DESIGNING A FRAMEWORK FOR LONG-RANGE CRITICAL CARE TRANSFER AWAY FROM THE EPICENTRE OF A CRISIS

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Objective

To develop and refine a novel framework for maintaining patient safety during long-range critical care unit transfer.

Introduction

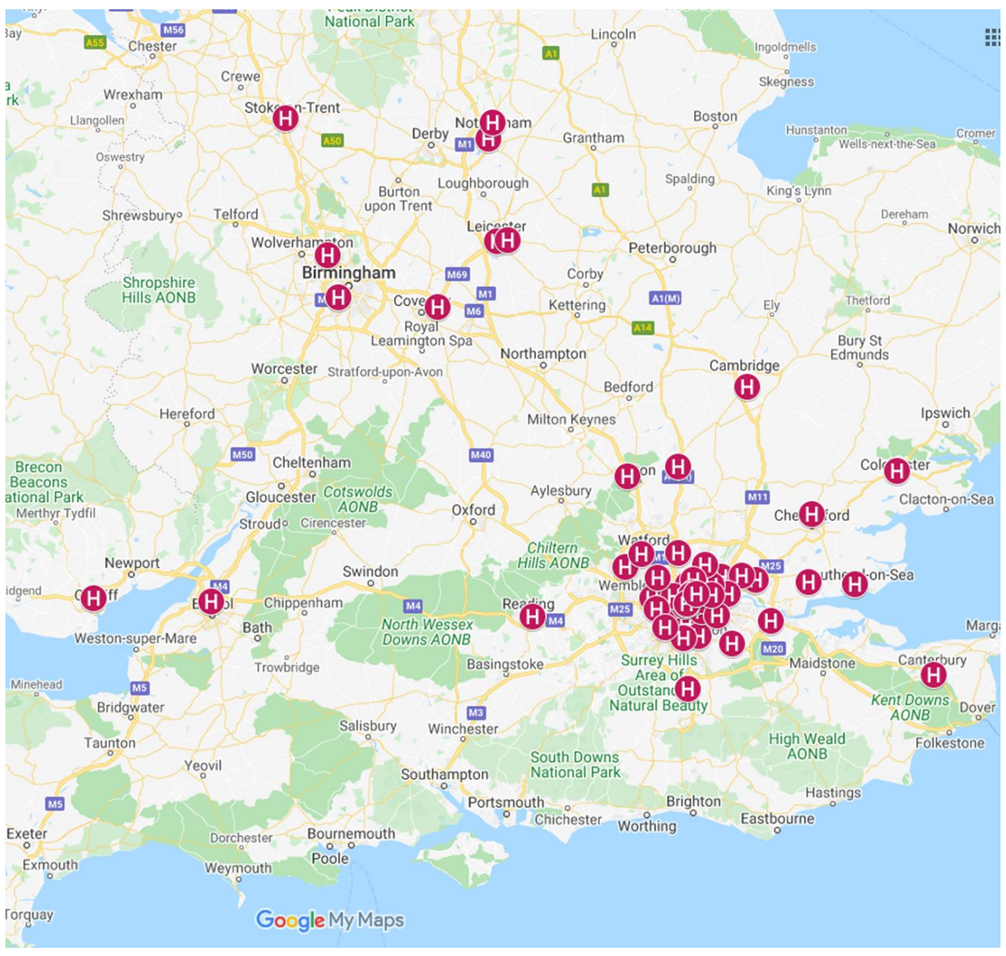
The North East London Critical Care Transfer And Retrieval (NECCTAR) Service provides a complete adult critical transfer capability. During the second wave of the COVID-19 pandemic, London was the epicentre of critical care activity[1]. Resource pressures escalated rapidly to unprecedented levels of demand[1]. Beds for regional decompression became increasingly rare within London, necessitating long-range transfer. These were considered to be journeys over two hours in duration and to hospitals outside of the M25. NECCTAR was the first critical care transport service during this peak to decompress a London-based COVID-19 patient to a bed sourced nationally.

