New Zealand National Stroke Clot Retrieval (SCR) Inter-Hospital Transport Clinical Guideline

Key Points

- Minimising stroke clot retrieval (SCR) transfer delays is more important to patient outcome than the skill level of the accompanying clinical staff and does not require a medical escort, in the vast majority of cases
- Early transport provider pre-notification can facilitate timely transfers
- Referral centre arrival time to departure (door-in-door-out time) should be <60 min
- Transport team should be able to depart team's base within <15 minutes of definitive acceptance by SCR centre
- Accurate ETAs should be communicated early to avoid futile transfers with confirmation of ETA required 30-40 minutes from arrival at the SCR centre and ideally again 5 minutes prior to arrival to ensure optimal patient flow
- ETAs are to be communicated to a designated SCR centre stroke team contact
- This document contains guidance on patient, crew, craft selection and dispatch
- This document contains clinical guidance on peri-transport patient care

Purpose

The purpose of this guideline is to facilitate safe, timely, and nationally consistent inter-hospital transport when relocating patients from regional hospitals to stroke clot retrieval centres in Aotearoa New Zealand. The document is intended for use by all involved transport providers. This will improve equity of access across the country to this time-sensitive procedure.

This is a living document which will be improved and developed progressively over time by representatives of the Transport subgroup of the National stroke clot retrieval improvement programme.

Overview

Stroke clot retrieval (SCR) can reverse stroke symptoms by removing a blood clot from a brain artery by an endovascular technique. SCR can substantially improve outcomes following stroke for patients who are eligible to receive it. It is generally used along with IV thrombolysis but can sometimes be used in isolation. The treatment is complex and only offered at Auckland, Wellington, and Christchurch Hospitals.

SCR is time critical and must occur as soon as possible after symptom onset meaning rapid transport is essential. This document outlines guidelines for the process for NZ inter-hospital transport providers, including hospital flight teams and pre-hospital helicopter crews, to follow when arranging and undertaking a time-critical helicopter transfer for a patient with acute stroke requiring SCR.

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Developed by the Stroke Clot Retrieval Transport subgroup as part of the New Zealand Ministry of Health funded National Stroke Clot Retrieval Improvement Programme.
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Determining SCR eligibility

Each participating hospital should have a guideline in place to assist with suitable patient selection.

- In most cases this involves a patient who is previously independent (modified Rankin Score 0-2), has a moderate to large clinical deficit (NIHSS>6) consistent with a stroke, evidence of large vessel occlusion on CT angiogram, no significant early ischaemic changes, or other contraindications on non-contrast head CT, and will reach an SCR centre within the required time frame.
- The standard time requires groin puncture to occur as soon as possible and ideally within 6 hours or sooner (7.3 hours max) or have CT perfusion imaging that indicates a small ischaemic core and large penumbra.
- When a suitable patient is identified, and an SCR neurologist is not already involved in the patient's care the SCR centre neurologist must be contacted. If SCR eligibility is confirmed the referring hospital clinician is notified to proceed with transferring the patient.
- Many of the patients referred for SCR will have received IV thrombolysis prior to transfer and especially in the case of IV Alteplase the infusion should continue during transfer if not completed prior transfer.

Notification of Transport Team

- All stroke hospitals should have a pre-hospital stroke notification process in place to alert the local ED and stroke team that a patient is due to arrive with suspected stroke.
- All stroke hospitals should have a locally agreed and clearly documented transport activation and coordination process in place that involves both pre- and hospital transport providers in a collaborative fashion to optimise transport time and safety.).
- Timing of referral to the transport team (i.e., pre-definitive acceptance or post) will vary by location. Earlier notification will speed up transfer and improve patient outcomes but will result in stand downs (if crew notified) impacting on crew fatigue management overnight.
- Notification at the time of the stroke alert will result in about 80% stand-downs. Notification after a regional physician review will result in about 50% stand downs, and after neurologist SMO review will result in about 20% stand downs.
- When alerting the transport team provide the name and phone number of the SCR neurologist or alternate nominated clinician to facilitate subsequent ETA updates.
- Once alerted the transport team should enquire about crew and craft availability, weather conditions, and determine an approximate ETA at the relevant SCR centre, which is communicated to the nominated SCR centre clinician.
- Concurrently, the ED team should prepare the patient for transport to ensure they are ready when the transport team arrives.

