

Transfer of ICU patients

Guide for RMOs new to Wellington ICU

Te Whatu Ora
Health New Zealand
Capital, Coast and Hutt Valley



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Introduction

As part of this ICU run, you will have the opportunity to perform patient transfers, both within the hospital, and as a part of the Wellington Aeromedical Retrieval Service (WARS). This is a fantastic part of the job, and is an excellent opportunity to develop your skills in critical care medicine with more remote SMO supervision.

Depending on your background, this might be the first time you have transferred a critically ill patient, but no matter how experienced you are, it is worth being humble when it comes to transferring sick patients as these are dynamic situations in which things can go wrong very quickly.

This guide aims to provide you with a bit of an introduction to some of the basic principles, unique considerations and potential pitfalls of transfer medicine, with a separate focus on aeromedical retrieval.

Training

As part of the departmental simulation calendar, we run a flight simulation approximately every 8 weeks. This forms part of the Thursday afternoon registrar teaching programme, and you should have an opportunity to attend during the run.

Flight sim takes place on level 9 in the simulation centre, and we are very lucky to have access to a simulated fuselage with hydraulics to simulate flying conditions. You will work with the flight nurses to manage part of an inter-hospital flight transfer.

The scenarios focus on familiarising you with the aeromedical environment, and on the human factors that go into preparation, communication and decision making in a dynamic situation rather than on the 'correct' medical management of a specific condition, and are a great opportunity to work alongside the nurses with whom you will work during real transfers.



Resources

Some other resources that may be useful if you are new to transfer of ICU patients include:

BJA Education [Transfer of the critically ill adult patient](#)

BJA Education [Anaesthesia for magnetic resonance imaging](#)

ANZCA/CICM/ACEM [Guideline for transport of critically ill patients 2025](#)

Association of anaesthetists: [Safe transfer of the brain-injured patient: trauma and stroke](#)



Section 1: Intra-hospital transfer

Intra-hospital transfer: general principles

The most common transfer you will do is within the hospital, either taking patients out of the ICU to the radiology department, or retrieving patients from the wards or ED to bring them to ICU.

Whilst you are still within the hospital, and more help is rapidly available than during inter-hospital transfer, you are also temporarily taking them away from a relative '*place of safety*' (even if it doesn't feel that safe, a medical ward during a MET call is better than the lift!). You must be aware that things can go wrong, and plan to mitigate the risks as much as possible.

You will be asked to transfer patients both out of the department (e.g. for CT/MRI scan), from ED, and may need to retrieve patients directly from a MET call to ICU. Depending on the situation, you may have lots of time to plan your transfer, or you may be under a lot of time pressure with an unstable patient who you just want to get back to the unit ASAP.

Tip: Whilst it can be tempting to immediately '*scoop and go*' if you find a critically unwell patient on the ward, this is rarely the correct answer. There is almost always time to make transfer a little safer, and to at least prevent the situation getting any worse.

The very basics for transferring any critically unwell patient around the hospital are:

	Description
Monitoring	SpO₂, NIBP, ECG (all critically unwell patients) ETCO₂ (waveform capnography is mandatory for all ventilated patients)
Equipment	Airway: Self-inflating Ambu bag, face mask, oropharyngeal +/- nasopharyngeal airways, portable suction unit If advanced airway in situ: syringe for ETT/tracheostomy cuff, fine-bore suction catheters. If tracheostomy: emergency supplies/algorithm Breathing: Non-rebreather oxygen mask, stethoscope, adequate oxygen cylinder supply, transport ventilator (if intubated/tracheostomy) Circulation: Obtain and flush IV/IO access prior to transfer, appropriate flushes and IV fluids to the patient's situation, defibrillation pads attached if needed EVD: If in-situ, ensure it is secured at the correct height, open, and draining freely
Drugs	Emergency drugs: MET bag contains pre-filled metaraminol and ampoules of other common emergency drugs Analgesia, sedation +/- neuromuscular blockade for intubated patients Appropriate volumes of drug and pumps for patient's ongoing infusions RSI drugs: can request ' <i>RSI bag</i> ' from ICU Pyxis (fentanyl/ketamine/rocuronium) but preferable to transfer patient to ICU for intubation
Communication	Phone, contact information for emergency situations (e.g. DI, ACNM ops), Consider potential signal limitations inside hospital (particularly radiology)

If you are taking a patient from the ICU to CT for example, the nurses will usually assemble all of this equipment well before the allocated time-slot, and will attach the transfer trolley to the end of the ICU bed. They will usually make sure they have what they think you will need in terms of infusions, emergency drugs and equipment; **it is your responsibility to check this all before you leave.**

If you are retrieving a patient from ED, they will similarly try to make sure that you have what you need, but are often very time-pressured and you may be unfamiliar with their kit/layout, so it is worth taking a moment to check everything for yourself before leaving.

At a MET call or on the wards in general, if you have a patient that needs to be transferred urgently to ICU or CT scan, you can call the unit and request that someone bring drugs/

equipment from ICU. The MET bag (ICU fishbowl/HDU office) and trolley (brought by the orderlies) also contain a lot of useful drugs and equipment, and it is worth familiarising yourself with these.

Tip: If you need something urgently for a patient on the ward, you can phone the ICU **ACNM** or **PAR nurse** and ask them to send someone to you. Try to **do this early**, and **be very clear** about exactly what it is you need (e.g. transport monitoring block and Hamilton ventilator with NIV set up).

Intra-hospital transfer: potential complications

Transferring a patient outside of the ICU carries a number of specific risks. Any other complication that could occur in the ICU can also occur with them in a CT scanner (e.g. desaturation, hypotension, arrhythmia, seizures).

Risk Category	Specific Considerations
Transfer	Oxygen supply : - Do you have enough for this patient considering the length of transfer and their FiO2?
	Power failure: - Are the pumps/ventilator adequately charged? - Do you have back-up means of ventilation?
	Prolonged transfer (e.g. entrapment in a lift): - Do you have adequate volumes of infusions? - Do you have a means of communication? - Have you requested an orderly?
Patient	Airway: - Does this patient need to be intubated before transfer? - Does this patient have a potentially difficult airway (particularly bag mask ventilation)? - If this patient's airway device became dislodged, what would you do?
	Physiological stability: - Has this patient had any particular physiological issues recently? - How would you manage these issues in a remote environment? - Does this transfer need to happen right now? - Is there anything you can do before transfer to improve stability?
Environment	Radiology: can this patient lie still and flat?
	Lack of phone signal in parts of the hospital
	MRI hazards: - Do you or the patient have any contraindication to MRI environment? - Are you familiar with MRI safety considerations (see below)?

We can anticipate and mitigate for many of these, and depending on your experience, your comfort zone for managing these complications will differ.

Tip: More harm is done by not considering a possible complication beforehand than by not knowing how to manage it. If in doubt about the safety of transferring a patient, ask a senior for advice **before** you go.

