Medical Retrieval

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Process of transferring critically ill patients using a team which travels to the patient location from a central location or the destination hospital.
Primary - Prehospital transport
Secondary – Inter-hospital transport

Principles

Provide best possible care with exposing patient to least possible risk
Transfer and transit are times of greatest risk
Level of medical care should always be retained/increased at each transfer
Assess the clinical problem in the place of referral
Stabilise the patient's condition prior to transportation
Transport the patient with physiological support & appropriate monitoring
Deal with foreseeable en route deteriorations as the working environment allows
Monitor and review the quality of the retrieval process

Adverse events

In 70% - 45% equipment, 25% vascular line, 25% patient instability
20% cardiac patients require intervention during transfer (RF: prev arrest, post-thrombolysis, MI, IV INF)

Communication
Staff
Equipment
Drugs
Mode
Documentation

Patient Retrieval

Communicate
Transferring/accepting hospital/unit/team – ensure have all info
Transporting team
Relatives and patient

Correct choice of patient
Benefit of transport must outweigh increased risks of transport
Must require care available at destination not available at source facility
Necessary care must be able to be provided during transport.

No absolute CI to air medical transfer as long as appropriate precautions taken
Relative CI to air retrieval:
- Bronchopleural fistula
- Bowel surgery<10d
- Active GI bleeding
- Vascular anastomosis<14d

Correct choice of transport
Weather conditions, terrain, distance

Correct choice of team
Staff on transport should be appropriate to retrieval
Experienced staff (doctor - resus, airway, ventilation, other organ support; nurse/paramedic)
Consider personal comfort and safety

Equipment
Electronic equipment with own battery power
Separate sources for O2 and suction
Defib, oxygen & suction
Kit should be light, portable, and attachable to fixtures of vehicle/aircraft
Alarms visible and audible
Monitors: ECG/cardiac, oximeter, ETCO2, NIBP (auto) or intra-arterial BP, thermometer
ETT: remove some air from cuff on ascent & re-instil on descent, humidification needed
Ventilator: robust, know gas consumption (Oxylog: min vol + 800ml/min), sufficient O2
Drugs & fluids: Infusion or syringe (ideally) pumps, pre-packed syringes, full resus packs

Transit to patient

Patient Preparation
Secure:
- Airway, ventilation, oxygenation - if likely airway compromise / resp failure, intubate pre-transfer
- All catheters, tubes, drains
- IV access (tape/splints as req) + extra access (min 2 large bore)
Sedation/Analgesia:
- Sufficient stock for increased req during transport
- Prophylactic antiemetic (risk of vomiting from medication, condition, or motion)
- Prophylactic anticonvulsant (if fitting risk)
IV Fluids:
- Ensure blood volume deficit corrected before transport
- Ensure sufficient stock for transit
- At altitude plastic bags distend & IV s often slow/stop so may need freq flushing
Injuries/conditions
- C-spine stabilisation: special braces – avoid sandbags as mobile
- Consider prophylactic ICC if any pneumothorax or >2 rib # as PTX expands at altitude
- Use Heimlich valves rather than underwater drains for ICC
- Haemorrhage controlled
- Splint # preferably without air splints
- Bivalve plasters prior to ascent
Environment
- Temp likely to fall during transport (esp aircraft)
- Core T monitoring
- Incubators for neonates
Communication
- Ensure patient, relatives, sending/receiving hospital teams all kept informed
- Mobile phone / in-aircraft radio
Documentation
- Notes, investigation results, XRs
- In-transit notes/obs
- Consider consent for transport due to increased risks

Re-assessment prior to transfer; liase again with accepting team, ensure bed ready, where transporting to

Anticipate problems
Loading and unloading
- removal of lines, thermal insult
Altitude effects
- decr PiO2: at risk if decr SaO2, decr Hb, incr O2 requirements, fixed CO
- need supplementations +/- cabin pressurisations
- in severe disorders may not be able to fly at sea level cabin altitudes, which will incr turbulence, flying time and fuel consumption

