients with acute cardiac, respiratory, paediatric or critical care requirements, or major trauma, will normally have a retrieval team comprising doctor and flight nurse.

Equipment
During your call we will be evaluating what special equipment, drugs or other items might be required for the transport. This may include bringing blood products, anti-venoms or antidotes.

Pick-up location
During your call our medical staff will be deciding whether it is better to collect your patient at the airport or come in to your hospital. Coming in to the hospital enables us to undertake more procedures and "package up" your patient in better facilities. However it adds extra time to the retrieval and ties up a crew for longer, causing delays for other patients waiting to be transferred across the State. As a routine, most patients are collected at the airport and the referring hospital is responsible for getting them to the airport with an escort and handing them over.

Flight profile
Our clinical staff will decide on a number of other operational parameters. These include whether we need sea level cabin pressurization and whether a multiple sector flight is appropriate or we need a straight through flight with overnighting of the crew.

Other issues
We need to consider which other patients can be carried on the same aircraft, considering clinical and workload factors. In the case of certain infectious patients, we may not be able to carry other patients on the same flight, particularly if they are immunocompromised.

Very large patients, who are too wide to fit on an ambulance or aircraft stretcher, require special arrangements. In some cases we may not be able to transport them at all. Patients who are able to fit on a stretcher but are very heavy (to around 180kg) may be carried on some aircraft. We need an accurate weight in advance and the case will need to be discussed with our retrieval doctor and extra lifting assistance provided at the airstrip.

After your call, the retrieval doctor will notify our Operations Centre of the priority of the flight and many of these special requirements. They will then liaise on any operational issues which preclude a straightforward transfer from occurring.

Dealing with multiple requests
It is not uncommon for there to be multiple requests of similar urgency all pending. During the day and early evening hours, an additional Clinical Coordinator (RFDS retrieval doctor) is available in the Operations Centre to overview outstanding cases and determine the most appropriate order of transport, based on clinical grounds.

Tasking the flight

The most appropriate crew will be tasked taking into account all other patients awaiting transport and the current distribution and workload of each Base. Many factors are involved including aircraft hours and serviceability status, pilot duty hours and limitations, staff shifts and rostering limitations, other patients to be collected. Weather forecasts, airstrip conditions, payload and fuel requirements also influence which teams can be used and when.

The Coordinator will call the pilot, flight nurse and doctor and allocate a particular aircraft. Arrangements are made for fuelling to meet the specific needs of the flight and preliminary notifications may be made to hospitals about estimated arrival times (ETA's) - especially if it is a relatively short flight. In some locations the time taken for a road ambulance to get the patient to the airport is longer than the time to get there. Calls may be necessary to arrange airstrip lighting and to check for livestock or kangaroos.

Conducting the Flight

After departure

Once the aircraft has departed, the pilot will provide an ETA which, with modern navigation systems, is usually accurate to within 1-2 minutes. The Operations Centre will liaise with the referring hospital nursing staff and local ambulance services, to try to ensure the patient is at the airstrip at the correct time.

On arrival

Collect at airstrip

The majority of patients are collected at the airstrip. This is the most efficient arrangement. It enables our limited aircraft resources and staff to deal with the greatest numbers of patients within their duty period. It allows us to collect a patient whilst another is already on the aircraft. If we have to come in to a hospital, we cannot leave a patient behind on the aircraft unattended in the heat or cold.

Coming in to a hospital

For critically ill and complex patients, our retrieval team may elect to travel in to the hospital to enable the patient to be resuscitated, stabilized and "packaged" for transport in better surroundings than at the airstrip. For some serious but time critical patients, (for example, a bleeding abdominal aortic aneurysm which cannot be "stabilized"), we may still elect for an airstrip handover from the referring doctor to save time.

An essential principle of retrieval medicine is sound patient preparation before transfer to prevent in flight problems. However there is always a balance between spending too long stabilizing the patient and the need to evacuate them as promptly as possible to a place of definitive care.

Scene responses

A similar situation exists for primary responses, where we must consider the merits of travelling to an accident site to extricate and prepare the patient, with collecting them at the nearest airstrip from volunteers and ambulance crews and then undertaking interventions in our aircraft.

Handover

Once the aircraft has shut down our staff will undertake a formal handover with escorting staff. This will include normal standard questions about the patient's current condition, relevant to their diagnosis, such as pain, recent analgesia, contractions and the like.

Our nurse or doctor will examine the patient briefly in the ambulance and take a baseline set of vital signs at handover. They will check the status of any infusions running and swap over to our own vital signs monitoring equipment and infusion pumps if necessary.

The patient will be taken out of the ambulance to a sheltered area, or near to the aircraft, and then transferred to the aircraft stretcher. (Road ambulance stretchers are not compatible with our aircraft loading and restraint systems). They will then be loaded into the aircraft, and connected to our monitors. A small bag of personal belongings can be taken but there is no room for large items of luggage.

After our clinical staff are satisfied the patient is secured, monitored and all is well, and that they have all the documentation to accompany the

patient, doors will be closed, the patient given a safety briefing and the pilot will commence the engine start up procedures and radio calls.

After departure with the patient

The aircraft will taxi and then take-off. We appreciate if the ambulance and escort can remain until after we have safely departed. Occasionally problems arise and it is helpful to still have someone at the airstrip should we have to abort our departure. For example, if the patient deteriorates, or there is an aircraft technical problem we may need to return for assistance. It is otherwise difficult to contact someone to come back to the airstrip to help us.

En route with the patient

Once the aircraft departs, our Operations Centre is notified and given a firm ETA for the next patient's location or final destination. Depending on the distance involved this may range from less than an hour to many hours.

We coordinate and book road ambulances to meet the aircraft at their arrival destination and to transfer the patients to their destination hospitals.

In Perth, stable low complexity patients will be handed over to professional paramedics for the final road transfer to a destination hospital. However patients on drug infusions, receiving blood, in active labour or in a more serious or unstable condition will be escorted to their destination. All critically ill patients have retrieval doctors accompany them through to the destination hospital, to continue their care and ensure an appropriate handover.

Arrangements are made to refuel the aircraft, recharge medical oxygen and replace medical consumables prior to the next task. Details of aircraft hours, fuel usage, pilot hours and serviceability status are confirmed prior to tasking another flight.


ROYAL FLYING DOCTOR SERVICE OF AUSTRALIA

Preparation of Patients - General Principles >

Standard interventions

An essential principle of aeromedical transport is the proper preparation of patients prior to flight.

Referring practitioners can help us by providing accurate clinical information and undertaking appropriate interventions and treatment prior to transfer.

Our goal is to provide a hospital level of clinical management for the duration of the transport.

Patients being transferred by air are usually travelling long distances. During their journey, at altitudes of up to 40,000 feet, the only care available is that onboard the aircraft. An essential principle of aeromedical transport is proper preparation of patients prior to transport.

Referring practitioners can assist us to provide smooth and uneventful transfers by providing us with accurate clinical information when referring patients, commencing relevant treatment and assisting with patient preparation prior to flight.

Our goal is to ensure that we provide a hospital level of management for the duration of the journey, whether a primary evacuation, where we initiate all the treatment, or an interhospital transfer, where we continue existing monitoring and treatment. There are established principles that patients who having entered the health system should not have the level of care diminish during transport. All patients carried on RFDS fixed wing aircraft are accompanied by a Flight Nurse with critical care and midwifery experience. Almost half our patients have a medical Retrieval Doctor on board the aircraft also. Most rotary wing interhospital transfers coordinated by the RFDS are currently undertaken with a Critical Care Paramedic and an RFDS Retrieval Doctor on the aircraft.

All of the normal interventions which may occur in a hospital setting can usually be managed in flight. This ranges from simple oxygen therapy and intravenous fluids to management of chest drains, urinary catheters, central lines, wound drains to ventilation and invasive pressure monitoring.

Airway & Oxygen

Patients need to have a secure airway, adequate ventilation and appropriate oxygen therapy during transport.

Due to the reduced partial pressure of oxygen at altitude, most patients carried by air will receive supplemental oxygen in flight by simple face mask. Patients with acute cardiac, respiratory and obstetric problems as well as those with other causes of tissue ischemia and blood loss are particularly susceptible to hypoxia at altitude. Patients who

In our routine pre-flight assessment we will ask about respiratory function including respiratory rate, oxygen saturation and use of oxygen in the hospital setting.

Most patients with acute cardiac, respiratory and obstetric problems, as well as those with tissue ischemia, poor circulation or blood loss, will require oxygen during transport on the ground and in the air.

already require medical oxygen on the ground will receive additional oxygen in our aircraft at altitude, sometimes using a non-rebreather mask.

When receiving referrals for air transport, we will routinely seek information about your patient's respiratory rate and oxygen saturations and whether they require oxygen in the hospital setting. We will also ask for a GCS (Glasgow Coma Scale) on patients who have head injuries or are otherwise obtunded, with a view to determining the need for intubation and assisted ventilation.

Most patients have a secure airway. Those who do not, due to trauma, burns, infection or obtunded state, will require interventions such as intubation. The cervical spine needs to be protected with a collar in trauma patients with suspected cervical spine injury.

Patients with inadequate ventilation due to drugs, fatigue, neurological conditions or other disorders of respiratory function, may also require intubation and assisted ventilation.

If the patient's airway is at risk, intubation should be performed by referring doctors if they are capable of doing so. This should be undertaken sooner rather than later and not left to the retrieval team, unless there are special circumstances.

Endotracheal intubation
The "gold standard" for airway protection and assisted ventilation is a cuffed endotracheal tube, inserted orally or nasally. This is usually performed with a rapid sequence intubation (RSI). Ongoing muscle relaxation is continued with agents such a Vecuronium, and sedation is continued with drugs such as Morphine and Midazolam or Propofol. A cuffed tube of appropriate size is used in adults and this enables ventilation at higher inspiratory pressures and protects the trachea from aspiration.

Laryngeal mask airways
A laryngeal mask airway (LMA) can be helpful if intubation is difficult. Whilst the airway is not completely protected by an LMA, patients can at least be ventilated. A transport team will usually replace an LMA.

Surgical airways
Surgical airways such as a cricothyroidotomy are useful to buy time and enable some ventilation urgently. An example is the Melker cricothyroidotomy catheter kit. They may need to be converted to a larger diameter surgical airway or an endotracheal tube for ongoing management.

Other aids
A wide variety of other devices exist to manage difficult airways. These include combitubes and obturator airways, bougies, intubating LMA's, Trachlight devices, fibreoptic laryngoscopes and retrograde intubation kits. They are not commonly available in rural settings and rely on the skills and experience of the operator.

Breathing & Ventilation

Ensure your patient is adequately ventilating as well as having a secure airway. Patients on supplemental oxygen may show satisfactory oxygen saturations, whilst under-ventilating and becoming progressively acidotic.