Clinical Escort and Mode of Transport Selection

Most stroke patients are more time critical than skill critical during transfers and escort selection should default to whichever suitably trained clinical escort/team and mode of transport can be (a) mobilised the quickest and (b) reach the SCR centre the fastest taking into consideration distance, weather, and crew availability.

Clinical Escort

In most cases a suitably trained Intensive Care Paramedic (ICP) or Transport Nurse.

- Minimum escort requirement for all stroke patients include:
  - Ability to monitor blood pressure and intermittent basic neurological observations.
  - Ability to administer IV medications to control hypertension (in consultation with medical staff or using a standing order)
- In patients who have received IV thrombolysis these additional skills are required:
  - Ability to monitor an Alteplase infusion (if used and ongoing)
  - Ability to monitor for angioedema and administer treatment for anaphylaxis
- Some patients are started on an IV anti-hypertensive medicine infusion prior to transfer and these additional skills are then required:
  - Ability to titrate an IV medicine infusion
- In a small subset of patients (<5-10%) there may be concern for airway protection requiring pre-transport or potential peri-transport intubation and the associated clinical skill mix. The need for intubation must always be discussed with the SCR neurologist as this may preclude the patient being suitable for SCR. Examples include:
  - Significantly reduced level of consciousness on neurological assessment (not counting aphasia, anarthria, bilateral stroke induced mechanical ptosis, or limb weakness)
  - Presence of a basilar thrombus and deteriorating neurological status

Mode of Transport

- Road transfer is preferred where distances to an SCR centre are <60 minutes and should be considered where distances are <120 minutes by road if transfer by air is not immediately available. Immediate availability of a road clinical escort is expected and where this is not achievable helicopter transfer will need to be considered.
- Helicopter is usually the most appropriate mode of transfer if distance is >60 minutes by road, provided the helicopter and crew are immediately available and offers >15 minutes in time savings. Helicopter availability may be limited during adverse weather and at night.
- Fixed-wing transfer is not preferred due to the additional time delays associated with transfer between airfields and hospitals but may be appropriate if helicopter transfer is not feasible (e.g., weather, not available) or flight times are long, and the patient will reach the SCR centre within the period of treatment benefit.
- Transport ‘mode’ may be a compositive of multiple of the modalities listed above and to achieve optimal coordination close collaboration between service providers will be required.

Arranging Transfer

Currently this is not standardized across the country, however, the following general principles should be as follows.

Each hospital should identify their preferred provider as first point of call. This could be direct notification to a pre-hospital team by ED staff, contacting the local ICU team or duty nurse manager, or contacting the SCR centre ICU inter-hospital transfer coordinator.

If the local or SCR centre ICU flight team is the first point of call, they will determine mode of transfer and assess crew/craft availably. If there will be an ICU team escort the relevant coordinator will notify crew and craft and then contact the SCR team with an estimated ETA and liaise with emergency department team around departure time. If instead a pre-hospital provider is selected with an intensive care paramedic escort, the coordinator will contact the relevant crew who will then notify the air desk for tasking. It needs to be clearly documented whose responsibility it is to notify SCR team of the ETA.

If the pre-hospital provider is the first point of call without involving an ICU flight coordinator a clearly documented pathway must be in place outlining the notification and tasking process.

It is very important that if one provider cannot provide the requested transport that there is a clearly documented mechanism of how referral to an alternate provider is made to explore other options.

If a transport referral is triggered by someone other than the designated SCR contact person (e.g., local ED clinician) the name and phone number of the SCR neurologist or alternate nominated clinician should be communicated to the transport team upon referral to ensure optimal communication throughout the transfer process.