It is always worth taking a moment before transferring any patient to consider and plan for general and scenario-specific risks (see table above), and asking yourself if there is anything else you need to do before beginning your transfer to make things safer. c

Tip: Using a transfer checklist (either formally or have a mental checklist for yourself) is a useful way to make sure you have prepared appropriately, even before a 'routine' transfer.

Intra-hospital transfer: MRI

The MRI environment has a unique set of risks and safety protocols, and is made all the more complicated with an intubated patient. As such, MRI is generally only performed for physiologically stable ICU patients, and by trained staff who are more experienced in transfer of critically ill patients. Before transferring a patient to MRI, you must complete the **mandatory e-learning**, and you will also be required to complete a safety questionnaire (can be done in MRI suite on arrival).

Specific considerations for MRI are:

Magnetic field:

MRI scanners have a continuous 'static' magnetic field, even when not in operation, and also generate a stronger, dynamic field during scanning, which pose risk to patients and staff by:

- Interference with medical devices

- You must use the MRI specific (yellow) Hamilton transport ventilator, which can enter the MRI scanner room but remains outside the 3T line. It will alarm if it is too close to the scanner
- If the patient has an implanted programmable device (e.g. PPM, ICD, nerve stimulator), this should be reviewed by the MRI team and consider reprogramming if necessary

- Risk of projectiles:

- **Oxygen cylinders and other resuscitation equipment must never enter the MRI scanner room** (can bring into the reception area)
- In the MRI suite, you will work with the MRI radiographers to transfer the patient onto the MRI trolley, and conduct a check for any ferromagnetic equipment (e.g. clips, piercings), and to transfer onto their remote monitoring
- You must also check your own pockets prior to entering. Do not wear steel-capped boots



- **Induced currents:**

- During scanning, the magnetic field is changed rapidly, and can induce currents within the patient leading to peripheral nerve and muscle stimulation (uncomfortable in conscious patient)

Radio-frequency heating:

Heating occurs due to the radio-frequency field applied during scanning. This is usually not enough to cause harm, but localised heat dissipation will be increased by presence of conductive materials (e.g. missed ECG sticker, pacing leads, implanted metallic prostheses), or by skin-to-skin contact, so this should be addressed during compatibility checks and positioning.

Acoustic noise:

The MRI changing field is very loud and can cause hearing damage. Patients should have earplugs inserted, even if sedated.

Quenching:

The MRI field is dependent on super-cooling by liquid helium. 'Quenching' refers to the controlled venting of this helium into the atmosphere, which is extremely expensive and renders the MRI machine non-functional

Emergency quench is only used in the following circumstances, and should only ever be done by MRI staff only:

- Fire in the MRI scanner
- Entrapment of personnel by object attracted to MRI scanner causing risk to life or limb

During a quench, large amounts of helium gas are generated and pose an asphyxiation risk if ventilation fails, so you should be prepared to immediately evacuate

Access to patient:

Whilst the patient is in the MRI scanner, you will have limited access to them for the duration of the scan (which can be hours), posing some issues:

- **Monitoring:**

- You will usually sit in the control room and be able to see them both through the window, and via a camera attached to the scanner
- Remote monitoring is routinely applied, but ECG in particular is susceptible to artefact. The pulse oximeter/arterial line may provide a more accurate heart rate

- **IV infusions/ventilation:**

- The MRI-safe Hamilton MR1 ventilator can enter the MRI room, but must be positioned at a safe distance from the scanner (note the TeslaSpy indicator lights at the bottom of the screen; if the red light comes on, the scan must be aborted and the ventilator returned for servicing). The oxygen supply will be passed through from the control room
- You should make sure that the screen is visible to you, and be aware that you may not hear the alarms from the control room
- Long IV extension lines can be fed through from pumps outside the scanner room and used for infusions and bolus medications (make sure these are all labelled and working before commencing)
- The MRI table will move during the scan, so you should do a test run to make sure that all lines/tubing has adequate slack



Transfer of ICU patients to MRI - Checklist

PREPARATION IN ICU:

Patient

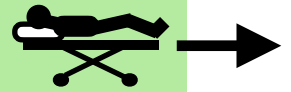
- How urgent is this scan?
- Is the patient stable enough for MRI?
- Will the patient tolerate lying still for a prolonged time? If not, do they need to be intubated first?
- **MRI safety checklist** completed
- Flush and spigot enteral tubes

Staff

- Airway doctor, two RNs and orderly required for all MRI transfers if ventilated or likely to need sedation
- All staff should complete annual MRI safety questionnaire and mandatory e-learning
- Are you comfortable transferring a patient to the MRI environment? If not, consider asking for supervision
- Inform ACNM and SMO/fellow that you are transferring patient to MRI

Equipment and monitoring

- MRI-safe Hamilton MR1 ventilator
- ICU standard monitoring for transfer (ECG, SpO₂, NIBP/IBP, ETCO₂)
- Minimise clutter on bed, number of infusions and check for metallic objects in sheets etc.
- Support RN to take spare pumps and infusions/long IV extensions down to MRI suite in advance
- Emergency drugs and airway equipment



PROCEDURE DURING MRI SCAN:

- Ring bell and await radiographer to bring you in to the MRI suite
- Transfer patient to MRI trolley and check for metallic objects etc.
- Transfer to MRI-safe monitoring and remove ICU monitoring
- MRI staff to help position patient appropriately/apply ear protection/place MRI coils

Check your own pockets before entering MRI room

- Pass primed and labelled IV extension lines and oxygen tubing through to MRI room
- Transfer patient, ventilator and monitoring to MRI room
- Connect to IV lines/oxygen and ensure all functioning appropriately
- Test run to make sure cables/tubing/lines have adequate slack
- Check monitoring/ventilator screen visible from control room
- Vital signs to be recorded for duration of scan
- Reverse above procedure for transfer at end of scan



EMERGENCY IN MRI SCANNER:

Under no circumstances should resuscitation equipment be taken into the MRI scanner room

- Request that the scan is terminated (NB quenching is not necessary)
- Call for help (e.g. SMO/fellow, DI, DA, ACNM ICU)
- Retrieve the patient from the scanner into the reception area
- Assess and manage the patient in the anaesthetic area of the MRI suite
- Once stable, consider if safe to proceed with rest of MRI scan or whether to abandon



Intra-hospital transfer: other specific scenarios

ED to ICU: Transfer from ED to ICU will be conducted by the most appropriate team available. This may be an ED SMO/RMO with RN bringing a ventilated patient to ICU (depending on workload), or an ICU RMO & RN may attend ED to retrieve. Handover of clinical information is a well-described risk if not carried out clearly between teams. Ensure you are familiar with the equipment you are using, if not bringing equipment from ICU.

MET call to CT scanner: Depending on the patient's condition, it may be appropriate for a nurse-only transfer to CT with an orderly, usually the PAR nurse (e.g. GCS 15 patient on anticoagulation following head strike for CT head). You should have a low threshold for accompanying the patient however, particularly if you think the scan might show something that necessitates ICU admission or urgent intervention (e.g. ICH, high-risk PE, active bleeding), and must accompany the patient if requested by the PAR nurse.