Bag-valve-mask

Inadequate breathing can be most readily and safely augmented with bag-valve-mask (BVM) ventilation. Self-inflating bags are generally easier and more effectively used by a variety of health professionals, than soft anaesthetic bags.

In most Western Australian ambulances and aeromedical aircraft, a “demand resuscitator” positive pressure resuscitation device is available. These are manually triggered with a hard shell mask, and are generally easier to use than a BVM assembly in an emergency.

However for ongoing care, or if the patient’s airway is at risk, intubation will be required.

Mechanical ventilation

If patients require assistance with ventilation, they should ideally be placed on a mechanical ventilator. This provides far more consistent and reliable rates, volumes and pressures than ventilation by hand, and frees up staff to deal with other management. Secure the endotracheal tube and place a humidifying filter in the circuit as well as the endtidal CO2 sensor. A flexible connector helps with connection to the ventilator and positioning of the tube.

Hand ventilation may sometimes be used for children or difficult cases. In these circumstances a reliable experienced practitioner needs to be allocated to this function. It is not helpful to have carefully secured the airway then left the patient being ventilated inappropriately by inexperienced personnel or volunteers.

A range of portable ventilators are available in hospitals and used by transport services. The most common of these are produced by Drager. The Drager 1000 is a simple, easy to use and reliable unit which only requires connection to a medical oxygen source such as hospital, ambulance or aircraft outlets, or to portable cylinders. The Oxylog 2000 and 3000 have more features but require electrical power. Battery life is limited and they have increased levels of complexity. The majority of emergency patients will only require intermittent mandatory ventilation (IMV).

Monitoring

Patients who are ventilated require careful clinical supervision to ensure rates, volumes and pressures are appropriate. They should be monitored with oxygen saturation and capnometry (end tidal CO2), plus intermittent blood gases if available. Alarms should be set to warn of disconnection, high or low pressures or failure of the oxygen supply.

Use of multifunction critical care monitors is even more important in rural settings than in the city, as staff numbers are often limited and may be less experienced in managing critical care patients. If you have the equipment - use it!

The ventilated patient should be under the direct supervision of a medical practitioner with skills to modify ventilator settings, administer drugs, titrate infusion rates, and manage any potential complications which might arise, including extubation. A suitably trained health professional should remain in attendance at all times and an alternate method of ventilation and airway management should be readily available.

Paralysis and sedation
Patients who are being ventilated for transport should be paralysed and sedated to ensure optimal conditions for ventilation and prevent awareness. Pain management is also necessary.

Care of the ventilated patient
Some general principles and tips for care of the ventilated patient, whilst awaiting transport, are outlined in the section on Tips for Special Groups of Patients.

Circulation & Fluids

Most patients undergoing air transport require at least one site of intravenous access.

Where patients only require drugs in flight, a well secured intravenous cannula with injection port is best located in the right forearm.

More seriously ill patients and those requiring ongoing fluids, blood or drug infusions, need two peripheral intravenous lines, to ensure backup access if one line fails (as commonly occurs).

Most patients who require air transport will need some form of intravenous access. Some patients may only require intravenous access to enable parenteral drugs to be more easily given, for example, intravenous analgesia, sedation or emergency drugs. Those patients who are fasted, dehydrated or shocked will require a means of providing intravenous fluids as well.

If patients only require access for drugs, then a single intravenous cannula with injection port is sufficient. This is ideally placed in the forearm, avoiding wrist and elbow flexures and well secured. Standard needle-free injection ports such as Smartsite™ minimize the need to use needles in flight. Placement in the right forearm is more accessible, as patients are normally on stretchers located on the starboard side of ambulances and aircraft. Cannulae can be occasionally flushed with normal saline. Heparinised saline is not required.

In general, patients with blood loss requiring reliable and ongoing intravenous fluid resuscitation, or those on essential drug infusions, need two peripheral intravenous lines. This provides a back-up in the common event that one fails during transport. Whilst it is possible to insert intravenous lines during transport, it is better to be prepared. One line in each upper limb, avoiding the back of the wrist, and wrist and elbow flexures, provides the greatest reliability and flexibility.

Infusions & Giving Sets

It is helpful if intravenous cannulae can have a multi-flow connector or extension tubing attached, to enable infusion giving sets to be changed easily without disturbing the cannula site.

It is helpful to hand over patients with full bags and freshly prepared infusions, to minimize the need to make these up in flight.

Due to variations in the types of infusion pumps used across the State, it is helpful if intravenous cannulae can have some form of multi-flow connector or extension tubing attached, or at worst, a three-way tap. This makes it easier to change infusion giving sets without disturbing the cannula site itself.

Intravenous fluids are most commonly provided in plastic bags and 500mL bags are usually most convenient and adequate. Drugs in glass bottles can be accommodated if necessary but are best avoided due to risk of breakage.

Considering the duration of transport, it is helpful if patients are handed over at the airport with reasonably full fluid bags and fresh infusions. This minimizes the need to make up new infusions in flight.

Drugs & Fluids

Drug Infusion Guidelines

Standard Drug Infusion Guidelines are available from the RFDS for all common infusions.

The RFDS publishes clinical guidelines for setting up common intravenous infusions formulated for both 500mL bag and 50mL syringe driver use. Whilst not prescriptive, standardization increases familiarity and minimizes the risk of errors during transport. The guidelines are available on our website, by phoning the RFDS, and can be faxed by our retrieval doctors for individual case scenarios.

Blood & Blood Products

Discuss the need for blood products with the RFDS retrieval doctor prior to transport and whether blood can be provided or needs to be brought (uncross-matched) by the retrieval team.

Any blood products provided for transport must be packed in accordance with the ARCBTS guidelines and accompanied by complete documentation if cross-matched.

Some patients require ongoing blood transfusions during transport. These range from acute trauma or surgical patients who may still be bleeding, to those requiring ongoing transfusion for chronic blood loss.

If your patient has suffered a significant haemorrhage, you should discuss with the retrieval doctor whether cross-matched blood products can be provided for transport by your hospital, or whether the retrieval team should bring uncross-matched blood for emergency use.

If blood is to be provided "just in case", this should also be discussed with the RFDS retrieval doctor prior to flight. It is essential that blood is packed for transport according to Australian Red Cross Blood Transfusion Service (ARCBTS) guidelines, and not just put in a foam "Esky". This meets air transport requirements and ensures that if it is not used, it can be safely passed on to a Transfusion Lab at the receiving hospital for further use and will not be discarded. Posters are available from the ARCBTS in Perth outlining the correct packing procedures for country hospital staff.

If Fresh Frozen Plasma is required this should also be discussed with the retrieval doctor and provided appropriately thawed.

When any cross-matched blood products are supplied, the appropriate documentation needs to be supplied.

Drugs in Flight

Many patients require medication to be administered in flight. Ideally, if regular drugs such as antibiotics are almost due, they should be given prior to transfer, to minimize our in-flight workload.

Confirm all medications which the patient is receiving when referring for transport.

Provide details of drugs required in flight and ensure they are supplied with the patient.

RFDS carries a comprehensive but nevertheless limited range of emergency drugs routinely on the aircraft. Specific drugs required during transport need to be supplied when referring the patient for transport, as treatment in flight is ultimately our responsibility

The requirement for drug treatment in flight and details of each agent and dose need to be provided to the assessing RFDS doctor when the transfer is requested, as treatment given in flight is ultimately the responsibility of the supervising RFDS doctor.

Analgesia

Patients being transported are exposed to movement which can exacerbate the pain from fractures and other injuries. Ideally analgesia is provided prior to the ambulance journey to the airport and the subsequent transfer between stretchers and loading onto the aircraft.

Large doses of narcotic analgesia immediately prior to transport should be avoided, unless there is an appropriate escort on the ambulance and airway management available. Caution is necessary with obtunded patients and those who are shocked.

Small doses of intravenous analgesia are reliable and quick acting in contrast to intramuscular injections. In-flight analgesia is almost always given by regular small intravenous doses of narcotics thus the requirement for intravenous access. Innovative options such as intranasal Fentanyl may be considered in some circumstances such as paediatric analgesia.

Pain relief may be augmented through proper splinting and the use of regional anaesthetic blocks. These can be inserted in the referring hospital using a long acting local anaesthetic agent and provide comfort without the side effects of narcotics for prolonged periods.

We consider it prudent not to top up epidural catheters in the transport environment.

Escorts and Infusion Devices

Patients requiring drug infusions require a suitable escort on the ambulance to the airport and an infusion controlling device. This is to ensure drugs are administered accurately in a continuous manner, and that any complications of drug treatment or the underlying condition can be dealt with between hospital and the airport. Apart from supervising treatment, an escort provides valuable information at handover.

An RFDS retrieval team does not come into the hospital in all situations and there remains a duty of care for the referring doctor and health service to safely transport the patient to the airport.

We would expect a registered nurse or medical practitioner to accompany patients receiving anti-arrhythmics, inotropes, anaesthetic agents, tocolytics or blood products by continuous infusion. It is our view that all patients receiving a drug by a continuous infusion should have an additional suitable escort provided. However whether infusions containing Heparin, GTN or antibiotics are escorted, is ultimately a duty of care matter for the referring practitioner.

Sedation

Most commonly sedation is used for disturbed mental health patients. Midazolam alone is not usually the most suitable agent in these cases. A major tranquilizer such as Haloperidol or Olanzepine in combination with a benzodiazepine such as Midazolam or Diazepam, is usually more effective in obtaining longer duration sedation and suppression of agitation.

As with all sedation, monitoring and care of the airway is imperative at all stages of transport.

Documentation

Transporting the patient alone is only part of the job. Transferring all their documents and investigation results is also important to ensure that the receiving hospital does not need to duplicate investigations and can continue to provide appropriate treatment.

Ensure that patients are accompanied by all appropriate documentation. This assists transport staff in providing ongoing treatment, as well as the receiving hospital.

Patients should be accompanied by an RFDS Flight Registration Form plus an appropriate referral letter, copies of relevant hospital medical records and results of investigations and x-rays.

A convenient RFDS Transport Envelope and checklist is provided to help collate all these documents.

RFDS Registration Form

A book of forms is provided to all hospitals and other regular referring locations. The cover outlines the simple steps involved in contacting the RFDS for transport. The single sheet forms inside provide a means of confirming the essential patient identifying details and a summary of the observations, treatment and general clinical condition at the time of referral.

It is preferable if this form is completed prior to calling the RFDS as the clinical details it contains match the details we will request when assessing the request. That is, our medical staff use standardized flight assessment forms, which mirror in layout and content the basic details on the form provided to hospitals. A flight request can thereby be processed in the quickest and most efficient manner if all details are at hand.