Although longer-range ground transfers are associated with inherent risks, these can be mitigated through a dedicated transfer team and equipment[2,3]. NECCTAR was required to rapidly and iteratively design a framework for long-range transfers. The service leadership drew on translatable experience from aeromedical pre-hospital resources. Detailed case review was undertaken refine the standard operating procedure. As pandemic pressures have reduced, the guidance has now become translatable to longer-distance repatriation and specialist transfers.

Methods

- Risks associated with long-range critical care ground transfers were broadly identified as patient, staff, and equipment/technical risks.
- Ethical considerations were prominent in planning.
- Risks were categorised for standard operating procedure design purposes. (SOP link figure 5.)
- Data were contemporaneously recorded for all taskings from point of referral to completion. The risks and their mitigations are summarised in Table 1.

Figure 1. NECCTAR Transfers to date



Results

- An iteratively designed standard operating procedure was developed. NECCTAR has been referred 29 long-range missions, and has completed 20 (68.9%) of these. Long-range taskings are significantly less likely to result in a completed transfer (68.9% v 88.3%, Fisher's p=0.029), predominately due to unanticipated changes in clinical status prior to departure.
- The longest duration of time and distance travelled under NECCTAR care was 5 hours, 32 minutes and 278 kilometres, respectively.
- All completed long-range transfers were followed up to the point of discharge from intensive care; there were no significant adverse events in this group.
- Transfer locations are shown in figure 1.

Table 1. Risks and Mitigations.

Risk Identified	Mitigation
Higher potential for clinical deterioration	Dedicated consultant led patient triage and selection Increased patient exclusion criteria Higher level of seniority for transferring crew AAGBI compliant monitoring Trial on transport ventilator
Patient exposure to environment	Heating packs, ambulance warmers, blankets Focus on packaging/pressure area management
Limited oxygen supply with potential associated high ambient oxygen	Cylinder manifold Oxygen consumption formally calculated Ambient oxygen sensors
Limited medical intervention available over prolonged/higher risk period	Additional equipment for management and intervention including Hamilton T1 ventilator, defibrillator, and point of care devices Medication provision: adequate infusion/sedation and regular medications Planned diverts as below
Provision of emergency assistance	Liaison with national ambulance services to plan for roadside rendezvous Formal planning of available route diverts
Crew exposure to environment including aerosolised SARS-CoV-2	PPE Ambulance ventilation Overnight rest available if weather conditions prohibit return
Medicolegal and ethical considerations regarding prolonged transfer and distance from family	Ethics discussions Multi-consultant decision making Family discussion Executive ownership of risk for transfer
Fatigue with long journey times	Dedicated long-range crew Early planning/tasking
Limited senior decision making capacity	Advance directives to be carried
Technical failure of vehicle/inadequate fuel	Pre-planned risk mitigation by ambulance team
Limited equipment battery life	Inverter checks, pre-planned charging

Figure 2. NECCTAR in Cardiff

Figure 3. NECCTAR in Birmingham

Figure 4. NECCTAR in Southend

Figure 5. Long Distance SOP QR Code

Conclusions

- NECCTAR developed a framework that ensures stringent patient selection undertaken by a dedicated, senior-led crew with multiple risk mitigations.
- A strong governance process has ensured updates to maintain patient safety. This framework has now been adapted for repatriation and specialist transfers and would also be generalisable to major incidents, including biohazard events and natural disasters.

References

1) NHS Providers. *COVID-19 pressures: an exploration of hospital activity through the first and second wave*. https://nhsproviders.org/news-blogs/blogs/covid-19-pressures-an-exploration-of-hospital-activity-through-the-first-and-second-wave (2021 accessed 22 August 2021)
2) Uusaro A, Parviainen I, Takala J, Ruokonen E. Safe long-distance interhospital ground transfer of critically ill patients with acute severe unstable respiratory and circulatory failure. *Intensive Care Med*. 2002;28(8):1122-1125.
3) Moynihan K, McSharry B, Reed P, Buckley D. Impact of Retrieval, Distance Traveled, and Referral Center on Outcomes in Unplanned Admissions to a National PICU. *Pediatr Crit Care Med*. 2016;17(2):e34-e42.

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