MET call to ICU: You should transfer this patient with the PAR and ward nurse back to the ICU, and should contact the ACNM to request a monitoring block, and any other drugs/equipment you need for transfer. Very rarely, a patient may require intubation in the ward environment - this is a high risk procedure which should only be undertaken by very experienced registrars, and avoided if at all possible.

Tip: temporising the airway with adjuncts and two-person bag-mask ventilation, or even IGel insertion in the unconscious patient to facilitate urgent ICU transfer for intubation is usually preferable to intubating in the ward environment. The DI must be informed if you are considering ward intubation.

Te Whare o Matairangi (TWOM) inpatient psychiatry unit: MET calls for patients in TWOM are relatively uncommon, but can feel particularly stressful. TWOM is physically quite remote from the rest of the hospital and support from the rest of the ICU team. If you think a patient requires further urgent medical assessment, the agreed pathway is that you should transfer them to the Emergency Department. The PAR nurse will phone ahead to inform them, and to request a resus bay if this is necessary.

Transfers to cath lab/IR/theatres: These transfers should be performed by a member of the anaesthetic team. Occasionally you may be asked to initiate the transfer of an unstable patient requiring ongoing resuscitation whilst an anaesthetist is made available, but you should not allow any procedure to begin until they are present. You should also feel empowered to say no, and to remain where you are (e.g. ED resus or ICU) if you feel uncomfortable until senior support is available.



Section 2: Inter-hospital transfer

Inter-hospital transfers: Wellington Aeromedical Retrieval Service (WARS)

All inter-hospital transfers are organised through the Flight Team co-ordinator, who works with the Duty Intensivist to triage urgency, complexity and allocate appropriate staff to any referrals they receive. About 50% of inter-hospital transfers require a doctor, and are categorised according to the acuity of the patient into the following:

Category	Patient description	Doctor required
A	Ventilated or requiring advanced life support or unstable	Always
B	Acute incident, generally non-ICU patients often require a doctor depending on condition, need for airway management and intervention	Depending on condition
C	Stable returning to home hospital or palliative care	No

During the run, you will have allocated 'flight' shifts, during which you are the first registrar on-call for inter-hospital transfers requiring a doctor. This includes air and road transfers, and may be at any time of day (although for overnight shifts you are on-call from home).

Occasionally, the flight team or DI will ask another registrar to fly if their skillset is better suited to the situation (e.g. advanced airway skills, paediatric experience) - please do not be offended if this happens. Similarly, if you are not a good flier or are not feeling well on the day, you can request that somebody else goes on the transfer whilst you cover their clinical work in the ICU.

Transferring any acutely unwell or injured patient confers risk to them, so it is important that it is only done if this is outweighed by the intended benefit, and is made as safe as possible by ensuring appropriate personnel are available. This includes limiting transfers out of hours to true life-or-limb threatening emergencies. Patients should not be transferred out of hours unless an intervention is planned upon arrival, or the referring hospital does not have critical care capability.

We benefit in Wellington from a centrally co-ordinated transfer team called WARS (Wellington Aeromedical Retrieval Service). This means that the entire process, is overseen by the Duty Intensivist (even if the patient is not being transferred to our ICU), including clinical advice in-transfer. Whilst you will not typically be involved in the decision about whether to transfer a patient or not, it is useful to be aware of the underlying principles, and to understand the process within our team (summarised on the next page).

Tip: Even the most straightforward flight transfers take longer than you think, so it is important to make sure that you are prepared for this and make sure you have eaten etc. and if it will cause your shift to overrun, you can say no, or claim additional hours

Inter-hospital transfers: Team

During all of your transfers, you will work most closely with a flight nurse. These are experienced senior ICU nurses who are much more familiar with the aeromedical environment than registrars, and frequently transfer patients on their own. You can make both of your lives easier during a transfer by communicating clearly about any anticipated problems, drugs or equipment needed, and any concerns you have about the patient.



Often there will also be a member of the Life Flight crew flying with you. They will help with providing transport to/from the airport and hospitals, loading/unloading the patient and equipment, and are very familiar with the aviation environment, so are a very valuable source of information and will speak to the pilots for you if priority take-off etc. is required. They also usually have a paramedic/technician background, and may be able to assist with some clinical tasks including CPR.

For fixed-wing and helicopter transfers, your pilots will need to lodge a flight plan, and appreciate as much notice as possible if your plans change (e.g. need priority take-off/landing, additional person flying, need sea-level conditions). The pilots can use a satellite phone to contact the Duty Intensivist or receiving centre, but are not medical so do not ask them to relay information, just ask clearly who you would like them to call. You should pay attention to the pilot and crew's instruction when transferring a patient by air, and follow any emergency instructions.

Lastly, please always be considerate when retrieving a patient - the referring team may well be struggling to manage a resource intensive and sick patient without tertiary specialty input. If you think something has been missed or needs to be done differently, please approach it diplomatically and do not frame it as an error on their part.

Inter-hospital transfers: Equipment

We use standardised equipment when transferring patients, and you should familiarise yourself with these on the ground. If you require anything specific, you can request/bring this from Wellington ICU or the referring hospital if single-use. The maximum patient weight for fixed wing transfers is 225 kg (unventilated), 160kg (ventilated). For helicopter, these are 190 kg (unventilated but maximum width 700 mm), 175 kg (ventilated).

Ferno INX transfer stretcher: dedicated patient transfer trolley, 5-point harness, 'ICU bridge' with restraints for ventilator, defib and drip stand for pumps/fluids.

Zoll X Series monitor/defibrillator: standard monitoring, manual defib and transcutaneous pacing

Hamilton T1 transport ventilator: can ventilate down to 3 kg baby; specific paediatric tubing needed for children. Smaller babies may be transferred by the NICU retrieval team

B-Braun SpacePerfusor syringe pumps: All infusions should be in a syringe as these are more reliable in transfer

Equipment bag: separate adult/paeds bags, see appendices for contents.