The forms are in quadruplicate, with the original white copy going to the receiving hospital, and the blue copy retained by RFDS for our medical records. The pink copy is provided to St John Ambulance as a source of patient identifying data. The yellow copy may be included in the medical record of the patient in the referring location, or kept in the book as a form of register of all patients referred to RFDS for transport.

Apart from sending out the top three copies of this single patient registration document, there is other important documentation which should accompany the patient.

Relevant documents to accompany the patient include, but are not limited to:

- RFDS patient registration form (white, blue and pink copy)
- referral letter from the treating doctor outlining history, investigations, diagnosis and current treatment

Copies of medical records including:

- Inpatient medical and nursing progress notes,
- Observation charts
- Medication charts
- Fluid balance charts
- Pathology results
- Cross-matching results
- Radiology reports and original films if possible
- Operative notes
- Relevant past notes and discharge summaries

Other items not to be overlooked include:

- False teeth and dental appliances
- Spectacles
- Hearing aids
- Prosthetics and other appliances
- Valuables and personal identification
- Medications & Insulin pens

You should send relevant original x-rays, if this will assist with management of the patient during transfer and at the receiving hospital. Even if they haven't been formally reported yet, they aren't much use to you once the patient has been transferred!

Transfer Envelope

An RFDS Transfer Envelope is available to all country hospitals. This not only provides a checklist of items to accompany the patient but provides a single resealable envelope to hold all relevant patient documentation. We encourage you to use this to avoid loose papers going astray during transport. Additional supplies are available by phoning the RFDS.

Consent

We assume that conscious mentally sound patients are able to consent to transport and treatment. Where there are issues relating to resuscitation orders, or refusal of certain forms of treatment on religious or other grounds, then these need to be brought to our attention when the patient is referred for transport and the patient accompanied by relevant documentation.

Blood products will not be administered to Jehovah's Witnesses where they are conscious and refuse consent, or if unconscious but have a current wallet card declaring their requirements. Children are normally accompanied by a parent or guardian wherever possible. Issues may arise when this is not the case and any supporting documentation such as written parental consents to treatment or surgery would be helpful to us and the receiving hospital.

Mental Health Patient Documentation

A large number of mostly referred mental health patients are carried by RFDS every year. These patients generally have Forms 1 and 3 under the Mental Health Act 1996 but there are a range of other Forms which may be relevant, such as Forms 7 or 11. (See Section on Mental Health Transfers).

It is important to confirm what Forms a patient is on when referring to us for treatment. Mental Health patients transferred on a voluntary basis can leave the aircraft and abscond at intermediate stops, or in Perth, and we are powerless to prevent this. Voluntary patients should normally be transferred by other means such as private transport, public transport or commercial flights.

It is worth noting that if a patient's condition changes, such that they should no longer be an involuntary transfer (organic medical condition diagnosed, or suitable for voluntary transfer), then Mental Health Forms may be rescinded by the referring practitioner. (Refer to Clinicians' Guide to the Mental Health Act 1996. Office of the Chief Psychiatrist. 2009)

Baggage & Meals

Only a small bag containing minimal personal items can accompany patients on aeromedical flights - definitely not suitcases.

Carriage of dangerous and flammable goods is restricted, as it is on airlines.

Biological specimens must be appropriately packaged to prevent leakage and contamination of the aircraft and occupants.

Light snacks and drinks for patients (and RFDS staff) are always appreciated.

Luggage

There is limited space on board aeromedical aircraft and no dedicated luggage area. Only minimal personal belongings can be carried. Suitcases cannot be carried and a small overnight bag is the usual maximum.

Dangerous Goods

Staff preparing patients for transport should understand that the normal restrictions which apply to carriage of dangerous goods on airlines, also applies to aeromedical flights. Dangerous items such as matches, lighters, gas cylinders or other flammable liquids, large knives or weapons must not be brought on board aircraft. Pilots are entitled to search patient baggage.

Biological Specimens

Likewise specimens and biological substances (with the exception of blood products for transfusion) must be safely packaged to prevent spillage and contamination.

Meals

Most aeromedical flights last for a few hours and may require diversions to additional locations whilst en route. On long distance flights from the northwest, patients may be in transit for up to 12 hours. The RFDS has no facility to provide meals in flight. It is extremely helpful for your patient's comfort and wellbeing if you are able to provide something to eat and drink. Sandwiches, snacks, fruit and drinks such as water bottles or juice boxes are ideal. Any spare meals are also appreciated by RFDS staff!

Relatives

We cannot routinely carry relatives or any significant baggage.

Aircraft used for aeromedical transport have limited seating capacity and payload, especially when undertaking long distance transfers across Western Australia. There is a maximum take-off weight for the aircraft and every extra kilogram loaded means less fuel which can be carried. This can cause problems when adverse weather requires additional fuel to be carried to enable holding, or landing at alternate airports.

Unnecessary passengers or baggage on the aircraft may prevent it being diverted to another urgent case en route, or require an intermediate stop for refuelling - thus delaying arrival at the patient's ultimate destination.

More passengers on an aircraft reduce the space available for staff to move around and care for patients routinely and to perform effectively in a resuscitation scenario. If they become air sick they become an additional liability.

As a general principle we do not carry relatives of patients other than a single parent or guardian of a child, or an essential carer or relative in special circumstances. Whilst it may be possible to accept a relative upon arriving at the airstrip, this is by no means certain. Relatives should not be given unrealistic expectations of travelling on medical aircraft. In many cases, if they travel by private means or commercial aircraft, they may well arrive at the receiving hospital in a similar time frame. Where a relative is carried, we reserve the right to offload them at an intermediate destination, if we need to attend to another emergency patient.

Escorts & Handover

It is more efficient for patients to be picked up at the airstrip.

A medical team will only go in to the hospital for complex unstable patients.

Some urgent patients cannot be 'stabilized'. Much time can be saved if they are brought to the airstrip also.

The RFDS has long-standing expectations of clinical escorts and handover processes based on many decades of air transport experience and an understanding of things which commonly go wrong.

It is both a professional courtesy and good clinical practice to ensure patients are properly handed over. Patients who justify an expensive air transfer usually warrant having an escort to the airport, in addition to ambulance personnel, and a comprehensive clinical handover.

With many ambulance sub-centres being staffed by volunteers, it is difficult to obtain a comprehensive clinical handover unless there is at least a registered nurse, familiar with the patient, able to provide this. Handover of documentation, clarification of drug orders, infusions and patient progress are all helpful and relevant.

Patients should be properly monitored, escorted and handed over.

Escorts should be able to manage predictable complications which may occur.

The expectation is that any escorts are reasonably able to manage predictable complications which may occur during transfer to the airport. This might include administration of drugs such as analgesics, anticonvulsants, acute cardiac life support agents, the management of infusion devices, or management of complications such as transfusion reactions or even delivery of a premature infant.

The period between leaving care in a hospital and handover to an RFDS aircraft should not be a void in which the patient is at risk. Appropriate monitoring should occur. In the case of cardiac patients this must include continuous ECG monitoring with a defibrillator readily available. Respiratory patients should have pulse oximetry as a minimum and most seriously ill patients would benefit from comprehensive ongoing vital signs monitoring of blood pressure, pulse rate, oxygen saturation and ECG.

Obstetric cases should have a midwife escort able to monitor the rate and strength of contractions, fetal heart rate, or post-delivery fundal height and PV losses.

Our expectation of all hospitals is that patients are brought to and handed over at the airport. Hospitals and referring practitioners accept responsibility for their care up until that time. At the destination end, RFDS accepts responsibility for the handover and escort arrangements to the destination hospital.

The normal process at handover involves the Flight Nurse entering the ambulance and recording a set of standard observations, accepting a clinical handover of the patient and notes from the escort, attaching a vital signs monitor and swapping over infusions, giving sets and infusion devices.

The patient is then transferred out of the ambulance, moved onto the aircraft stretcher and loaded into the aircraft. Assistance with each of these phases of transfer is appreciated.

The ambulance and escorts should preferably not leave the airstrip until the aircraft is airborne. Situations have arisen where the patient deteriorates, or there is an unexpected aircraft problem, which results in an aborted takeoff.

It is helpful if the ambulance remains at the airstrip till the aircraft has safely departed, in case a problem with the patient or aircraft arises.

In the case of seriously ill patients, the retrieval team will come in and a handover will usually involve treating medical and nursing staff in the referring hospital. This is most useful when further resuscitation and stabilization are required, or the patient already has numerous complex interventions (lines, infusions, etc.) which are best sorted out in a hospital environment rather than at an airstrip. Planning is required as we are unable to leave another patient on the aircraft at the airstrip.

It is always appreciated if referring doctors make themselves available to handover at the hospital but we understand that other clinic commitments, and self-preservation in the middle of the night, mean this is not always possible. Good clinical notes, a clear telephone referral in the first instance and nursing staff able to provide an update on the patient's treatment and progress, are an appropriate alternative.

Some patients are time critical and cannot be further "stabilized" (for example, an acute extradural haematoma, leaking abdominal aortic aneurysm, advanced preterm labour). In these instances we will ask that the patient be brought to the airport whenever possible, to avoid the additional 1½ - 2 hour delay involved in a retrieval team coming in to the hospital. This will require the referring doctor and nursing staff to arrange for packaging and transport to the airport but ultimately means urgent patients reach definitive care much earlier.

Coordination & Arrival Times

We are unable to give you an exact arrival time when you call as there are many factors to consider and usually multiple patients being prioritized. However we should be able to give you a rough estimate, particularly for urgent cases. Otherwise you should ask us to call you back.

Our normal procedure is to notify you, or the staff of the referring hospital, as soon as our aircraft is airborne. In this situation our estimated time of arrival (ETA) is usually very accurate.

If we have to pick up another patient first, or the flight time is very short, we may have less time to notify you of our ETA than is desirable. We will do our best to provide advance warning of arrival.

If we are delayed by the patient at the first location, our ETA for a subsequent location will be delayed, as will other flights waiting. It is therefore imperative to minimize delays whenever possible. Please try to get your patients to the airstrip on time.

We cannot give you an accurate arrival time until the aircraft has actually departed.

You should discuss the estimated arrival time with the RFDS doctor to ensure it is reasonable for your patient, and consider alternatives if it is not.

If we are preparing to depart for your patient and another more urgent call comes in, we may divert the aircraft to that patient, in which case we will advise you of the delay.

We work in an environment of pilot flight duty time limitations and constantly changing priorities. If you have not heard back from us or wish to have an update on when the aircraft may arrive, please call. Likewise, please notify us of significant changes in your patient's condition as we may divert an aircraft to respond more urgently or need to put additional equipment or personnel on the aircraft.

In planning flights involving multiple sectors, we will make a choice of which patient to collect first. It may be that a more serious patient is collected last, to minimize the time they spend flying around the skies, out of a hospital environment.

