Renal Transplantation in Glasgow during the COVID-19 pandemic:
early experience and lessons learned

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Acceptance framework

We developed a multifactorial framework to guide decisions on acceptance or decline of kidney offers based on balance of risks and benefit. The overall philosophy is analogous to the transplant benefit score used for liver matching, i.e. aim to transplant those who will gain greatest benefit by being transplanted now rather than waiting, which was a combination of those least likely to get a timely offer after the pandemic and those at lowest risk from COVID-19 infection and taking into account the ability to prevent infection by shielding while on the waiting list. So far this has worked well and it has been easy to reach consensus on offers, but we are also employing a practice of seeking second and third opinions on offers whenever feasible. The acceptance framework is in the document “acceptance_framework.pdf”

Mass suspension

Before we suspended the group of patients for whom we were unlikely to accept an offer, and as most other centres were closed, we experienced a high volume of calls with offers, and later re-offers of the same kidney after it had been declined for earlier named patients. This proved to be unsustainable, both for us and the ODT Hub.

We were successfully able to suspend more than half the active waiting list based on criteria taking into account age, sensitisation/matchability and dialysis modality. The process, initial criteria and equality impact assessment are all in the file “nephrologist_info_Covid_suspensions.pdf”.

The mass suspension was done using a download of the CSV file of our active waiting list from NTxD, which was merged with data on current RRT from our electronic patient record and analysed using R software. Once criteria for suspension were developed, R was used again to divide the waiting list into kept active and suspended patients. This process was fairly straightforward; the much more difficult task was working out which renal unit each patient belonged to so that we could inform the correct nephrologists.

We have since modified the criteria so all waiting list patients under 50 are being kept active, and those over 50 are suspended unless cRF > 75% or matchability score 8-10. These new criteria would be easier for other centres to adopt as the necessary information is fully contained within the CSV file downloaded from NTxD.

Problems

The main problem is that the method of analysing the waiting list, generating an algorithm to decide on suspensions, then for ODT to develop a method to mass suspend from a list took around 2 weeks. During this time, some patients were suspended for other reasons, but the “keep active” list was not updated to take account of the changes, and those patients received letters informing them that they were still active. Fortunately ODT were only given the list of patients to suspend, so none of these were re-activated in error.

Even having suspended more than half the patients, there are still a number of unsuitable offers. Of 52 adult offers received since mid-April, only 19 were accepted for a named or alternative patient, and only 10 of these have led to actual transplants. Reasons for accepted offers not leading to transplants have included patient choice once fully counselled about risks as the major reason, but there have also been adverse findings at retrieval, non-proceeding DCD due to prolonged time to asystole and donor-specific antibodies at levels which would not normally preclude a transplant but would need augmented immunosuppression with depleting anti-T cell antibodies.

Pre-op COVID-19 testing of recipient

This has been done as a combination of PCR sent on arrival and CT thorax. Of the 13 adult recipients to date, all had PCR and 12 also had CT thorax, all of which were negative (CTCV0). The timing of the laboratory report for 8 of the transplants was before the arrival time of the kidney, so the PCR did not delay transplants in any of these eight cases.

One PCR was reported at three minutes before induction of anaesthesia, and four hours after the kidney had arrived. In this case, the delay in starting operation was partly due to competing theatre cases in progress. The recollection of the surgeon
was that this case had not been delayed by waiting for report, so we believe a verbal report was received from virology earlier. In this case, the specimen had been sent at 21:14 the previous evening (after the long day virology shift was finished) and was marked as received in the lab at 08:51. Although there was no actual delay in this case, the rapid testing with CEPHEID now available might prevent a delay in transplant in a future case with similar timings.

Transit time from the specimen being collected on the transplant ward and arriving in the virology lab on another hospital site varied from 47-70 minutes (sent directly by taxi in daytime), to 155-240 minutes (sent in regular transport via labs) to 10 hours 47 minutes (sent overnight). The median time from sending sample to receiving laboratory result was 6 hours 35 minutes (IQR 5 hours 13 min to 11 hours 52 min), and range was 2 hours 58 minutes to 21 hours (excluding the 45 hour 48 min result which we think was reported verbally much earlier).