Laerdal portable suction unit



Inter-hospital transfers: Drugs

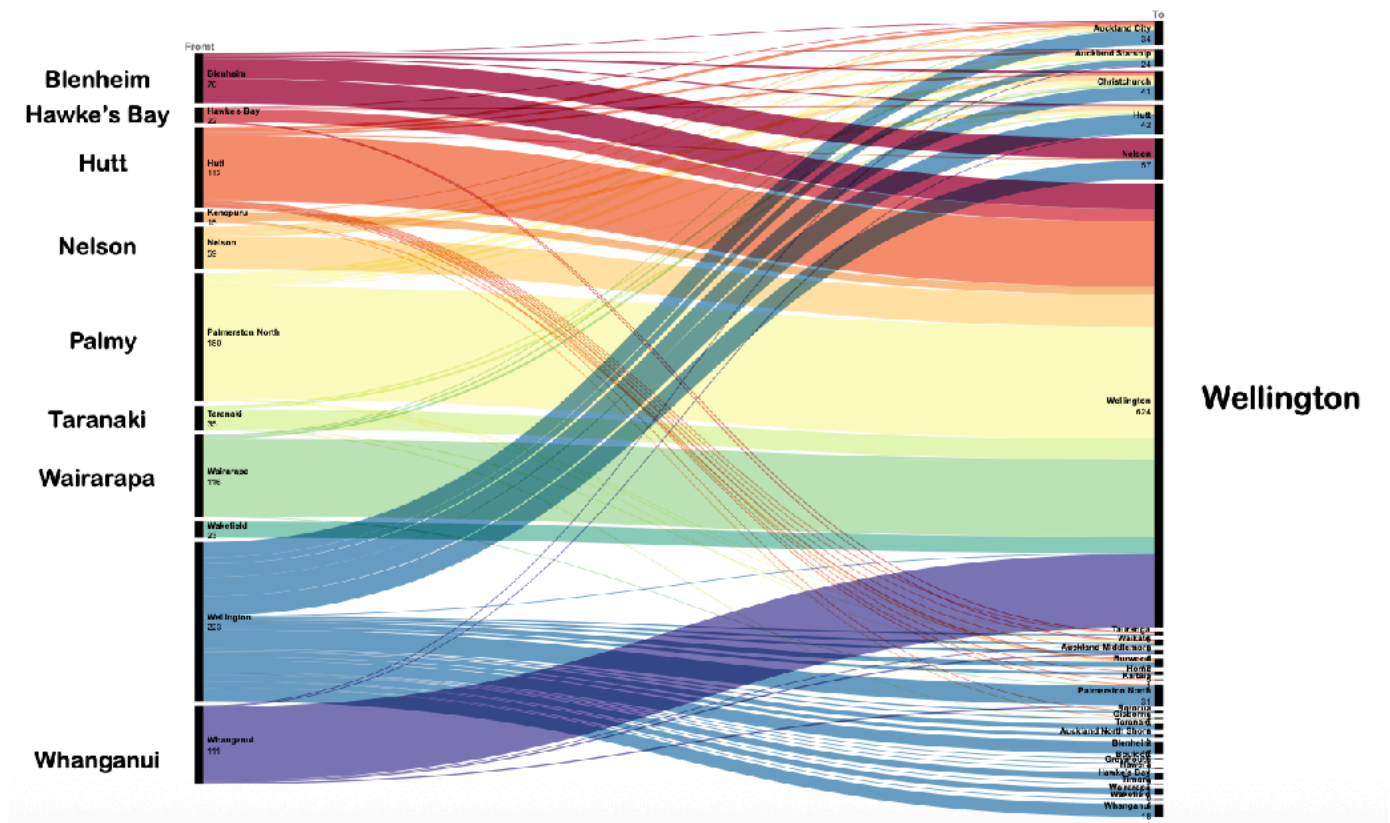
You will also take a standardised drug bag on all of your transfers. The contents of these are in the appendices and cover most unanticipated critical care emergencies, but may be inadequate

You should prepare adequate quantities of any infusions (e.g. noradrenaline/propofol), and any bolus drugs (e.g. vasopressor, NMBD, analgesia) at the referring site rather than using supplies out of the transfer bag, which should be reserved for unanticipated emergencies. It is also better to sign out controlled drugs from the referring hospital and dispose of the remainder at your destination.

For unstable, complex, or paediatric patients, you should calculate and pre-prepare your emergency drugs before transfer, and discuss dosage with the flight nurse.

Inter-hospital transfers: Where we work

You will primarily be involved in flights to retrieve patients from hospitals around the region back to Wellington Hospital for tertiary care. Occasionally, we will transfer patients from Wellington ICU who require services provided at Hutt Valley hospital, or will repatriate ICU patients back to their primary hospital for ongoing ICU care once they no longer require tertiary surgical services.



Flow diagram showing frequent WARS referring centres and destinations

In addition to this, you may be involved in secondary transfer of patients from one regional hospital to another (e.g. Blenheim to Nelson), or more rarely in tertiary transfer of patients outside our region, either for specialist services not provided in Wellington (e.g. Middlemore for major burns, Christchurch for spinal injuries), or for urgent transfers of patients where the local flight team are unable to provide timely transfer (e.g. Gisborne to Waikato Hospital).

The service uses Life Flight aircraft (5 fixed wing and 1 helicopter) based at the Life Flight base at Wellington airport, and the Wellington Free Ambulance service. The decision about which mode of transport to use depends on weather, vehicle availability, destination, distance, duration, altitude, pressurised vs unpressurised cabin, patient weight and urgency of transfer. All are coordinated in the same way.

Inter-hospital transfers: Safety

As part of orientation to the run, you will receive a safety induction at the Life Flight base. Before your first flight, you will also be briefed by the crew about emergency procedures for the specific aircraft for that job. During all flights, you should pay attention to instruction from the aircraft crew and pilots regarding safe behaviour around the aircraft, and communicate with them if there is a problem.

Before every flight, it is your responsibility to make sure that you are fit to fly - you cannot look after a patient effectively if you are not fit to fly yourself: the 'I'M SAFE' mnemonic can be used to remind yourself of the key things to consider before flying.

'I'M SAFE' mnemonic: adapted from aviation industry, highlights key issues about fitness to fly

Illness - if you have a cold or other medical condition that could be made worse at altitude, do not fly

Medications - do not fly if you have taken sedating medications; consider taking anti-emetics prior to flying if prone to travel sickness

Stress - if you don't feel good about doing this transfer let the DI know

Alcohol and drugs - obviously don't do this at work or on-call

Fatigue - make sure you have rested and that this flight will not make your shift overrun

Eating - make sure you've had some food and water, or have some available during the transfer/on return (noting the cafeteria closing times)

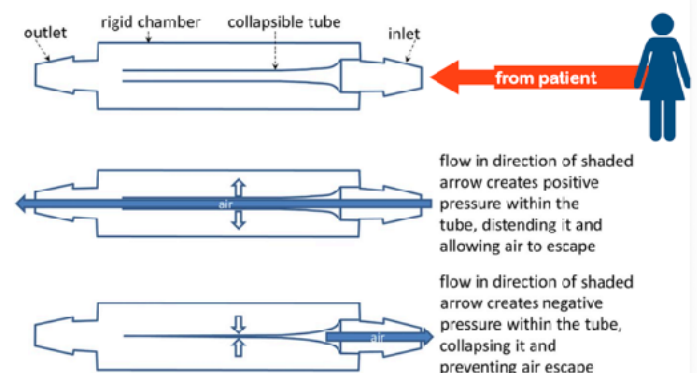
Inter-hospital transfers: Aeromedical Considerations

The aeromedical environment poses some unique challenges when transferring patients. Mostly these can be overcome by routine care (warming the patient, administering IV fluids etc.) but some you will need to specifically consider and discuss with the aircraft crew. In particular, think about the effects of G-forces and reduced atmospheric pressure on your patient and request modifications accordingly (see table below).