Please try to get your patients to the air strip on time to prevent delays for others.

Please notify us of any significant changes in your patient's condition, which may alter how we do things.

Cardiac

Most aeromedical transfers in this category are patients with Acute Coronary Syndromes. A smaller number of patients have isolated arrhythmias or cardiac failure.

Give oxygen, ensure intravenous access, and provide continuous ECG monitoring for all cardiac patients.

Perform a 12 lead ECG and fax to RFDS and receiving hospital when referring for transport.

Thrombolyse appropriate cases as promptly as possible.

Ensure monitoring and an appropriate escort when transferring to the airport.

Notify us of any significant changes in the patient's condition or treatment prior to arrival.

Acute Myocardial Infarction / Acute Coronary Syndromes

General principles

On clinical grounds give:

- Oxygen
- Sublingual nitrates
- Aspirin
- Narcotic analgesia

Insert a single intravenous cannula and take bloods.

Monitor vital signs and ECG continuously.

Obtain a 12-lead ECG.

Thrombolyse promptly in ST elevation myocardial infarction if there are no contraindications. Advice is available if required from tertiary hospital emergency departments, coronary care units or RFDS retrieval doctors. ECG's are easily faxed if you need advice.

Third generation fibrinolytics are preferred over Streptokinase, particularly in Aboriginal patients. If a single bolus dose preparation such as Tenecteplase (Metalyse) is not used, ensure full treatment is completed.

Refer to RFDS for transport.

We need to know the:

- Basic history and examination.
- 12 lead ECG findings.
- Blood results if available.
- What treatment was given and the result?
- Has the patient reperfused or is there ongoing pain?
- Have they had any complications such as arrhythmias, hypotension?

Patients who have not reperfused will usually be given a higher priority for transport. In general, smaller hospitals will get priority over regional centres if patients are similar.

Patients outside the Perth metropolitan area cannot reach a tertiary unit for PCI (percutaneous interventions) within an appropriate time frame, so thrombolysis locally is essential.

Patients with Non-ST elevation acute coronary syndromes will be risk stratified according to AHF guidelines for urgency of transport.

Ensure the patient has a functioning IV line, is monitored and escorted by appropriate staff to the airport (with defibrillator available).

Ensure copies of ECGs, drug treatment given, and past medical history are included in the referral documents.

Arrhythmias

General principles

Transport management will depend on the nature of the arrhythmia and underlying cause.

On clinical grounds give:

- Oxygen

Insert a single intravenous cannula and take bloods.

Monitor vital signs and ECG continuously.

Obtain a 12-lead ECG. Fax us the ECG when referring patients for transport.

Pre-transport consultation with the receiving hospital may result in advice to commence a drug infusion. Please inform us prior to flight so that we are prepared. Sometimes no drug therapy is an appropriate option.

Ensure continuous ECG monitoring and an escort to the airport.

Patients with Complete Heart Block resulting in a substantial bradycardia or hypotension may require transcutaneous pacing prior to and during flight.

Acute Pulmonary Oedema

General principles

Differentiate from other causes of acute breathlessness and identify any precipitating underlying cause such as myocardial infarction or arrhythmia which require treatment.
On clinical grounds give:

- Oxygen
- Frusemide
- Glyceryl trinitrate spray or sublingual

Consider Morphine (low dose), anti-arrhythmics and Digoxin for rapid AF

Consider CPAP or BIPAP if available. Whilst this can be continued during transport, many patients will ultimately be intubated and ventilated for long distance transport.

Obstetrics

The most common cases are preterm labour (PTL). Other transfer indications include preeclampsia, antepartum haemorrhage (APH) and postpartum haemorrhage (PPH).

Start a Salbutamol infusion according to RFDS transport guidelines and call us promptly. Ensure there is IV access if Salbutamol is not initially used.

Do not expect us to come in to the hospital. Send the patient to the airport with a midwife escort in time for the aircraft's nominated arrival, to minimize delays.

Do not expect a neonatal team for an unborn baby.

Preterm Labour

Commence tocolytics to suppress labour early and refer to us for transport early. Neonatal outcomes are superior if transferred in utero rather than following delivery.

Follow the RFDS transport guidelines and refer to RFDS as early as possible. We have extensive experience in successful long distance transport of women in preterm labour, even with ruptured membranes and advanced cervical dilatation - provided tocolysis is initiated promptly and aggressively.

Our preference is early commencement of a Salbutamol infusion. You can start with Nifedipine orally but progress to Salbutamol rapidly, if contractions do not settle. Most patients undergoing long distance transport are treated with intravenous Salbutamol in flight as we have more success with its use and it is more reliably titrated against clinical response.

Consider Celestone Chronodose and IV antibiotics if indicated.

We need to know:

- Basic history and examination
- Gestation & parity and obstetric history
- Frequency and strength of contractions
- Reliable PV findings especially:
  - Intact or ruptured membranes
  - Cervical dilatation

Ensure an IV line is in place (so we can start Salbutamol if it is not already running.)

Send the patient to the airport in accordance with our advised ETA with a midwife escort. Do NOT expect us to come in to the hospital. (The added delay may make the difference between a successful transfer and delivery in your hospital).

Do not expect a neonatal team unless the infant has already delivered. It delays transfer, the large cot causes problems with management of mother in the aircraft if she has not delivered, and the accompanying paediatrician is not obstetric trained.

We normally send Flight Nurse (Midwife) only. Advise us if contractions do not settle or there are significant changes whilst we are en route.

Preeclampsia & Eclampsia

Our aim in transport is to prevent convulsions and control blood pressure during transfer to an appropriate hospital for delivery.

The severity of preeclampsia will determine the urgency of transfer and escort requirements for the flight. In addition to blood pressure and renal function, obtain the following if laboratory facilities are available: platelet count, uric acid, hepatic transaminases, clotting screen and 24 hour urinary protein estimation.

Control blood pressure prior to and during transfer. This may include oral Alpha Methyldopa or Labetalol, or intravenous Hydralazine.

If IV fluids are given, avoid fluid overload. 100 ml/hr is usually sufficient. Monitor urine output.

Magnesium Sulphate is the most effective prophylaxis against convulsions. Intravenous infusion requires careful, close monitoring (respiratory rate, blood pressure and tendon reflexes) in your hospital and during transport. We will provide a doctor on the flight. Magnesium can be commenced intramuscularly, especially in a primary care setting.

Careful monitoring of all women with preeclampsia should include symptom review (especially headache and epigastric pain) blood pressure, fluid balance, checking for reflexes and clonus and assessment of fetal wellbeing.

Eclampsia is a medical emergency with significant maternal and fetal mortality. Treatment priorities are initial ABC resuscitation, followed by controlling seizures and controlling blood pressure.

Additional advice is available from your regional obstetrician or current KEMH guidelines. Notify the RFDS early, as these patients require a high priority transfer with a medical retrieval team.

Antepartum Haemorrhage

Antepartum haemorrhage (APH) is defined as bleeding from the genital tract after the 20th week of pregnancy. The major causes are placenta praevia and placental abruption, but other causes exist. It

is not always possible to determine the cause prior to transfer of these patients. Vaginal examination should be avoided until the location the placenta is known. APH is unpredictable and the woman's condition may deteriorate at any stage.

If haemodynamically unstable, commence ABC resuscitation. Consider the possibility of a concealed abruption.

All APH patients should have at least one large-bore IV line.

Consider cross-match of blood early so it will be ready to transport with the patient. If no blood is available locally, the RFDS retrieval team can bring universal donor blood.

Observe and monitor closely and notify RFDS of any deterioration in maternal or fetal status.

Anti-D immunoglobulin. If the woman is Rhesus D negative, a dose of 625 units should be given as soon as possible. (Refer to KEMH guidelines.)

Postpartum Haemorrhage

Primary postpartum haemorrhage (PPH) is the main cause of maternal mortality in developed countries. Recognition and referral of high-risk patients and active management of labour will prevent only some of the occurrences. As per ALSO (Advanced Life Support in Obstetrics) training it is helpful for obstetric teams to regularly review and rehearse their PPH plans.

Early recognition of PPH and institution of a treatment plan is important. Appropriate management plans can be found in the KEMH Clinical Guidelines and ALSO protocols. For those patients requiring transport:

- Resuscitate with ABC and attempt to stop bleeding using standard protocols.
- Notify RFDS early.
- Have a clear management plan and discuss this with the RFDS doctor. In-flight management options are limited as we do not routinely carry blood products, myometrial prostaglandins, Misoprostol tablets or intrauterine balloons. With enough notice it may be possible to bring these with the retrieval team. Activated Factor VII may be an option.
- Cross-match blood early, and check coagulation indices. RFDS can bring universal donor blood if indicated.
- Attempts to control the bleeding surgically will depend on local resources and staffing. Occasionally a specialist obstetrician can be flown out by RFDS to manage the bleeding on-site.

Secondary postpartum haemorrhage can occur any time between 24 hours and six weeks postpartum but most commonly occurs between 8-21 days postpartum. There is a high associated maternal morbidity.

Treatment is based on the cause, which is in turn based on clinical assessment. This will generally include antibiotics, bed rest, monitoring, and surgical evaluation under anaesthesia with curettage. Approximately 15% will require blood transfusion. Transport requirements will depend on stability of the patient.

General Considerations in Obstetric Transfers

1. Accurate estimation of gestational age is extremely helpful.
2. Advice that has been given by the receiving specialist should be clearly communicated to the RFDS doctor, so we are all aware of the treatment plan.
3. For obstetric patients from remote communities and for the very young, it may be appropriate for a support person to travel on the RFDS aircraft.
4. Where a mother needs medical transport postpartum due to complications, transport of the newborn is decided on a case-by-case basis.

Neonates

The best way to transport the unborn fetus is in utero.

Specialized transport arrangements exist for transport of neonates, particularly premature infants. However if your case is a woman in premature labour, the transport of unborn babies is an obstetric not a paediatric problem and you should contact the RFDS immediately for advice on transport.

The best way to transport the unborn fetus is in utero. In general, neonatal retrieval teams are not sent for unborn infants and do not provide an acute resuscitation service.

Specialist advice on neonatal problems is available from your regional paediatrician, or from NETSWA based at Princess Margaret Hospital (PMH).

Initial resuscitation of the newborn includes oxygenation, respiratory support and CPR if needed as per current protocols. Prior to and during transport, treatment aims are the prevention of hypoxia, hypothermia and hypoglycaemia.

The medical retrieval team for aeromedical transport of neonates in rural Western Australia comprises a paediatrician and RFDS flight nurse. The paediatrician is either from a regional centre (Derby or Port Hedland) or from Perth as part of NETSWA. A dedicated neonatal transport unit is brought to the referring location by the transport team and the baby remains in this unit until arrival at the receiving Neonatal Intensive Care Unit, usually at PMH.