The histograms show times from specimen collection to arrival in lab, and time from arrival to result issue, and include times from a further eleven patients admitted for transplants which did not proceed.

Key lessons for early reporting would be to use direct taxi transport to the virology lab, and to request rapid testing using CEPHEID machine if the patient is admitted in the evening and kidney is likely to arrive in the daytime. There is now an on call rota for the virology labs so 24/7 availability of testing, with rapid testing tending to be used for urgent samples sent at
night. The key is good communication with virologist, particularly around necessary timescales for reporting.

We have also used preoperative CT thorax in most cases, although one proceeded without. In one case there were indeterminate changes (CVCT2) on the CT, so the transplant did not proceed despite the negative PCR (but noting the high false negative rate for PCR in asymptomatic patients). Another transplant did not proceed due to an incidental finding on the CT suspicious for malignancy.

**Transplant operations**

Local infection control policy is to treat all patients as if COVID-19 positive within the theatre suite. This means patients have anaesthetic induction in the operating theatre, with anaesthetist and anaesthetic assistants in level 3 PPE (FFP3 mask, visor, gown), then there is a stand-off period of 20 minutes after intubation before the rest of the theatre team can enter, using standard theatre PPE. The anaesthetic team don PPE in a separate operating theatre re-purposed as a donning station, which adds to the time, particularly if an additional anaesthetist is needed, e.g. for difficult intubation.

Teams in theatre are limited in size, with one scrubbed and one circulating theatre nurse, and the theatre is cleared of unnecessary kit, so obtaining additional equipment takes longer than normal and needs to be taken into account when planning operation.

At the end of the operation, all the team except anaesthetist and anaesthetic assistant leave while the patient is extubated, then a further air change is needed before the patient is moved from the theatre to recovery, which is then followed by a deep clean. The boxplots below show the anaesthetic and operating times for deceased donor transplants since re-opening, compared with the same times from data in the surgical audit for 2017-2019.

![Anaesthetic time](image1)

![Operating time](image2)

There has been large scale redeployment of anaesthetists, anaesthetic nurses and recovery staff to the expanded ICU. This has required restructuring of the anaesthetic rota for main theatres including the emergency theatre. There are still two 24/7 emergency theatres, where most deceased donor transplants take place, but the QEUH is also the main regional vascular centre and a major trauma centre, so there are significant competing pressures in an environment with stressed operating theatre staff. Restarting with transplants likely to be uncomplicated seems sensible until departmental confidence improves.

Implications for the transplant service is that patient turnover is much slower than normal, and there is generally no opportunity to bench the kidney while the recipient is being anaesthetised. When two transplants are done back to back, the benchwork for the second must be done after the deep clean following the first transplant. These necessary additional delays are particularly difficult if ex vivo normothermic perfusion is needed.

**Postop care**

Very few of our transplant recipients go to critical care post-op. On the rare occasions when it has been necessary, they have needed to go to ICU as the general HDU is not plumbed for dialysis. We have avoided accepting kidneys for patients likely to need ICU as the general ICUs are the red COVID-19 units, and the neurosurgical ICU has been repurposed as the general ICU.
The transplant ward is made up entirely of single rooms, and half of the physical ward is a separate haemato-oncology ward. As immunocompromised patients are found in both halves of the ward, the service has been able to avoid medical boarders such as step-down patients being placed in the ward during the pandemic. Post-op transplant patients are usually nursed at the top end of the ward nearest to the nurses’ station, and access surgery patients placed closer to the ward entrance, so ward rounds generally start at the acute transplant end.

The radiology department is spread across two floors, with most diagnostic radiology done on the ground floor, but one of the ultrasound rooms is on the first floor. We were able to negotiate that transplant patients would be scanned on the first floor, separate from other patients needing ultrasound scans. This has only been possible due to deferral of some routine radiology workload and diversion of some to ambulatory care sites. Further documentation of the patient pathway strategy is in the document “COVID patient flow.pdf”.