As part of your pre-departure checks, you should consciously think about these issues and mitigate them.

Some examples:

- **Trauma:** actively exclude and drain any significant pneumothoraces and apply Heimlich uni-directional valve; consider gas entry with other penetrating trauma, particularly ocular trauma; sea-level cabin in fixed wing
- **General surgery:** transfer within 7 days of bowel anastomosis risks suture disruption and gas within stoma bag will expand (and explode); discuss with surgeon; decompress with NG/rectal tube; change and vent stoma bag; sea-level cabin
- **Critical ICP or significant shock:** will tolerate fluid shifts poorly, and should aim to minimise G-forces on take-off and landing; request long roll-out on fixed wing transfers



Heimlich valve

Aeromedical Considerations: GHOST-BAN

Physiological stressor	Cause	Effects	Mitigation
G ravitational forces	Acceleration and deceleration Patients usually have head toward front of vehicle	Acceleration: decreased venous return exacerbating hypotension Deceleration: increased venous return, exacerbating pulmonary oedema or raised ICP	Try to achieve euvolaemia Request gentle driving (ambulance) or long rollout (slower deceleration) depending on situation
H umidity (dehydration)	Air at altitude is colder and less humid Dry supplemental O ₂	Dehydration (patients and staff) Thickened secretions (important for ventilated patients)	Oral/IV fluids Humidified oxygen (HME filter)
O xygen (hypoxia)	Reduced atmospheric pressure (particularly problematic above 10,000 feet)	Hypoxaemia (patient and staff) Impaired decision making	Request sea-level cabin (fixed-wing) or low altitude flight (helicopter) Supplemental oxygen
S hakes/vibration	Aircraft turbulence Take-off and landing	Interference with monitoring (esp NIBP) Worsening patient agitation Projectile effect	Secure and pad patient well Secure any loose items Consider anxiolysis/sedation +/- intubation if agitated patient Consider arterial line if CVS unstable
T emperature	Transfer to/from aircraft Cold air at altitude	Hypo/hyper-thermia Worsening patient agitation Uncomfortable staff	Check patient temperature Wrap well if cold Request change to cabin temperature if needed
B arometric pressure	Lower atmospheric pressure at altitude Helicopter cannot be pressurised	Gas filled cavity expansion (pneumothorax, surgical emphysema, bowel obstruction, sinuses, ears, teeth, penetrating trauma) Affects patients, staff and equipment (ETT cuff)	Don't fly with a cold Drainage of pneumothoraces with intercostal drain and Heimlich valve; decompression of stomach with NG Check ETT cuff pressure Request sea-level cabin (fixed-wing) or low altitude flight (helicopter)
A ctivity & fatigue	Stressors above Sick patient Long shift	Impaired decision making	Ensure fit to fly before setting off Optimise other stressors
N oise	Aircraft environment (worse on helicopter)	Difficult communication Difficulty with patient assessment (auscultation, alarms)	Ear protection Explain hand signals to conscious patient Use other means of patient assessment

Inter-hospital transfer: Retrieval process

The inter-hospital retrieval process requires a lot of organisation, and is summarised in the diagram on the following page.

When you are on a flight shift (or occasionally another shift if the flight registrar is already out), you will get a call from the flight co-ordinator to tell you there is a flight, and asking you to get ready (flight suit, eat & drink, go to the toilet) and meet at either the flight office (level 2 near security office/MAPU) or at the helipad entrance on the roof (level 8 in the main hospital building).

You will receive a handover about the referral, current patient condition, destination, mode of transport and any anticipated interventions that the flight team/DI think may be required. This is your opportunity to say if you don't think you are the right person for the job (for any reason), to allow somebody else to be found. Occasionally, the DI/flight nurses might request that somebody else goes on the transfer if particularly high-risk or complex (e.g. requiring airway intervention, sick or very small paediatrics, intra-aortic balloon pump, significant instability etc.).

You will then depart with the flight nurse and Life Flight crew member if available, either in the helicopter, a taxi/Life Flight vehicle to the airport (for fixed wing transfers), or a Wellington Free Ambulance (for road transfers).

Once you arrive at the referring hospital, your role as the flight doctor is to:

- Make a fresh assessment of the patient (do not assume that what you were told on the phone is actually what is going on)
- Resuscitate and perform any procedures as necessary
- Discuss your findings and plan with the flight nurse then the DI (mandatory 24/7 for every transfer)

With the flight nurse, you will also need to:

- Prepare any drugs and equipment you need for transfer
- Transfer and secure the patient to the transport stretcher
- Explain the plan to the patient (if conscious) and their family or whānau
- Obtain copies of written notes

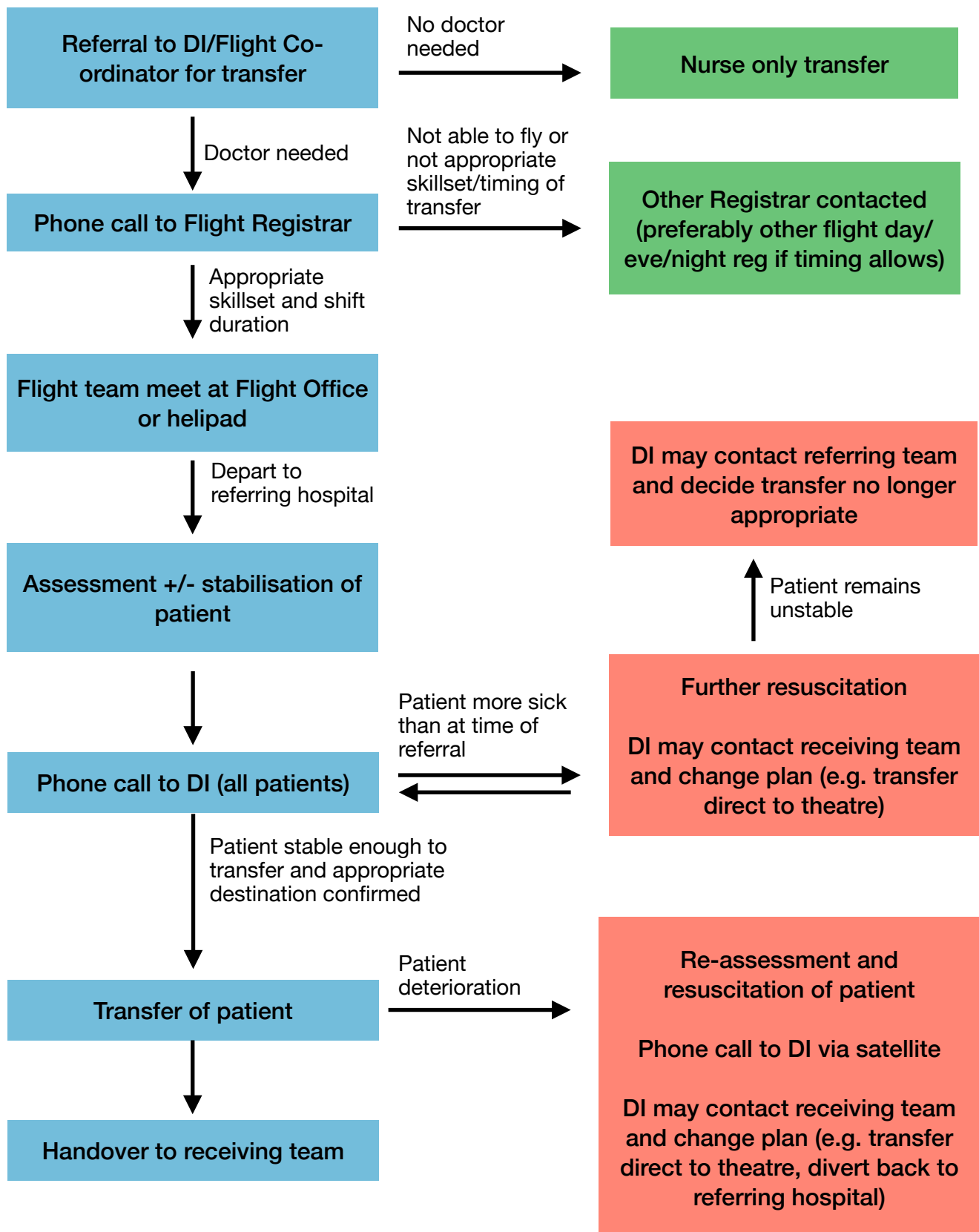
Immediately before transfer, it is useful to do a 'time-out' to recap the situation, concerns for transfer and management plans, as well as to allow other team members to speak up about their concerns (see transfer checklist). You will then transfer the patient onwards to their destination (sometimes with a family member as passenger). If patient is not being transferred to ICU (i.e. theatres, cath lab), the DI may sometimes ask you contact the accepting team with an ETA, or to answer any questions they have.