Decr humidity
- humidify gases
Decrease temp, darker, space/lighting limitation, noise, vibration, G forces
Vital signs
- more difficult to monitor
Staff problems
- sickness, sinus/ear pressure
Special considerations
- air embolism/eye injury/HI (aerocoele, CSF rhinorrhoea)/# (rebleeding; G forces on C spine)/decompression sickness/ACS – travel lower
Weather conditions
Defib
- movement artefact will make it difficult to sync; consult pilot before giving DC shock

Transfer patient
Continuing care during transfer

Direct handover
Including communication with family, referring hospital, ED consultant, patient

Documentation and audit
Pre-transfer condition; investigations accompany patient

Mode of transport

Helicopter
Indications: trauma score <12, GCS <10, SBP <90, RR <10/>35, HR <60/>120, AVPU below V
Halves road transit time for 50-200km
Pros: flexible landing (closer to hospital, reach inaccessible areas); less turbulence/faster to mobilise than fixed wing
Cons: more expensive, noise, vibration, less space, mild complications of altitude, more weather dependent (eg poor vis); slower to mobilise than road; slower speed than fixed wing; usually not pressurised; T control difficult; safety considerations on approach; more dangerous to crew; communication only via headset

Fixed wing
Distance >200km or road transport >3hrs
Unpressurised if <900km light aircraft at altitute to 3000m
Pressurised (usually to 2000m) if >900km turboprop/jet at altitude at 8000m+
Pros: faster airspeed, more cabin space, less noise/vibration, better temp control
Cons: longer mobilisation time, long landing strip, requires road transport from landing to hospital

Road
Standard ambulance vs high level care ambulance vs specialist retrieval team
Pros: quicker to arrange; good <50km; less dangerous to crew; no complications of altitude; cheap
Cons: slower at longer distances, need road access

Intra-hospital transport of critically ill patients

Equipment
Airway/ breathing
- Portable ventilator with disconnect alarm – back up manual resuscitator bag always available.
- Equipment to secure airway, emergency drugs, analgesics, sedatives and muscle relaxants
Circulation
- Defibrillator and suctioning device
- Infusion pumps for accurate administration of drugs

Monitoring
- Basic monitoring – ECG, HR, BP (invasive and noninvasive), oxygen saturation and capnometer
- Dedicated equipment for transport
- Durable, trolley linked devices – able to pass through all doorways
- Able to function in the specific intervention area e.g. MRI
- Gas, suction and electrical supplies present and compatible at destination
- No equipment should be placed on patient – specially designed transport trolleys

Policy and procedure in place to regularly check all transport equipment

Staffing

Key personnel identified for each transport event

Appropriately trained doctor, nurse and orderly – bare minimum

Each team must be familiar with equipment and sufficiently experienced in securing airways, ventilation, resuscitation, and anticipated emergency procedures.

Pre-departure procedure

Transport team freed of all duties

Receiving team informed of arrival

Check all equipment, notes, imaging films – checklist recommended

Patient status

Optimization of patient's clinical status prior to mobilization

- Secure airway and ensure patent
- Check ventilation parameters and ensure adequacy
- Check all alarm settings and check if switched on
- Confirm haemodynamic stability (at least for transfer)
- PEEP/FiO2 settings appropriate
- All drains secured and functioning
- IV drips and infusion pumps functioning properly
- Patient secured safely to trolley

In-transit procedures

- Plan route, secure lifts
- Adequate communication and emergency facilities en route e.g. phones to raise alarm
- Check patient status at intervals – act immediately on any significant change

Arrival procedures

- Check receiving monitoring, ventilation, gas, suction and power facilities and transfer connections
- Patient re-assessed on new monitors, ventilators and gas/power supplies
- If another team assumes responsibility, a complete hand over given to team leader
- Transport team to stay until receiving team ready to take over care.

Neonatal transfer

Beware:

Hypoglycaemia, Hypothermia, Hypoxemia, Hypotension, Infection