Preparing the Patient for Transfer

As soon as the transport mode and crew are confirmed the transport provider should provide an accurate and realistic ETA confirmation to the SCR team[2] to ensure updated time frames still meet clinically required time frames to avoid futile transfers and allow receiving hospital preparations.

To minimise delays, the patient must be fully prepared for transport prior to the arrival of the clinical escort/flight personnel. This includes collating all necessary transfer documents and ensuring that personnel at the receiving hospital have the required patient details to initiate administrative processes. It is the responsibility of the local hospital team to ensure all of the patient's belongings accompany the patient. Especially hearing aids and dentures are very important to accompany the patient as they are needed for post SCR stroke evaluation and early cares. A localised SCR transport check list at each referring hospital is recommended.

If during the transfer preparation phase unanticipated delays arise that will result in changes in patient ETA, the SCR team[1] must be notified to reassess if transfer remains clinically appropriate.

[1] **Auckland** Hyper-Acute Stroke Nurse: **021829691** (direct dial) or hospital operator via 0800 1 PASTA
Wellington Neurology/stroke registrar: weekdays (8:00 to 16:00) **0275554712** (direct dial)
week evenings (16:00-022:59)/weekends (8:99-15:59): **0275720662** (direct dial); Overnight (23:00-07:59): 0211998497 (direct dial) or via hospital operator (04) 385 5999 at any time asking for stroke registrar on call
Christchurch Neurology Registrar: Day and evenings (8:00-22:29): **021 653 414** (direct dial); overnight (22:30-7:59): via hospital operator **(03) 364 0640** ask for 'neurology registrar on call'

Patient handover to transport team at the referring hospital

On the arrival of personnel providing the clinical escort, referring hospital team must provide a timely clinical handover that minimises delays to departure (<15 min), including:

- The history and any additional relevant clinical information (for example allergies).
- Current therapy including whether Alteplase/Tenecteplase, antihypertensives were given, or are still being administered and confirmation that no bag changes are required en route (which is to be avoided).
- The patient's vital signs.
- The name and phone number of the SCR neurologist or alternate nominated clinician.
- The relevant medical records (if unavailable consider emailing instead of delaying departure)[2]
- Any prescriptions charted that may have to be provided en route (using standing orders will allow clinical escorts (where appropriate) to administer drugs mentioned in this guideline)

*At the time of departure, the referring hospital clinician should contact the receiving SCR neurologist or nominated alternate to confirm/update the estimated time of arrival and a contact number for the transport team and/or (if applicable) Flight co-ordinator in case the SCR centre team needs to make contact[3]

Patient management en route

General Principles

- Do not insert additional IV lines unless absolutely necessary.
- Compress any external bleeding.
- Monitor and record the following every 10 minutes:
    - Blood pressure (Post-thrombolysis target <180/105; otherwise SBP<220/120).
    - Heart rate.
    - O2 saturation.
    - GCS.
    - Signs of angioedema.
- Contact the on-call doctor for the transport service if any of the following occur:
    - There is a significant change in the patient's condition.
    - The systolic BP remains over 180 mmHg or the diastolic BP remains over 105 mm Hg despite treatment for *thrombolysed* or >220/120 for *non-thrombolysed* patients.
    - The GCS falls by more than two points.
    - There are clinically significant signs of external bleeding or haemodynamic instability.

[2] Auckland SCR service email: HASUNurse@adhb.govt.nz
Wellington SCR service email: RES-7SouthWardAdminM@ccdhb.org.nz
Christchurch SCR service email: n/a – medical records shared access across South Island

[4] For air ambulance paramedic lead transport teams (i.e., not inter-hospital ICU retrieval team (IHT)) the SCR team can contact 0800 244 111 to receive updates on flight status; if patient is transported via IHT contact the flight coordinator via the hospital switchboard for updates if required.

Intracranial haemorrhage (ICH) – suspect if:

- Sudden rise in systolic BP to over 200 or diastolic to over 110 if *thrombolysed*.
- GCS falls by more than 2 points.
- Significant worsening of prior neurological deficit.
- Nausea or vomiting.
- Severe headache.