Tip: In flight, you will be able to communicate via a headset with the flight nurse, but any procedures/drawing up new drugs will be more difficult than on the ground, which is why preparation is so important.

If there is significant deterioration in transfer, you can speak to the DI at any time via satellite phone for clinical advice, and also so that they can relay information to the receiving team.

Once you arrive at your destination, you will hand over to the receiving team (usually but not always ICU). If you are transferring an ICU patient and have time left in your shift with no competing urgent tasks, it is helpful to complete the admission and any jobs for the patient. If you are working beyond the end of your shift, you can hand this over to one of the on-duty registrars.

You must make sure that you have completed the transfer paperwork before leaving (most of this will be done by the flight nurse, but you will need to sign the document and also ensure any drugs administered are prescribed appropriately and controlled drugs disposed of).



Inter-hospital transfer: Guidelines and checklist

A new collection of guidelines for common clinical scenarios has been written, and is available as a printed handbook attached to the flight trolley and online.

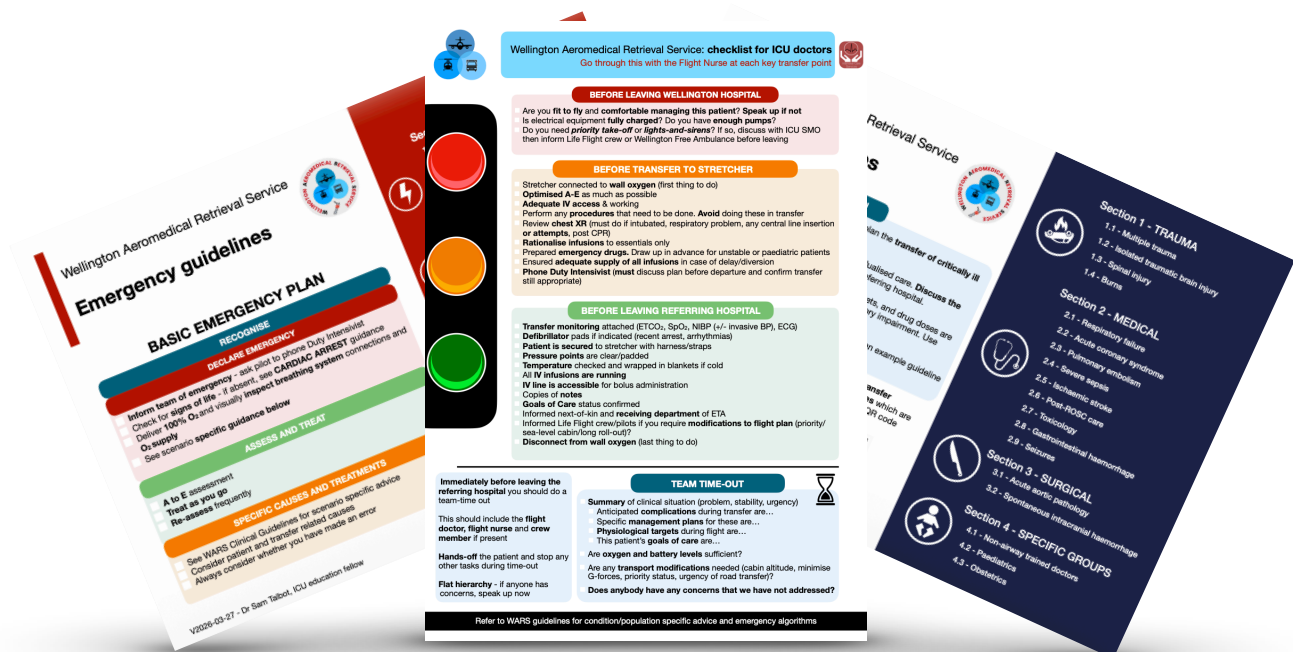
This guide aims to act as a cognitive aid for flight doctors and nurses when planning the transfer of critically ill or injured patients with these common conditions.

It does not cover every possible condition, and patients can have multiple competing issues: you should always discuss the patient with the duty intensivist prior to departing the referring hospital.

All guidance, physiological targets and drug doses unless stated otherwise are for non-pregnant adults, and clinical judgement should be used when extrapolating them.

The **clinical guidelines** and **transfer checklist/team time-out** are designed to be used together to help in the planning of a retrieval, from before you leave Wellington, through to the handover at the receiving hospital. The **team time-out** in particular is designed to be quick and easy to use before departing the referring hospital to ensure a shared mental model between team members, even if you do not use the guideline or checklist.

The **emergency guidelines** are designed to be used as an aide memoire if there is a deterioration in transfer - as with all things in medicine, prevention is better than the cure, and if you anticipate and plan for these potential emergencies, they can often be avoided.



