

Notes from first ventilated covid-19 interfacility-ICU transfer

Below is a summary of this transfer, followed by some learning points and then suggestions for the sending hospital in order to make the transfers as safe and efficient as possible. We are still very much in a learning phase and any comments or suggestions are welcome. I will be putting together an additional summary for intra-hospital transfers in the coming days.

Please consider this to be a living document that is subject to frequent changes.

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Setting:

- First confirmed covid-19 patient in the UK requiring ventilatory support
- 50-year-old male
- Discussions about transferring patient to HCID ICU at St Thomas' evening of 4/3/20
- Confirmation of acceptance following morning.
- As SLACCN transfers lead I was notified of the transfer and accepted responsibility for providing the medical escort
- The nurse was provided from the sending hospital

Timings

06:45 – messaged re: likely transfer

07:22 – d/w HCID lead at GSTT over composition of transfer team

10:44 -- contact by LAS HART lead to arrange team to assemble at Bromley LAS station (nearest base to PRUH)

11:40 – collected by HART team from Denmark Hill and started initial briefing en route

12:30 – briefing of HART team on patient and what their organ support requirements are and how these will be met en route. Numerous potential pitfalls identified and group effort to make plans to mitigate them, although these were nearly all identified from the medical perspective and the HART team were fully reliant on our expertise.

13:11 – depart Bromley LAS station for PRUH

13:30 – briefing of local medical and nursing staff of requirements and sequence of events to effect safe transfer

13:35 – commencing dawning of level 4 (check this) PPE following decision to follow HART SOPs for PPE even if this was higher than absolutely necessary. Mantra of: *Our patient, your office*. We will take the lead from HART on PPE and work as a team in the way in which they have drilled to work.

14:00 – Once in PPE completely unable to make contemporaneous notes or even use the phone. Sense of time passing very much lost, although HART will have a detailed record of these

15:?? – Depart PRUH

16:?? – Arrive St Thomas' and met in well-prepared and secure entrance out of public or media access. Medical escort and HART team separate. Personal effects of escort and 'clean' equipment (see below) are brought to ICU by HART team who are not in PPE

16:?? – Brief handover to receiving HCID consultant and escorted to East Wing 6. Corridors were completely cleared of all staff and really impressed by the preparation of the HCID team

17: ?? – slow time transfer of patient to HCID ICU monitor, vent etc.

17:?? – medical team doffed by HCID nurse

18:00 -- medical escort released. All 'clean' items to be returned to sending hospital but contaminated items remain with HCID team until fully decontaminated. (i.e. aerosol bombing)

Pitfalls, learning points & what to expect

The HART team are experienced paramedics, but they are in no way able to manage critically unwell patients alone. Senior clinicians are essential to manage the patient at every step in the journey

HART ambulances are still regular fleet vehicles. They have hundreds of items on board that will not be needed and must be removed before transfer so as not to be wasted or go through unnecessary cleaning procedures.

The team consists of 5 to 6 people, not including the medical escort:

- Team leader
- Navigator
- Driver of main ambulance
- Paramedic assisting the medical team
- Driver of spare/clean ambulance which travels in convoy

When in transit, you will travel in a convoy consisting of the main ambulance, a back-up or 'clean' ambulance and the team leader in a car. Although the patient's pathology may not be particularly time-critical, you will travel on blue-lights to keep the team moving and tightly together.

Joint briefing of medical, nursing and ambulance staff is essential. Do not make ANY assumptions about what each other's understanding of the plan is.

We adopted the mantra of "Our patient. Your office." By this we meant that we would provide clinical care, but we would follow all the HART SOPs regarding PPE SOPs. In some ways this seemed over the top

for covid-19, but it is what they have drilled to do. This is not the time for us to start to adjust their plans on the fly. Additionally, being in the ambulance is not the same as being in an ICU. For the journey you are very up close and personal with the patient, you can't 'step-out' to fix your mask/gown, and caring for the patient en route means kneeling down, reaching around both them and your team, etc. As such I believe a Tyvek suit is 100% necessary to cover your legs and back; something which is not achieved with ICU gowns.