The decision to transfer, the destination and clinical treatment decisions are made in consultation with either the regional paediatrician or the NETSWA paediatrician, or both. However, the duty RFDS doctor authorizing the flight will need to know the clinical details when the initial call is made to request transport. This is to enable prioritisation of the patient against other urgent flight requests, to anticipate logistical issues and to brief the RFDS flight nurse on preparation and special requirements.

In addition, clinical details regarding the mother should be given to the RFDS doctor if the plan is for the mother to travel with the baby.

Whether the mother travels on the flight with the neonate depends on a number of factors including the aircraft payload for the flight and whether she is self caring or requiring ongoing nursing care during transport.

Accommodation for the mother may be available in PMH if she does not require a hospital bed. This is usually fine if the mother has had an uncomplicated delivery, has minimal ongoing blood loss and is able to walk. If the mother requires a hospital bed it will need to be arranged at an alternate hospital.

If the mother is likely to need significant nursing care during flight, such as an epidural top-up or blood transfusion, it may be preferable for her to be transported at a later time due to the workload with the neonate in flight. We may be able to accommodate another adult such as the father but this will be dealt with on a case-by-case basis.

Additional advice on neonate resuscitation and transport is available from NETSWA. See also the WANTS Handbook published by PMH.

Trauma

General Considerations

Refer early and minimize investigations such as radiology prior to arranging transport.

Send any investigations with the patient so transport staff and the receiving doctor can see them. No use keeping them!

Keep us informed of delays due to surgical intervention. If the patient is going to theatre and our pilot has been tasked, he may run out of duty hours resulting in a delayed transfer.

Multi-Trauma

We work on the EMST (Emergency Management of Severe Trauma) or ATLS (Advanced Trauma Life Support) principles. All RFDS doctors are current in EMST - using this system ensures major problems are not missed and are treated in the appropriate priority. It also provides a useful framework for communicating injuries.

Call us early in trauma. Call even before the patient arrives. You should be put through to your nearest RFDS doctor even at this stage. Give whatever information you have about the type of accident, the number of people injured and their condition at the scene if known. This will allow RFDS to get airborne as soon as needed or even divert an aircraft in flight. At whatever stage you call RFDS in major trauma, it is not necessary to know the full extent of the injuries but resuscitation and stabilisation need to continue.

Mechanism of Injury

Knowing and communicating the mechanism of injury helps to anticipate injuries. Information can be gathered from ambulance officers and police.

- Car / motorbike / pedestrian etc.
- Accident type (rollover / car versus tree etc.) and speeds involved
- Restraints (seatbelt / airbag / helmet)
- Trapped in or ejected from vehicle
- Condition at scene (conscious /unconscious/walking)
- Alcohol or drugs involved (may mask head injury)
- Condition of others, especially major injuries and fatalities

Primary Survey

Evaluate and treat immediately life-threatening conditions in the standard order

1. Airway and cervical spine
2. Breathing
3. Circulation

Early interventions may include airway manoeuvres, chest decompression, IV fluid resuscitation, prior to the secondary survey.

This may also be the time to call RFDS, if someone is available to make a brief call.

Two large bore IV lines should be inserted early in all multi-trauma patients. Other options include intraosseous and central venous access.

Secondary survey

In almost all cases it will be possible to complete a secondary survey and stabilise while awaiting transport. The patient needs to be adequately exposed, examined "top to toe" and log-rolled.

- Head. Assess and monitor the GCS.
  - For safe transport, intubation may be required for a GCS less than 12 or 13.
  - Look for haematomas, lacerations and signs of base of skull fracture.
  - Document pupil size, reactivity, equality.
- Cervical spine. The potential for spinal cord injury must be taken seriously. With limited radiology in rural WA, it is generally impossible to safely "clear" the cervical spine prior to transfer in major trauma. Plain cervical x-rays should be taken and examined, but if normal there may still be significant injury. In general, full spinal precautions continue until assessed fully at the receiving hospital. These include a hard collar (e.g. Laerdal Stifneck), sandbags or head block with tape, and close supervision.
- Chest. Because of gas expansion at altitude, a small or moderate pneumothorax can become life-threatening during air transport. In addition, it is difficult to diagnose and treat pneumothoraces in the aircraft during flight. We therefore have a low threshold for insertion of chest drains. In addition, patients who have chest trauma and require intubation will generally have prophylactic chest drains inserted.
- Abdomen. Examine for bruising, distension and bowel sounds. Consider a nasogastric tube (orogastric in head trauma).
- Pelvis. Clinically assess or x-ray and consider risk of significant haemorrhage. Techniques to splint a fractured pelvis include the T-pod pelvic splint.
  - Multi-trauma patients need a urinary catheter for monitoring fluid status.
- Limbs. A clinical diagnosis of fracture may be sufficient prior to transfer.
  - Fractured limbs should be reduced if indicated and splinted for stability and comfort, e.g. using plaster slab.
  - Fractures of the femur require a traction splint (e.g. Hare, Donway, Sager).
  - If x-rays are taken, send them with the patient.

Further considerations

- High flow oxygen is helpful for all major trauma patients.
- Analgesia, antibiotic cover and tetanus prophylaxis should not be forgotten.
- Most multi-trauma patients are best transported on a vacuum mattress with care to continue spinal precautions. Scoop stretchers and spinal boards are very useful in the field but not appropriate for prolonged transport due to discomfort and pressure issues.

AMPLE History

This is a useful mnemonic for eliciting the balance of the patient's history.

A - Allergies
M - Medicines
P - Past Medical History / Pregnancy
L - Last Meal
E - Events / Environment leading to the current trauma

Head Injuries

The aims of patient management in severe head injury are to identify and treat life-threatening injuries and prevent further injury to the brain and spinal cord. This includes the avoidance of hypotension, hypoxia and hypercarbia.

Airway management and cervical spine control take priority, as in all trauma cases.

There is a moderate incidence of cervical spine injury associated with head injuries, although x-rays may appear normal. Spinal precautions (hard collar, sandbags or head blocks with tape) should continue throughout transport if the patient has a depressed conscious state.

Complete the primary survey, addressing airway, breathing and circulation, with immediate treatment of life-threatening conditions.

Oxygen is required in all cases of head injury.

Assessment of conscious state

- Rapid assessment can use the mnemonic AVPU (Alert, responding to Voice, responding to Pain, Unresponsive)
- Detailed assessment should be made using the standard Glasgow Coma Scale (GCS) of 3-15, which is re-assessed frequently. Score eyes out of 4, verbal out of 5 and motor out of 6. Remember the best score during each assessment is used, and it is the trend in the score rather than the actual value which usually influences management.

Intubation in head injury

- Indications for intubation include deteriorating GCS, poor airway, inadequate breathing, and the combative head-injured patient.
- We have a low threshold for intubation prior to transporting the head-injured patient. A trauma patient with a GCS around 12-13/15 has significant risks of hypoxia, hypercarbia, and deterioration during flight. Associated facial or neck injuries are another possible indication for intubation.
- The technique for intubation in head injury is a Rapid Sequence Induction with special attention to cervical control and measures to avoid hypertension and hypotension.
- During ventilation maintain normocarbia, avoid excessive hyperventilation, and avoid obstructing neck veins with tight ETT ties.

Mannitol is only given in head injuries as a short-term measure to reduce intracranial pressure and carries risks of worsening secondary brain injury through hypotension. Only give on the advice of a receiving specialist.

Glasgow Coma Scale

The GCS is scored between 3 and 15, with 3 being the worst, and 15 the best. It comprises three parameters: Best Eye Response, Best Verbal Response and Best Motor Response, as given below.

Glasgow Coma Scale

	1	2	3	4	5	6
Eyes	Does not open eyes	Opens eyes in response to painful stimuli	Opens eyes in response to voice	Opens eyes spontaneously	N/A	N/A
Verbal	Makes no sounds	Incomprehensible sounds	Utters inappropriate words	Confused, disoriented	Oriented, converses normally	N/A
Motor	Makes no movements	Extension to painful stimuli	Abnormal flexion to painful stimuli	Flexion / Withdrawal to painful stimuli	Localizes painful stimuli	Obeys commands

Summary

Airway Management

- Oxygen for all.
- Intubation and ventilation for depressed conscious state, actual or potential airway obstruction, poor ventilation.
- Cervical collar. Plain x-ray helpful but not always definitive.

Breathing

- Chest drains.
- Analgesia or anaesthetic blocks for rib fractures.
- Ventilatory support.

Circulation

- Good vascular access with two lines.
- Adequate but not excessive fluid resuscitation.
- Control haemorrhage externally - dressings, surgical.
- Control internal bleeding - splinting fractures, pelvic binder, surgery.
- Blood transfusion where necessary (request early if required).
- Fresh Frozen Plasma given if more than 6 units of packed red cells transfused.
- Other agents if a transfusion coagulopathy occurs.
- Reversal of Warfarin when necessary (Vitamin K, FFP, Prothrombinex).

Disability & Drugs

- Analgesia - intravenous narcotic boluses or local anaesthetic blocks.
- Antibiotic prophylaxis in contaminated wounds.
- Tetanus prophylaxis.
- Mannitol for cerebral oedema is usually a last hope measure.
- Activated Factor VII in severe massive transfusion coagulopathy.

Exposure & Environment

- Avoid hypothermia - use warmed fluids, re-warming measures.
- Attention to cleaning and dressing wounds.

Burns

Careful assessment and documentation of burns helps guide management.

Major burns are often greatly under-estimated, and constant review of fluid balance and response to intravenous fluid therapy is vital both prior to and during transport

Airway burns require early intubation.

Dressings usually involve SSD cream and dry dressings, and need to be securely in place for transport.

First Aid and Initial Treatment

In acute presentation, cool the burnt area to prevent further tissue damage. Twenty minutes of cool running water during the first two hours is the current first aid advice.

Adequate analgesia should be given early.

Careful assessment of Burn Surface Area (BSA) and depth of burns: indicate area and depth of the burns on a chart such as the Lund-Browder chart, both back and front. This can be faxed to the burns unit. Also consider sending digital photos for advice.

In addition it is important to fully assess the patient for other injuries such as fractures, and for possible cyanide or carbon monoxide poisoning.

Indications for Transfer to a Specialist Unit.

- BSA > 10-20%, or circumferential burns
- Burns over flexures, or other special areas including face and perineum.
- Airway burns.
- Children with significant burns.

Vascular access is extremely important in major burns as large volumes of fluid need to be infused rapidly. If two large intravenous cannulae cannot be achieved, consider other methods such as an intraosseous needle or venous cut-down, through the burn if necessary. It can be difficult to secure access lines to burnt skin, and they may even require suturing in place.