Wellington Aeromedical Retrieval Service: **checklist for ICU doctors**

Go through this with the Flight Nurse at each key transfer point



BEFORE LEAVING WELLINGTON HOSPITAL

- Are you **fit to fly** and **comfortable managing this patient**? **Speak up if not**
- Is electrical equipment **fully charged**? Do you have **enough pumps**?
- Do you need **priority take-off** or **lights-and-sirens**? If so, discuss with ICU SMO then inform Life Flight crew or Wellington Free Ambulance before leaving

BEFORE TRANSFER TO STRETCHER

- Stretcher connected to **wall oxygen** (first thing to do)
- Optimised A-E** as much as possible
- Adequate IV access** & working
- Perform any **procedures** that need to be done. **Avoid** doing these in transfer
- Review **chest XR** (must do if intubated, respiratory problem, any central line insertion or attempts, post CPR)
- Rationalise infusions** to essentials only
- Prepared **emergency drugs**. Draw up in advance for unstable or paediatric patients
- Ensured **adequate supply of all infusions** in case of delay/diversion
- Phone Duty Intensivist** (must discuss plan before departure and confirm transfer still appropriate)

BEFORE LEAVING REFERRING HOSPITAL

- Transfer monitoring** attached (ETCO₂, SpO₂, NIBP (+/- invasive BP), ECG)
- Defibrillator** pads if indicated (recent arrest, arrhythmias)
- Patient is secured** to stretcher with harness/straps
- Pressure points** are clear/padded
- Temperature** checked and wrapped in blankets if cold
- All **IV infusions are running**
- IV line is accessible** for bolus administration
- Copies of **notes**
- Goals of Care** status confirmed
- Informed next-of-kin and **receiving department** of ETA
- Informed Life Flight crew/pilots if you require **modifications to flight plan** (priority/sea-level cabin/long roll-out)?
- Disconnect from wall oxygen** (last thing to do)

Immediately before leaving the referring hospital you should do a team-time out

This should include the **flight doctor, flight nurse** and **crew member** if present

Hands-off the patient and stop any other tasks during time-out

Flat hierarchy - if anyone has concerns, speak up now

TEAM TIME-OUT

- Summary** of clinical situation (problem, stability, urgency)
 - Anticipated **complications** during transfer are...
 - Specific **management plans** for these are...
 - Physiological targets** during flight are...
 - This patient's **goals of care** are...
- Are **oxygen and battery levels** sufficient?
- Are any **transport modifications** needed (cabin altitude, minimise G-forces, priority status, urgency of road transfer)?
- Does anybody have any concerns that we have not addressed?**



Refer to WARS guidelines for condition/population specific advice and emergency algorithms