Media/social media commentary from China, have shown many pictures of escort teams wearing widely different levels of PPE. This creates confusion amongst viewers. As such, I believe the team should all be in the same PPE and that the default should be that which HART is wearing. The HART and GSTT HCID teams did a great job of keeping us out of the public eye, but this cannot be guaranteed.

Once dawned in PPE you are extremely limited in what you can do and communication behind both a FFP3 facemask and a face shield is difficult. Dexterity of the multiple layers of gloves is also markedly reduced. Certain tasks will necessarily have to be passed back to the home team to perform (see summary below)

The extra layers of gloves at first seemed unnecessary, but when doffing contaminated kit, they were essential.

You cannot step out for a quick comfort break once in full PPE. You must think about what you eat/drink and expect to be a little on the dry side.

You will not be able to use your mobile phone to call for advice or use any mobile apps. Even more reason for a senior clinician to be the escort. The HART team were great liaising with the HCID centre, but even they have issues, such as having to place their mobile radios in a plastic bag and not being able to hear what others say due to PPE.

The HART PPE kits come with paper scrubs as well as the Tyvek suits, mask, gloves, goggles, face shield, etc. We opted not to wear the paper scrubs. In the future I think I would wear them, as it makes disposal easier at the HCID centre. You will be sweaty after hours in the suit and want to change back as soon as possible.

HART team members have their own boots, which get decontaminated and re-used. We need to have a think about how essential these are as the team had not expected to have to provide these to the medical team.

One of the key steps in limiting viral particle spread is avoiding breaking the ventilator circuit. However, to go on to the transport ventilator, this unfortunately must be done. Top tips in doing so include:

- Pre-oxygenate the patient with 100% fiO₂ to allow the longest interruption of ventilation possible.
- Suction the patient at this point, so that you might be able to avoid needing to do so in transit. Please also suction oral secretions before moving the patient to the ambulance trolley.
- Prepare the new circuit by placing everything that is needed together first (circuit, HME, ETCO₂, closed-suction set, etc) and TAPE all of the joining points. Circuit disconnections are common, and taping avoids this. Our own pitfall today was that despite preparing the new circuit as described, when we were adjusting the patient's head to perform the exchange the old one fell

apart. Fortunately, we had pre-planned to stop the ventilator prior to any movement, so there was no major aerosolization of particles.

- Ensure the patient is completely paralyzed to avoid coughing or spontaneous breathing
- Set the new ventilator to match the current settings and have it on, but away from the ETT
- Clamp the ETT during expiration to minimize the pressure in the circuit, and then switch the ICU ventilator off.
- When disconnecting, have a cap or a bag or something to place the end of the old circuit in. I would recommend handing the circuit to the nurse controlling the ventilator to perform immediate, safe disposal.
- Attach the new ventilator circuit to the ETT and release the clamp.
- As soon as effective ventilation is established, tape the new connection between the ETT and circuit AND, if not already done so, tape the ETT to its 15mm adapter.
- Side-stream ETCO₂ is by far and away the most common and easiest to use device these days. Today, I would say this was one of our potential points of failure. Although it was placed on the clean/dry side of the HME filter, it does aspirate gas from the ventilator circuit and vent it to the atmosphere after analysis. It may be worth investigating with virologists whether this is of significant clinical risk. Mainstream ETCO₂ does not aspirate any gas and hence could be a safer option.
- Something we could have done but didn't was to place an inco pad on the patient's chest to capture any secretions that may come out of the ETT or circuit, and then dispose of it after the new circuit was connected.

Make special note that the portable Laerdal LSU Serres suction unit does not by default have a filter of any kind. As such, if needed to be used, it would vent air with a very high viral load into the atmosphere immediately adjacent to the operator. Filters are available from the manufacturer; however these are only effective down to 0.3 microns. I believe current covid-19 particles vary in size from 0.2 to 0.5 microns; making such filters better-than-nothing, but still not ideal. Trusts should check what their local situation is and seek to have filters available for the LSUs likely to be used by your outreach team or others likely to care for patients when there is no wall suction available.

We opted to place a white fluid containment (body) bag on the ambulance trolley and slide the patient into it. This not only keeps body fluid inside; but it is also useful for keeping lines and wires together and not hanging off the trolley's side. The HART team did not have one as part of their standard kit. They could have obtained one, but the nearest base to get one was miles away.