Fluid Requirements in Burns

Calculations are frequently incorrect and generally underestimate what is required, so response to therapy must be monitored.

The Parkland formula is an excellent starting point for calculating fluid requirements:

Fluid requirements = 2-4mL/kg body weight X % burn area + maintenance fluids

- Total is given over the first 24 hours, with half being given in the first 8 hours.
- Requirements start at the time of burn not time of presentation.
- Generally Hartmann's solution or Normal saline are appropriate fluids to use.

Seek expert advice early from adult burns unit (RPH) or paediatric burns unit (PMH).

Urine output is a good indicator of adequate resuscitation and ongoing fluid management, so an indwelling catheter should be inserted prior to transport. Urine output of greater than 0.5 ml/kg/hour is required to ensure excretion of metabolites and give renal protection.

Airway Management

- Indications of airway burns include soot or carbonaceous matter around nostrils and lips, burns to mucosa, hoarse voice and stridor. In the presence of any of these, early intubation should be considered.
- Need to intervene early before the face and neck becomes oedematous and difficult to intubate.
- In extensive burns, airway oedema can result as a general manifestation of oedema even without airway burns, so consider early intubation if burn area is greater than 40-50%.

Dressings

- The receiving burns unit will give specific advice on how to dress the burns. It is important that they have a realistic idea of the expected time in transit as this affects the advice regarding SSD cream. In general SSD cream or silver impregnated dressings (e.g. Acticoat) will be used for rural transfers because of the length of transport time.
- A non-stick, dry dressing and/or a sheet is the dressing generally used with or without SSD cream.
- Wet dressings can cause hypothermia, and cling film can encourage infection, so these are generally not used.
- Dressings can slip off easily during transport so please attempt to make them secure.

Further Considerations in Burns

- Escharotomies may be required where vascular compromise is occurring. Seek surgical advice.
- Tetanus prophylaxis should be given if immunization status is not adequate or not known.
- There are significant risks of infection in burns. This is helped by careful asepsis and good dressings. Seek advice as to antibiotic prophylaxis.

Acute Surgical Conditions

Blood Loss

Control haemorrhage in bleeding patients before transport if possible.

Wherever possible stop the bleeding. It is risky to transfer patients who continue to bleed, especially over longer distances and long time frames. Utilize standard principles for control of external bleeding. Utilize local or regional surgical intervention when possible.

Controlled hypotension in the short term may help moderate blood loss. Do not over-resuscitate patients, causing increased perfusion and bleeding, with associated dilution of clotting factors.

Provide cross-matched blood if possible and if likely to be required. Pack according to Australian Red Cross Blood Transfusion Service (ARCBTS) guidelines so it is not wasted if not used. When there is significant blood loss include thawed Fresh Frozen Plasma (FFP) if possible. An optimal ratio is 1:1 units of packed cells and FFP for significant blood loss.

Blood can be brought on retrieval flights but will be uncross-matched O neg (or O pos); possibly group specific if time allows.

Consider activated factor VII for massive transfusion coagulopathy. Seek expert advice from RPH Trauma Service or the ARC Blood Transfusion Service clinical consultant.

Reliable large bore intravenous access should be provided prior to transport in two sites, ideally each forearm. Avoid flexures and secure well.

Bowel Obstruction

Patients with a bowel obstruction or a perforated viscus will usually require air transport at a restricted cabin altitude.

Trapped gases will expand at altitude. We will normally arrange a sea level cabin altitude in our pressurized aircraft to prevent gas expansion, pain and possible perforation.

Routine management includes intravenous infusion with maintenance fluids whilst the patient is fasted.

A nasogastric tube helps decompress the stomach, to minimize vomiting and gas expansion during flight.

Adequate analgesia should be given, with an antiemetic.

Mental Health

Good pre-flight sedation is one key to successful transfer of even the most disturbed patient.

Use a sedating major tranquilizers and not just benzodiazepines.

Ensure patient safety and that the airway is managed in heavily sedated patients.

Send the appropriate Mental Health Forms with the patient.

Ensure there are two functioning intravenous cannulae with injection ports, (with one in the right forearm).

Voluntary patients should be sent by other means. They usually do not require stretcher transport or medical treatment during transport.

Violent referred patients can be transported safely by air, especially if sedated appropriately prior to flight. We usually do not transfer at night due to limited emergency resources available across the State at night. There are some benefits of sedation overnight in hospital and the consequent reduced arousal the following day.

We need to know:

- What is the diagnosis and what has been the patient's recent behaviour?
- What treatment has been given so far?
- Are they on Forms (and which ones)?

We require two functioning IV cannula with injection ports, (preferably one in the right forearm).

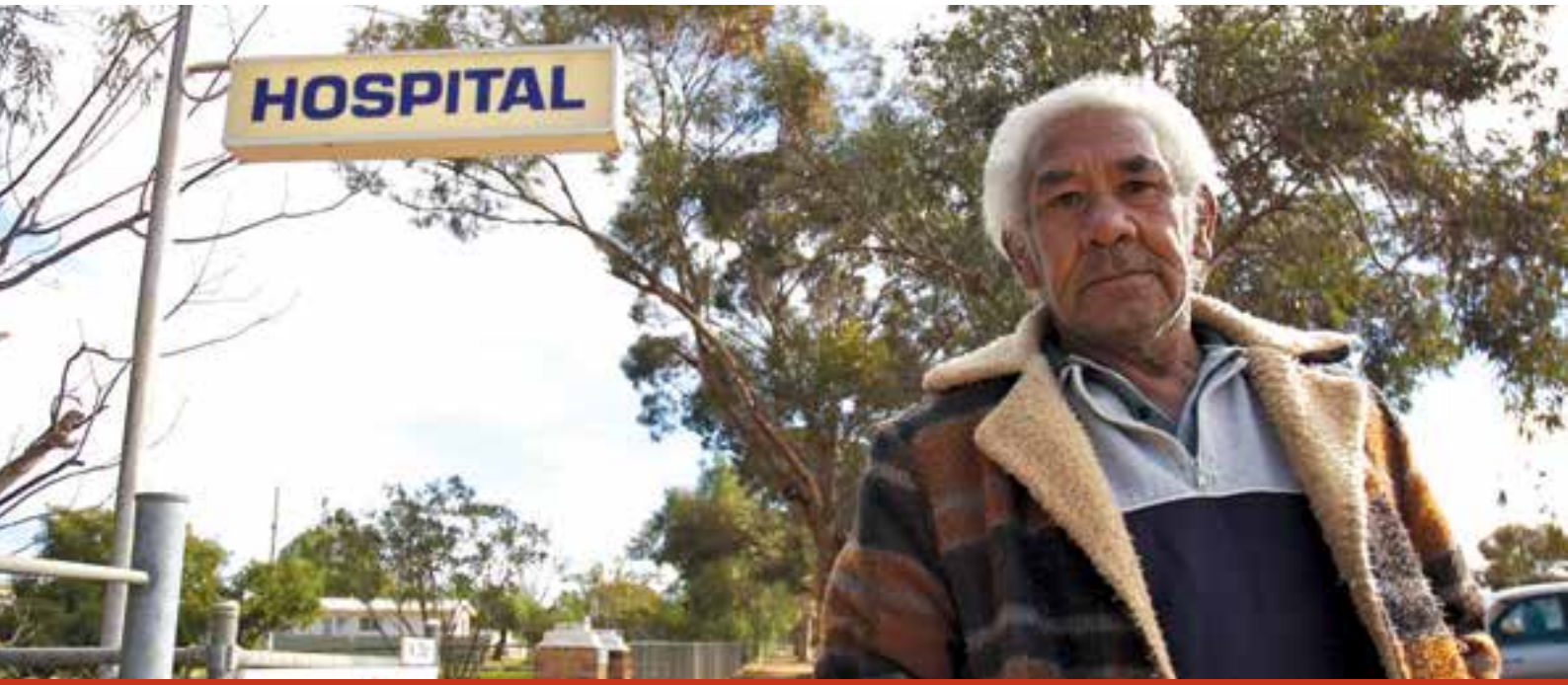
Ensure the correct Mental Health Act Forms and a referral letter are sent with the patient.

Administer sedation prior to flight - ideally a mixture of a major sedating tranquilizer such as Haloperidol or Olanzepine and aliquots of Midazolam or Diazepam.

Take care with sedation and ensure careful observations of your sedated patient and airway in hospital, prior to our arrival.

Air safety requirements prevent us from loading and departing with a patient who is violent and cannot be adequately restrained and sedated.

If the patient is combative on our arrival we may be unable to transport them, and may require you to come out to assist with additional sedation, restraint and loading, or take the patient back.



Poisoning & Envenoming

Treat all snake bites seriously.

Ensure the Pressure Immobilization Bandage (PIB) has been correctly applied.

Transfer to a destination with laboratory facilities for coagulation testing, antivenom stocks and staff able to monitor and treat the patient, before removing the PIB.

Antivenom should be given if there is evidence of envenoming - but not just a good story or positive VDK.

Visual identification of snakes is highly unreliable.

At least twelve hours close observation in an appropriate facility is required for all suspected snake bites.

RFDS can bring antivenom and a venom detection kit, but the patient will still need transport to an appropriate destination.

Snake Bite

First Aid should be started as soon as possible.

- Pressure immobilization bandage (PIB) along the whole limb.
- Splinting of the limb.
- Immobilization of the patient.
- Do not wash the bite site, as skin swabs can be used for venom detection.

If a patient arrives with PIB in place, ensure it is appropriately applied. If necessary, do not remove but reinforce with a second bandage and splint the limb.

Seek advice from a Clinical Toxicologist available through the Poisons Information Centre (13 11 26), RPH or SCGH, or through the RFDS.

Initial Assessment and Care Prior to Transport

Assist airway, breathing and circulation if indicated, and establish intravenous access.

Assess for symptoms and signs of envenoming. These can be systemic (headache, nausea, abdominal pain, collapse), local (regional lymphadenopathy, oozing from bite site), or related to neurotoxins (ptosis, blurred vision, muscle weakness, progressive paralysis), myotoxins (muscle pain).

Coagulopathy is a serious and common complication especially for Brown Snakes and can lead to death from intracranial haemorrhage. Beware the patient with collapse or headache.

If no coagulation tests are available, a bedside Whole Blood Clotting Time is helpful. Place 5-10 mL of blood in a plain glass tube and invert gently every 5 minutes. Normal blood will clot within 20 minutes. Don't invert the tube too often as this can break up the clot.

Principles of Antivenom Use

Antivenom is given if there is clinical or laboratory evidence of envenoming. Do not administer just because a VDK is positive but do not withhold in the presence of envenomation.