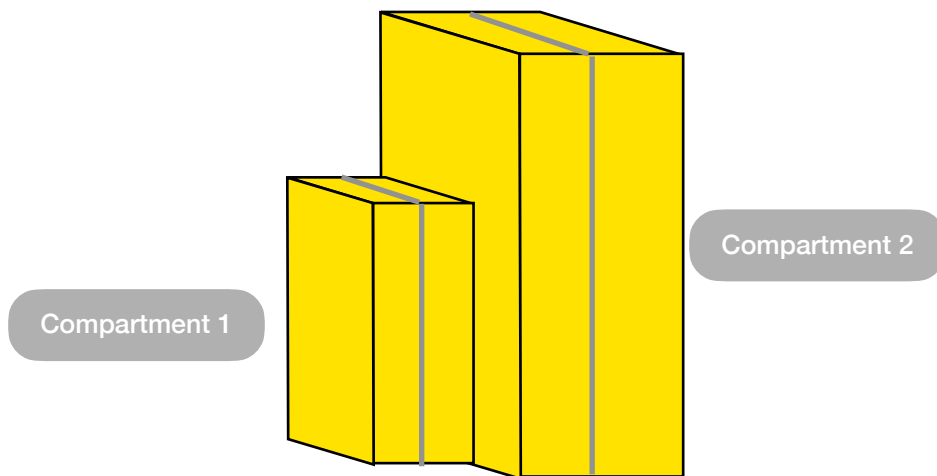
Appendices

WARS Adult Flight Bag contents	22
WARS Drug Bag contents	23

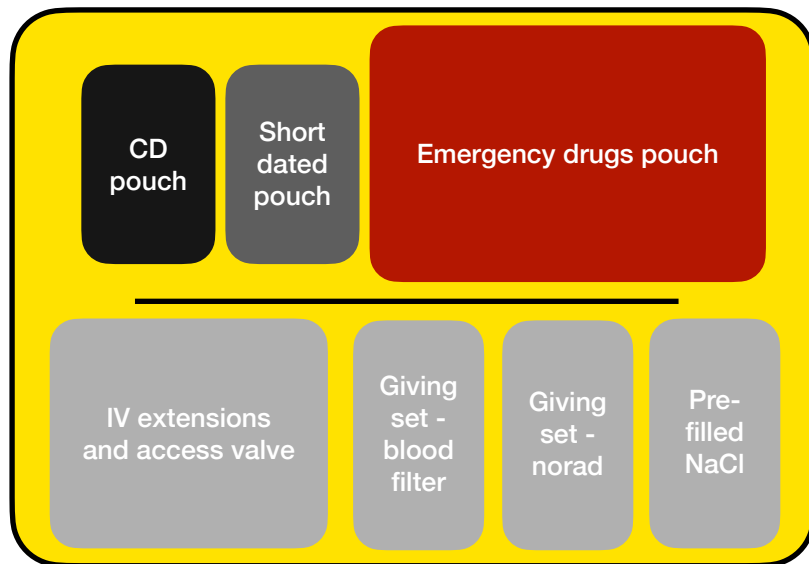
WARS Adult Flight Bag contents

OUTSIDE FRONT – Lower pocket – ICU PATIENT		OUTSIDE edge - Small top pocket (RESP)	
Transducer cable	1	Oxygen tubing	1
Pressure bags: 500ml, 1000ml	1 ea	Nasal prongs	1
Tape measure	1	Hudson mask	1
Cuff pressure measuring syringe	1	NRB Mask	1
Comfit OETT ties	1	OPA 1, 2, 3, 4	1 ea
Transparent or white rippable tape	1	NPA 6, 7, 8	1 ea
T1 vent circuit + flow sensor	1	OUTSIDE edge - Other small pocket	
Exhalation valve + membrane	1	Disposable SpO2 probe (Massimo)	2
Zoll CO ₂ Sample line	2	ECG dots	10
HME	1	Glucometer & stylets	1
Tenoplast tape	1	Thermometer	1
		Hypokit	1
OUTSIDE FRONT – Upper pocket		OUTSIDE edge – Long pocket	
Zoll Adult defib pads	2	Temperature cable + probe	1 ea
Stethoscope	1	Closed suction 12G	1
Ambubag + PEEP valve	1	Yankeur	1
Oxygen Tubing	1	Tuta blood pump	1
HME	1	Suction catheters – selection	
Adult masks: Large, small	1 ea		
ALS & anaphylaxis algorithms (A5 size)			
Pocket 1 – ARTERIAL		Pocket 5 – INTERCOSTALS	
Single transducer set	1	Rocket chest drainage kit 12 Fr	1
Angiocaths 20G (1 ¼ inch)	1	Heimlich valve with drainage bag	2 ea
IV3000	1	Sleek	1
Skin prep	1	Urine drainage bag	1
		Clamps	2
Pocket 2 – CVL		14g cannula	2
CVL quad lumen set	1	3 way tap	1
Stat lock	1	Pocket 6 – NASOGASTRIC	
Skin prep	1	NGT: 12, 14, 16	1 ea
CVC dressing	1	Syringe 60ml catheter tip	1
Clearlink adaptors	4	Urine drainage bag	1
Rapid infusion catheter set	1	Safety glasses	1
US probed cover	1	Sleek	1
Pocket 3 – NEBS		Skin prep	2
Nebuliser mask	1	Lubricant jelly	4
Micromist nebuliser	1	Pocket 7 – Spare Ventilation parts	
Inline Neb T with valve (white)	1	T1 exhalation membrane + exp valve	1
Multi dose inhaler adaptor	1	Spare Flow sensor (1.88m)	1
Salbutamol 5mg, Ipratropium 500mcg	3 ea	HME filter	1
Pocket 4 – AIRWAYS		ETT Mount	1
OETT: size 5, 6, 7, 8, 9	1 ea	Zoll CO ₂ Sample line	1
OETT tapes	1 ea	CPAP Masks: Med, Large + Harnesses	1 ea
Magill's forceps	1	ALONGSIDE EDGE	
Yankeur suction	1	Portex stylet	1
Syringe 10ml	1	Bougie	1
Lubricant jelly	2	I-Gels size 3, 4, 5	1 ea
McGrath blades sz 3, 4, VL		Lubricant sachets	2
SCALPEL CICO KIT		Arterial catheter set	2
Rapi-fit connector	1	EZ-IO POUCH	
Scalpel	1	EZ-IO drill + black cover	1
ETT Size 6.0	1	IO needles 45G 15mm YELLOW	2
Gauze (5 swab pack)	3	Lignocaine 2% 100mg/5ml	1
Combine Medium	2	5ml syringe + filter drawing up needle	1

WARS Drug Bag contents



Compartment 1



Controlled drugs pouch

Diazepam 10mg x 1
Fentanyl 100mcg x 2
Ketamine 200mg x 1
Midazolam 15mg x 2
Morphine 10mg x 2
Morphine 30mg x 2

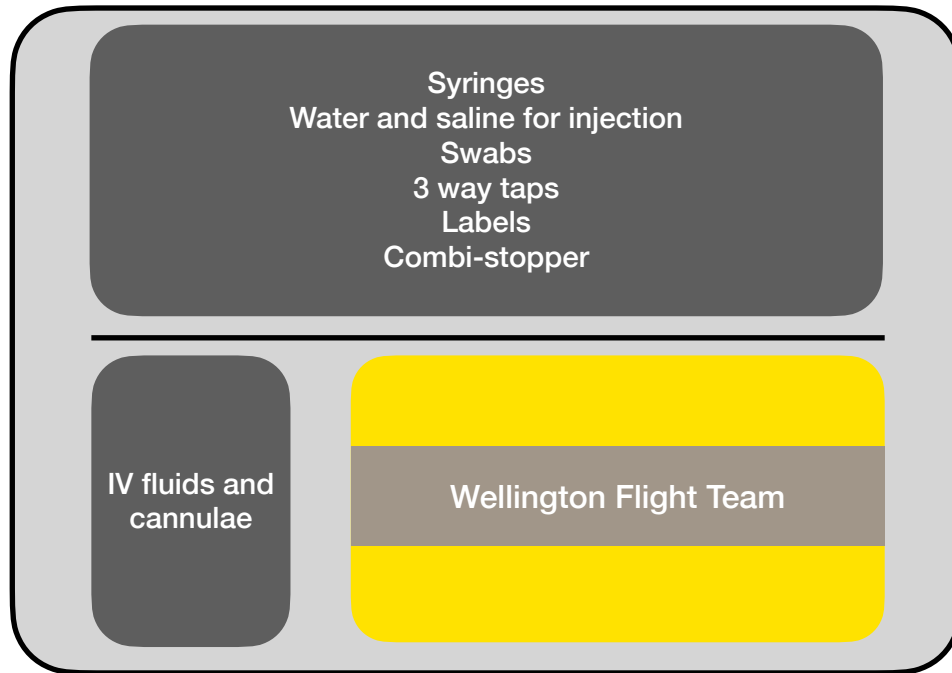
Short dated drugs pouch

Argipressin 20 units x 1
Atracurium 50mg x 2
Novarapid 300 units x 1
Rocuronium 50mg x 3

Emergency drugs pouch

Adrenaline 1:1000 x 10
Adrenaline 1:10,000 PFS x 2
Amiodarone 150mg x 5
Atropine 600mcg x 2
Cyclizine 2mg x 2
Haloperidol 5mg x 2
Metaraminol 10mg x 3
Metaraminol 20mL PFS x 1
Metoclopramide 10mg x 2
Naloxone 400mcg x 2
Ondansetron 4mg x 2
Phenylephrine 10mg x 2

Compartment 2



IV fluids and cannulae

Additional IV cannulae
Dextrose 5% 100mL x 2
Dextrose 10% 500mL x 1
Mannitol 500mL x 1
NaCl 0.9% 100mL x 1
NaCl 0.9% 1000mL x 1
Noradrenaline 10mg/100mL x 1
Potassium 10mmol/100mL x 1

Wellington Flight Team bag - sheet 1

Dextrose 50% 100mL x 1
Glucagon 1mg PFS x 1
Levetiracetam 500mg x 4
Metaraminol 10mg PFS x 1
NaCl 23.4% 20mL x 2
Nimodipine 30mg x 4
Paracetamol tabs 500mg x 10
Propofol 1% 100mL x 1
Sodium bicarbonate 8.4% 100mL x 1

Wellington Flight Team bag - sheet 2

Adrenaline 1:10,000 x 1
Digoxin 500mcg x 2
Dopamine 200mg x 2
Dobutamine 250mg x1
Furosemide 20mg x 4
GTN 50mg IV x 1
Hydralazine 20mg x 3
Isoprenaline 200mcg x 5
Labetalol 100mg IV x 4
Lignocaine 2% 5mL x 2
Milrinone 10mg x 1
Noradrenaline 4mg x 3

Wellington Flight Team bag - sheet 3

IV access equipment

Wellington Flight Team bag - sheet 4

Aminophylline 250mcg x 2
Calcium gluconate 10% 10mL x 2
Flumazenil 0.5mg x 1
Heparin 25,000 units x 1
Hydrocortisone 100mg x 1
Hyoscine butyl bromide 20mg x 2
Magnesium sulphate 10mmol x 2
Metoprolol 5mg x 2
Promethazine 25mg x 2
Salbutamol 5mg x 1
Thiopentone 500mg x 1