Just about everything we did took longer than it would normally do. As a result, we had to change one of the infusions before departure and pay constant attention to the battery life of the infusion pumps at this particular hospital. One pump, despite being on charge began alarming only about 15 minutes after being unplugged and hence needed to be swapped out. We had to bring 4 extension leads and a power-bar in order to keep everything plugged in during the ambulance transfer. Had we not done this we could easily have had another battery failure. I would suggest having a queue card of individual battery lives for the devices your Trust uses. I know ESTH did this a couple of years ago and might be able to share it.

During the brief, you need to decide what equipment is *absolutely necessary* to have with the patient, and hence be considered 'contaminated' afterwards, and what can be kept 'clean'. We opted to keep the transfer bag, documents, spare pumps and our personal effects 'clean' and these were placed in the 'back-up' ambulance. In the event they are needed, they can quickly (30 seconds) be brought to the main ambulance as the vehicles travel in convoy. Do take note, this is where your wallet, phone and keys will be and you will not have access to them until fully doffed.

For HCID infections, simple wipe-down of medical equipment is not sufficient and it needs to be 'bombed' before being returned to the sending hospital. As such you must expect to not have access to those devices for 'a while' until they are shipped back. Again, separating items out into clean and dirty will minimise the loss of availability of equipment.

Suggestions for the Sending hospital to help make the process safer and more efficient:

These transfers consume huge amounts of resource to be done properly. Please think ahead about getting extra hands to the pump. Only a few people will need to be clinical or exposed to the patient however, so HCAs. Porters, admin staff will certainly be valuable.

1. Prepare a discharge/transfer letter and make 2 (two) copies of the notes. One copy to be kept 'clean' and should be complete. The other set can be more focused and will go with the transferring team. These will be disposed of at the end of the transfer as they will be considered contaminated.
2. Identify a room/space near to the patient where the briefing will take place with the HART team, and where escorting staff will dawn PPE. The briefing should include:
 - a. Sending consultant
 - b. Nurse in charge
 - c. Escorting clinicians
 - d. HART team
 - e. Additional non-clinical staff to assign support roles.
3. Get the nhs.net address of the lead transferring clinician and if possible, the HCID/receiving clinician. This will allow the letter to be emailed and sections to be cut and pasted into the notes. GSTT are nearly completely paperless so this is very useful for them.
4. Please prepare enough of the drugs that the patient is on (sedation, norad, etc) for at least 4 hours. Any syringes that have less than 2 hours remaining at the point the team is ready to leave the ICU should be changed, even if this involves waste.
5. Prepare 4 syringes of rocuronium, 100mg each and label and cap them with a red bung. This will allow the patient to be kept paralyzed throughout, without the need for another infusion to run.
6. Whilst the team are preparing the patient with you in the room, they will be in full suits, and you will be in the highest PPE that your unit has been using to this point. It will almost certainly be

easier to work in your outfit, so having 1 nurse assisting the team would be great, and 2nd one present just when the physical move take place.

7. Please allow the transferring nurse to have a break before getting suited-up
8. Please acquire from the mortuary a fluid containment (body) bag. If it is not white, it is best to have a white sheet on top in the event media/public come within line of sight
9. Empty urinary catheter bag just before moving the patient onto the ambulance trolley
10. When it is time to leave the bedspace you will need a lot of people to hold doors, operate the lift, etc as the team will not want to touch anything along the way.
11. Get the HART team leader to liaise with security to identify the route between ICU and the ambulance bay. ED may not be the best place to park, and more discrete areas should be considered. Ensure security has blocked off as much of the route from public and other staff.
12. The receiving team at GSTT have a 'spills officer' walk behind them team. Anything the drips, leaks, or simply falls off the trolley needs to be considered contaminated. They carry cleaning wipes and waste disposal bags. The team should not have to stop whilst this is being addressed.
13. Items you should expect to lose for an extended period
 - a. Ventilator
 - b. monitor & leads
 - c. infusion pumps being used
 - d. Any charging leads, including 4-way extensions
14. Items you should get back promptly, if placed in the 'clean' ambulance
 - a. Transfer bag
 - b. Spare pumps
 - c. Ventilator charging brick