Indications for immediate antivenom prior to transfer include unstable cardiovascular system, seizures, proven coagulopathy, active bleeding and paralysis.

Where symptoms and signs are more subtle or the patient is asymptomatic but has abnormal pathology, discuss with a toxicologist.

The current preference is for monovalent antivenom to be given, appropriate to the type of snake involved.

Visual identification of snakes is highly unreliable. The likely snake may be determined from the geographical location, the clinical symptoms present, with support from a Venom Detection Kit (VDK) test and advice from a local toxicologist.

The amount of antivenom to be given and the use of premedication continue to be debated.

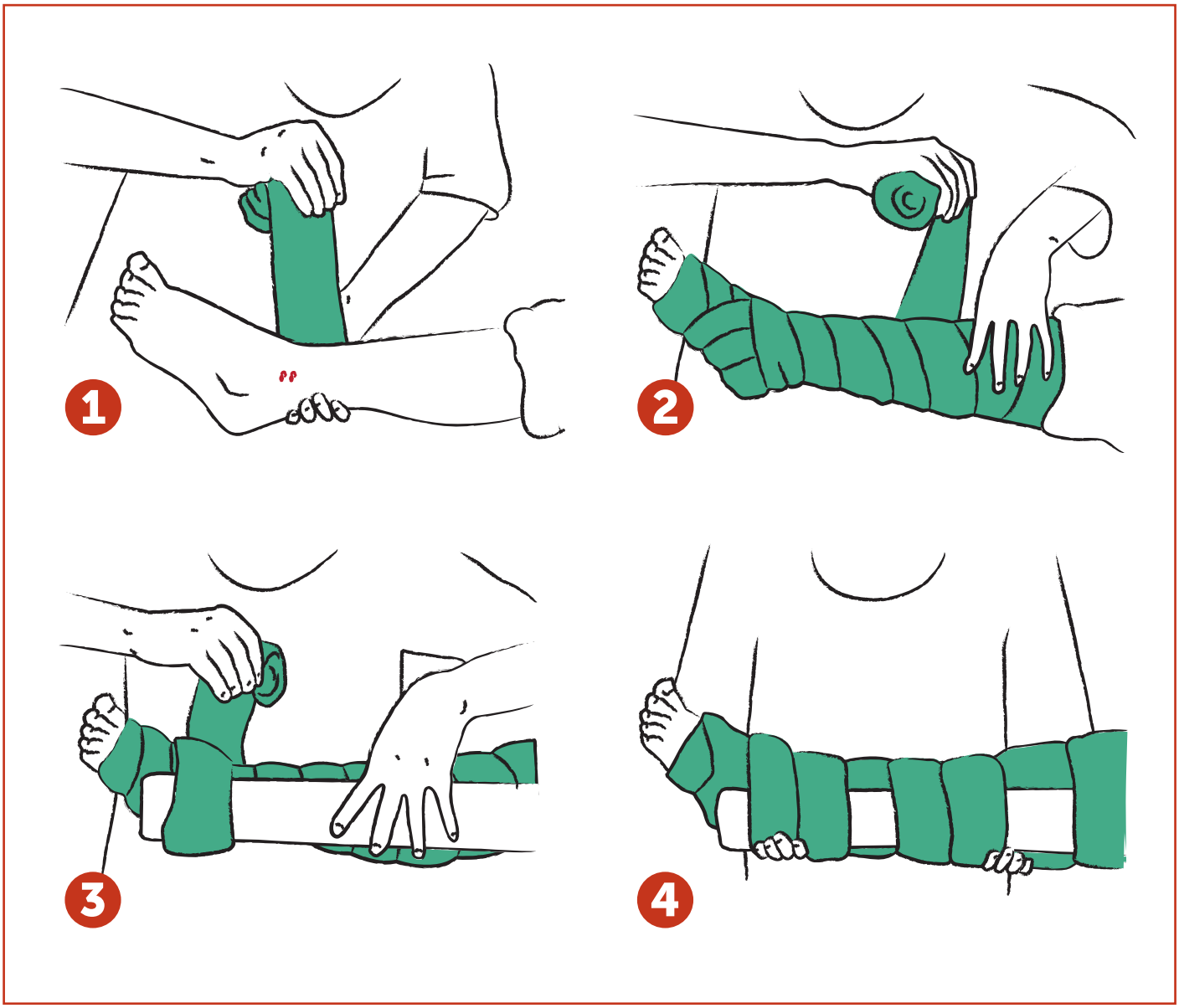
Use of the Venom Detection Kit
The venom detection kit is used to determine which antivenom to use, not whether the patient is envenomed. A bite site swab is more accurate than urine.

Selecting the Destination
Take advice from a toxicologist and let them know your local and regional facilities. The destination will generally be a regional hospital or a tertiary hospital. The destination should have:

- Antivenom
- Laboratory capabilities to measure coagulation indices and renal function
- Staff and facilities to treat, resuscitate and monitor the patient
- In complicated cases the patient may still require secondary transfer for tertiary care.

Common Pitfalls

- Failure to take seriously and apply pressure immobilization bandage
- Removal of First Aid without preparation, or antivenom available
- Failure to treat when clearly envenomed
- Use of incorrect antivenom



Application of a Pressure Immobilisation Bandage (PIB)

Poisoning

General Approach

Resuscitation
Follow an Airway, Breathing and Circulation approach, with particular attention to the risk of aspiration and hypoventilation associated with a GCS less than 12.

The approach to the poisoned patient should follow the following priorities:

- Resuscitation
- Risk assessment
- Supportive care & monitoring
- Investigations
- Decontamination
- Enhanced elimination
- Antidotes
- Disposition

Resuscitation should also include control of seizures, avoidance of hypoglycaemia and hyperthermia.

An antidote may be required for successful resuscitation in a limited number of circumstances.

Risk assessment
Risk should be assessed in conjunction with a Clinical Toxicologist available through the Poisons Information Centre (telephone: 13 11 26).

The following information will be required:

- Agents
- Doses
- Time since ingestion
- Clinical features and progress
- Patient factors such as weight and co-morbidities

Planning ongoing care and patient disposition should be in conjunction with a toxicologist and the RFDS. The anticipated course of the poisoning will influence preparation of the patient for transport and whether the RFDS doctor needs to bring special antidotes with them.

Supportive care & monitoring
Supportive measures and preparation for safe transport may include securing the airway, providing ventilation and circulatory support (fluids, inotropes, invasive pressure monitoring, pacing). Renal function and urine output often needs close monitoring.

All poisonings should have a 12 lead ECG, blood sugar and paracetamol level.

Decontamination
Gut decontamination is often not helpful for deliberate self-poisonings, unlike some industrial and accidental poisonings. Seek advice as attempts at gastric lavage may cause more harm than good.

Decontamination of skin and clothing of patients with industrial or agricultural poisonings (e.g. organophosphates) is useful and also important for transport, as there is a risk to staff from exposure to the agents in a relatively closed environment.

Paraquat poisoning is the only poisoning where decontamination takes priority over resuscitation, preferably at the scene (Fullers earth, soil, activated charcoal may all be used). Caution should be exercised with administration of oxygen.

Doctors working in areas with significant industries should make themselves familiar with potential hazards, such as cyanide used in mining.

Sepsis

Severe sepsis is a common cause of critical illness in rural and remote settings. Effective management depends on early recognition and early aggressive management.

Treat the cause. Give full dose, broad spectrum antibiotics early.

Ensure good oxygenation.

Ensure good tissue perfusion by managing hypotension and ensuring adequate urine output.

The ultimate pathology in sepsis with multiple organ failure is cellular hypoxia. This can be avoided by ensuring adequate oxygen delivery and tissue perfusion.

Identify and Treat the Cause

Empirical use of antibiotics is guided by reference to current Therapeutic Guidelines ("The Pink Book") or specialist advice. Current thinking recommends full dose, broad spectrum antibiotics given early with good quality culture samples where possible.

Culture samples may be transported with the patient if no local laboratory facility exists.

For severe sepsis in the Kimberley, especially during the "wet season", consider "Meliodosis" and use Meropenem, as delays will be fatal.

Maintain Oxygenation

Where possible, monitor oxygenation by arterial blood gases. If in doubt use high flow oxygen (15 L/min via non-rebreather mask). If inadequate, despite high flow oxygen, the patient may require ventilatory support. Oxygenation is aided by maintaining an adequate haemoglobin (Haematocrit>0.3)

Ventilation may also assist with the management of a significant metabolic acidosis, if the patient is not able to compensate. If the patient is obtunded they may also require intubation and ventilation to protect the airway.

Maintain Perfusion

Evidence of organ hypoperfusion is demonstrated by hypotension (relative to the patients normal blood pressure), falling urine output, and an arterial Lactate >4 mmol/l. (This can be measured on a number of desktop blood gas analysers).

Extensive fluid resuscitation may be necessary. If possible monitor central venous pressure. Aim for 8-12mmHg, or12-15mmHg in ventilated patients.

Hypotension should in the first instance be managed by volume challenges of 500mL to 1000 mL. If there is no significant response to fluid therapy, early use of vasopressors is needed. Choice of inotrope will depend on availability. Start with Noradrenaline. If not available then use Adrenaline.

Advice is available from the RFDS doctor or a senior staff member in the receiving intensive care unit.

Aim for a mean arterial pressure (MAP) of >65 mmHg (systolic BP >90). Target a higher pressure if the patient is normally hypertensive.

Aim for a urine output>0.5ml/kg/hr. Insert urinary catheter and attach hourly urine burette. Ensure good records of urine output and volume of fluids given.

Maintain good glycaemic control.

Destination

Do not wait for a bed to be found before requesting a retrieval flight. The RFDS doctor can assist with this for critically ill patients and offer advice on patient management and preparation.

Care of the Ventilated Patient

General Principles

Airway

- Ensure the ETT is well secured with tie and tape, and cuff inflated appropriately.
- Record depth at the teeth and do a check chest x-ray if possible.
- Add a heat and moisture exchanger filter.

Breathing

- Record ventilator settings, taking note of respiratory rate, tidal volume, minute volume, FiO2 and inspiratory pressures as a minimum.
- Consider PEEP and I:E ratios. No PEEP for asthmatics.
- Check arterial blood gases and ensure adequate oxygenation.
- Aim for normocarbia and avoid excessive hyperventilation.

Circulation

- Peripheral intravenous cannulae - have two good lines in case one fails during transport.
- Central venous access - helpful if using inotropes, multiple drug infusions or to monitor fluid status in sepsis or cardiac failure.
- Arterial line - for repeated arterial blood gas sampling and invasive blood pressure monitoring in unstable and inotrope dependent patients.
- Fluids - give appropriate fluids in appropriate volumes.
- Maintain normotension.
- Urinary catheter with hourly measurement burette.