**Problems**

There is an acute inpatient dialysis area on the transplant ward, used for dialysis of hospital inpatients on non-renal wards, and we had one instance of a newly transplanted patient being dialysed in this area due to staff shortages. We felt this could lead to a high risk of nosocomial COVID-19 transmission so made two changes: firstly, that transplant patients would be dialysed in their own room on the ward, and secondly the acute inpatient dialysis area was relocated to an unused area of the main outpatient dialysis unit (there was fortunately spare physical infrastructure as the new hospital was built with future haemodialysis expansion needs taken into account).

We also found that the nurses from the transplant ward were being asked to contribute to acute dialysis of COVID-19 patients on the ICU. This was an area of additional service as the ICU were finding that CVVH circuits were tending to clot due to hypercoagulability of COVID-19 infected patients, so intermittent haemodialysis unit was increasingly being used for renal support instead. Once this issue had been identified, immediate changes were made so that nurses based on the transplant ward would not be redeployed to help out with dialysis in red areas.

**Nosocomial COVID-19 infection**

We have experienced no COVID-19 infections to date in any patient transplanted this year, and only one PCR-proven infection in one patient transplanted in 2019, although another patient transplanted in late 2019 had symptoms consistent with COVID-19 and an indeterminate CT thorax but negative PCR taken on two occasions. These patients are very likely to have community-acquired COVID-19 given the time since transplant.

We reviewed all renal surgery patients having admissions for emergency (n=44) and elective surgery (n=50) between 1st March and 1st May 2020, and only 2 have tested positive for SARS-CoV-2 in the month since their admission; both positive patients were following prolonged emergency admissions in early March, one with positive PCR 2 days after discharge and the other 11 days after discharge. This suggests nosocomial infection is not occurring in the environment prevalent in NHSGGC with current PPE arrangements between mid-March and early May 2020.

**Post-discharge follow-up**

The acute transplant clinic, attended by a transplant surgeon and a transplant nephrologist, and which follows up patients for the first year after transplant was previously located in clinic corridor in the dialysis unit. Initial plans were for all COVID-19 infected haemodialysis patients to be co-located there, so plans were made to move the transplant clinic to avoid immunosuppressed patients going to the same check in desk and waiting area. The transplant unit was therefore moved to the “Centre for Integrative Care”, a separate unit on a different hospital site normally used for homeopathic and herbal medicine which falls under the same management structure as the renal service. Because the CIC under normal circumstances offers intravenous mistletoe infusions, it was already equipped with suitable facilities for phlebotomy, and the view of the therapeutic garden certainly beats the view of the multi-storey car park at our usual site!

Moving to a different site brought the issue of supply of medications. Different commissioning arrangements in Scotland mean that immunosuppressants, while supervised by the transplant and renal services, are prescribed in primary care and supplied with standard repeat prescriptions in community pharmacies, but when patients are experiencing difficulty in supply, we give top ups from the hospital pharmacy. An arrangement of TTO packages of the common immunosuppressants within the CIC clinic has been made, but the dispensing needs a two person check, which can delay the flow of the clinic if there is neither a pharmacist nor qualified nurse on site.

For acute transplant patients with mild COVID-19, there is an arrangement that they do not come to the CIC clinic until clear, but instead come for bloods to a set aside single patient room at the entrance of the nephrology ward where COVID-19 renal patients are co-horted, then are seen clinically by a nephrologist. So far, only one acute transplant patient, several months from transplant, has tested positive for COVID-19 on PCR, so this arrangement has not been stress tested.

Long-term transplant patients are seen in nephrology clinics in the referring renal units. For Glasgow patients, these clinics are all off the main site and mainly in ambulatory care hospitals, which are cold sites. COVID-19 positive transplant follow-up patients attend for urgent bloods in renal COVID-19 ward in a similar arrangement to the acute transplant patients.