- If ICH suspected, stop Alteplase infusion, provide support and ring on-call transport doctor. Ensure adequate airway and breathing, control seizures and provide pain relief if required.

Stop Alteplase infusion – if:

- Systolic BP is greater than 200 mmHg or
- Diastolic BP is greater than 120 mmHg
- There are signs of intracranial haemorrhage (see above)
- There are signs of severe extracranial bleeding or
- The patient has angioedema

Managing hypertension

- Post-Thrombolysis
  - BP target is <180/105 mmHg and BP must not exceed this; aggressive therapy may be required. However, do not lower SBP to <160mmHg.
  - First line BP lowering drug is Labetalol 10 mg IV bolus or Labetalol infusion; second line or if Labetalol is contraindicated is GTN patch (TTS 5/25mg) or GTN infusion
  - Repeat BP in 5-minute cycles.
  - If BP remains 180 mmHg systolic and/or 105 mmHg and using up to 3 IV Labetalol boluses or a GTN patch transition to Labetalol OR GTN IV infusion - systolic BP target range of 160-180 mmHg.
- Non-thrombolysed patient
  - BP target is <220/120. If BP exceeds administer Labetalol 10mg IV boluses every 5-10 minutes to a max of 200 mg and/or initiate infusion; do not lower SBP to <200.

Management of peri-oral angioedema

Peri-oral angioedema is an uncommon complication of thrombolytic treatment of acute ischaemic stroke, occurring in ~ 1% of treated patients. It may occur during or up to two hours after administration and may be hemi lingual, contralateral to the side of the stroke.

- Stop Alteplase infusion
- Treat with hydrocortisone 100mg.
- If concerned about airway compromise, treat with 5mg nebulised adrenaline, and consider intubation.

If the on-call doctor for the transport service is uncertain about peri-transport stroke management they should contact the on-call SCR centre neurologist via hospital switchboard

Pre-arrival notification

Between 30-40 minutes prior to hospital arrival at either the ambulance bay for road or fixed wing or helipad for helicopter transfer, the transport team must send a text message to the SCR team (see page 1 footnote for contact details) to provide an updated ETA, to report any change in neurological status, and ideally to confirm the handover point within the clot retrieval centre. SCR centre contact must respond to the text confirming receipt.

Text message is preferred over phone call due to signal reception on aircrafts and safety consideration for the crew. All SCR centres should ensure a suitable mobile number is available as effective landline communication via telephone cannot be guaranteed.

Prior to arrival, transport team also ensures any additional routine hospital notifications take place (e.g., notify ED/switchboard to organise orderly in some places; do not assume the SCR team will arrange this).

Ideally, the transport team will also send a further text message to the receiving dedicated mobile number 5 minutes out from arrival to allow the stroke team to meet the patient at the door for immediate transfer to the angio suite if clinically appropriate.

Any significant change in clinical status of the patient en route should also be communicated to the receiving SCR team to ensure a smooth and safe process upon arrival.

On arrival at SCR centre

The SCR team will meet the escorting personnel in ED or, where agreed, near the heli-pad, unless another specific place has been arranged.

Following a brief hand over from the escorting personnel and a brief assessment by the SCR team, the patient should be conveyed immediately to the interventional suite on the transport stretcher unless otherwise instructed.

Other potential destinations include ED, CT scanner, stroke unit, or ICU depending on the patient's status and readiness of the angio suite and team. Once the patient has been delivered to a clinical area, has been shifted to an alternate bed, and handover has occurred the transfer team departs.

Repatriation

It is expected that patients will be transported back to their hospital of domicile once clinically stable. This should ideally occur within 24 hours of arrival but will be contingent on transport feasibility.

Special consideration

There will be special circumstances such as have arisen in the context of the COVID-19 pandemic. Specific guidelines around such circumstances are often evolving rapidly and are beyond the scope of this document. To avoid ad hoc service changes that may compromise patient and staff safety early and proactive communication between stroke and flight teams is encouraged and any changes to routine pathways should ideally be approached in a nationally coordinated fashion. While operational the SCR Service Improvement Programme will provide national leadership in this space.