Drugs

- Both sedation and paralysis are normally required for transport. See the RFDS Drug Infusion Guidelines.
- Continuous infusion is usually more reliable in the transport setting than episodic bolus doses.
- Manage pain and awareness.

Eye Protection

Tape eyes closed to protect them and instil lubricant.

Gastric Decompression

Insert a nasogastric or orogastric tube with drainage bag.

Monitoring

The ventilated patient is effectively undergoing anaesthesia. The full suite of available monitoring modalities should be used, including:

- continuous ECG,
- pulse oximetry,
- blood pressure (non-invasive or invasive),
- heart rate,
- respiratory rate,
- temperature, and
- capnography.

Use of multifunction critical care monitors is even more important in rural settings, where staff numbers are often limited and may be less experienced in managing critical care patients. If you have the equipment - use it!

Supervision

The ventilated patient must always be under the direct supervision of a medical practitioner with skills to modify ventilator settings, administer drugs, titrate infusion rates, and manage any potential complications which might arise, including extubation.

Handover

A treating doctor should be present to handover a ventilated patient to retrieval staff. RFDS will usually come into the hospital to connect the patient to our retrieval equipment and “package” them ready for transport.

Advice is readily available from us prior to and whilst en route to you. If in doubt, ask!

Medical Emergency Response (MET Criteria)

Medical emergencies such as collapse or cardiac arrest are often preceded by warning signs which are evident from a patient's vital signs. The Medical Emergency Team concept has been derived to ensure an appropriate and timely response to such abnormal warning signs.

The table below is an example of parameters which will identify adult patients at risk and should stimulate an urgent response from medical and nursing staff. Age based criteria also exist for paediatric patients.

Apart from activation of your health service's own staff, your response may include seeking telephone advice and arranging an urgent medical retrieval. Consider the RFDS in your plan.

Warning Signs of a Severely Ill Adult	
Heart Rate	*>150 or <50 bpm*
Respiratory Rate	*>30 or <8 breaths/min*
Conscious level	*GCS<12*
Oliguria	*<0.5 ml/kg/hr*
Sodium	*<120mmol/l or >150mmol/l*
Potassium	*<2.5mmol/l or >6mmol/l*
pH	*<7.2*
Bicarbonate	*<18mmol/l*
Worried nurse	*Concerned expressed*

Reference: Basic Assessment & Support in Intensive Care. BASIC steering group. June 2007.

About the RFDS >

The Royal Flying Doctor Service (RFDS Western Operations) is a not- for-profit organisation providing an aeromedical evacuation service across all of Western Australia, in addition to a range of visiting medical services to remote and rural areas. The RFDS commenced in Western Australia in 1935 and is part of a national federation, operating in every State and Territory except the ACT.

The RFDS has five operating centres in Western Australia – Jandakot, Kalgoorlie, Meekatharra, Port Hedland and Derby. Each rural Base is staffed with approximately 5 full-time pilots, 5 doctors and 5 nurses, plus two turboprop aircraft. The Jandakot Base in Perth has additional emergency crews and houses our aircraft engineering facility, operations centre and corporate headquarters. Each Base has a 24-hour emergency response capability as part of our State-wide retrieval system.

Doctors are required to have very broad medical experience including obstetrics, paediatrics, anaesthetics and emergency medicine. They do long shifts on duty and individual emergency retrievals from more distant parts of the State can exceed 12 hours. Our Flight Nurses are all experienced nurses qualified as midwives, as well as in critical care.

Each year in Western Australia our staff handle:

- over 30,000 emergency and routine medical consultations (mostly by telephone);
- approximately 25,000 patients on various clinics, and
- over 8,000 patients requiring primary evacuation or secondary retrieval from across the State.

Emergency cases comprise:

- Trauma patients (27%)
- Cardiac patients (25%)
- Obstetric cases (10%)
- Paediatric cases (15%)
- Acute Mental Health cases (4%)

We attend to every type of medical condition, in age groups from newborn to the elderly, and from seriously disturbed patients with mental illness to tourists injured on holidays. The RFDS covers locations as close as Rottnest Island, to as far away as Kununurra or the Cocos Islands in the Indian Ocean.

RFDS aircraft fly nearly 6 million kilometres in WA each year, utilising a fleet of 14 turboprop aircraft rotated among the five bases and the fast long-range Rio Tinto Lifeflight jet based at Perth Airport.

RFDS doctors also coordinate and staff the Perth Emergency Rescue Helicopter for all critical care interhospital retrievals. The service operates night and day, every day of the year with all emergencies coordinated from our Operations Centre in Perth.

In addition to emergency services, the RFDS provides a range of other health services and programs including inpatient care, visiting female GP's to rural areas, primary health care nurses and our medical chest (pharmaceutical supplies) to remote locations.

The State and Commonwealth Governments contribute significantly to operational costs but the Service is reliant upon fundraising and cost recoveries for the remainder of its operating budget, and for the purchase of medical equipment and aircraft.

There is no direct charge to patients for our services.

Aircraft are predominantly Pilatus PC12 pressurized turboprops. These fly at around 25 - 30,000ft and 500kmh. The aircraft are fast, able to land on small remote airstrips, and have a large interior that is capable of handling all necessary medical equipment, two stretcher patients and crew. The cost of new aircraft is approximately A$6.0 million.

The Rio Tinto LifeFlight jet is a Hawker 800XP which flies at up to 40,000ft and 1,000kmh. It can carry up to three stretcher cases and a medical team anywhere within Western Australia in three hours.

Further Information >

Useful Telephone Numbers

RFDS Emergency & Retrieval Calls	1800 625 800
Royal Perth Hospital Trauma Line	1800 631 798
Princess Margaret Paediatric GP advice line	1300 851 511
Fiona Stanley Hospital	6152 7642
Poisons Information Service	13 11 26
SCGH Emergency Department	9346 4266
Dept of Health Duty Officer (Disasters)	9328 0553
Mental Health Emergency Rural Link (After Hours)	1800 552 002
Interpreter Service	1300 131 450
Australian Red Cross Blood Service	9325 3030
Blood Orders (Fax)	9421 2847

(Updated March 2015)

References

Minimum Standards for Transport of Critically Ill Patients. Joint Faculty of Intensive Care Medicine ANZCA and RACP and ANZCA and ACEM.

Minimum Standards for Intrahospital Transport of Critically Ill Patients. Joint Faculty of Intensive Care Medicine ANZCA and RACP and ANZCA and ACEM.

National Standards for Aeromedical Evacuation. Royal Flying Doctor Service of Australia.

Sedation of Acutely Agitated Adult Patients Prior to Transportation. A guide for medical practitioners. Western Australian Therapeutics Advisory Group.

The Management of Acute Neurotrauma In Rural and Remote locations. A set of guidelines for the care of head and spinal injuries. The Neurosurgical Society of Australasia, RACS.

Clinicians' Guide to the Mental Health Act 1996. Office of the Chief Psychiatrist. 2009

Clinicians' Guide to the Mental Health Act 1996. Office of the Chief Psychiatrist. Supplement 2006.

Acknowledgements

Thanks to Dr Sally Edmonds and Dr Angela O'Connell for their contributions to the text and many useful suggestions.

Thanks to Emote Marketing for design and layout. *www.emote.com.au*

Golden Rules >

Here are some "Golden Rules" which will help us ensure a smooth transfer for your patients and minimize any problems occuring.

1. Call us early.

The earlier we know of your patient, the sooner we can commence making arrangements for transport. A delay in calling us may mean that the aircraft and team are sent elsewhere, or we miss an opportunity to divert an aircraft which is nearby.

2. You do not need a bed confirmed for acutely unwell patients.

We can initiate tasking a retrieval flight before a destination in Perth is confirmed. Sometimes the destination changes during the transfer. If you are busy resuscitating the patient we will arrange a destination for you.

3. Provide accurate clinical details.

Please provide accurate clinical details when referring a patient to us. The information you provide is used to prioritize multiple concurrent flight requests to determine the order in which they are completed and which staff, drugs and equipment are required.

4. Notify us of significant changes.

If there is a significant change in your patient's condition, please let us know. We may change the priority of the flight, divert other aircraft or change the team, drugs or equipment we bring with us.

5. Continue to treat the patient.

You need to continue to manage the patient until we arrive. We are happy to provide ongoing clinical advice, or direct you to specialty units for support.

6. Prepare the patient for transport.

There may be some interventions we will suggest which are required to assist with smooth transport. Also documentation, a referral letter, copies of laboratory results and x-rays need to be collated to accompany the patient. Ensure infusions are running and not about to run out. Use a checklist such as our standard transfer envelope.

7. Transfer to the airport on time, with a suitable escort.

Ensure arrangements are made to transfer the patient to the airport at the confirmed arrival time. There may be a patient already on the aircraft. Delays impact on other tasks which are still outstanding. Ensure that appropriate clinical escorts, (which may include a nurse or doctor) accompany the patient, to care for them and provide a comprehensive handover.

8. Communicate.

If you are concerned about any aspects of your patient's care prior to, or following transport, please contact us.

If any delays advised to you prior to arrival are unsatisfactory, please call our Operations Centre and request to speak to the Duty Doctor, our Clinical Coordinator or Medical Director. If there were any problems with the transfer, please call us or write to us afterwards, so we can follow them up.

If you would like to know more about our services and how they operate, please call us on 9417 6300 and ask for the Medical Director.

Help us to help you!

Notes >

Notes >

Organising a Retrieval Flight >

1. Complete a Referral Form

Ensures you have accurate medical details at hand, which will assist us to prioritize the flight and determine the team and equipment required. You will be asked details as laid out on the form.

The document becomes part of our medical record with the original passed to the receiving hospital.

2. Telephone the Statewide Coordination Centre on 1800-625-800

Give the Basic Details (top part of form) to the Operations Coordinator.

Give the Clinical Details (bottom part of form) to our Duty Doctor or Clinical Coordinator and discuss merits of case.

We can provide advice on initial management and patient preparation, or assist you to obtain highly specialized advice.

If the patient is acutely ill, we can organise a bed in an appropriate hospital.

3. Await advice of our arrival time

We can only give you a rough estimate of the ETA initially.

You will receive a firm ETA once the aircraft and team are airborne.

4. Transfer the patient to the airport

Unless the patient is critically ill and our team needs to come in to the hospital, you need to arrange to transfer the patient to the airport at the agreed ETA.

Ensure all appropriate documentation accompanies patient and there is an appropriate clinical escort.

Please advise of significant changes in patient condition at any time.

Royal Flying Doctor Service

WESTERN OPERATIONS

Flying Doctor Service of Australia Western Operations
3 Eagle Drive, Jandakot Airport WA 6164

Emergency: 1800 625 800

Telephone (Administration): 08-9417 6300
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ISBN 978-0-646-93588-1