Providing post-lung transplant care during the time of COVID-19

Sara Winward, Iain Lawrie, Susan Talbot Towell, Nina Sheridan and Patricia Ging

ABSTRACT

The COVID-19 pandemic is a public health emergency of international concern. Solid organ transplant recipients have been identified as being at high risk of acquiring the virus SARS-CoV-2 and having a more severe COVID-19 disease. This article describes the experience of the National Lung Transplant Centre in Ireland in changing established care pathways for lung transplant recipients during the pandemic. The innovations which were put in place to protect this clinically vulnerable group are discussed. With the advancement of technology and remote monitoring systems available, patient-focused strategies and community-based interventions were implemented. Additional strategies have been implemented so that the new model of care can be safely maintained.

Key words: COVID-19 ■ Lung transplantation ■ Virtual clinic ■ Immunosuppression ■ Lung transplant specialist nurse ■ Advanced nursing practice ■ Ireland

The novel coronavirus caused by the virus SARS- CoV-2, since named coronavirus disease 2019 (COVID-19) emerged in the Hubei province of China in early December 2019 and spread worldwide. As the number of cases and deaths attributed to this disease increased, COVID-19 was declared a 'public health emergency of international concern' by the World Health Organization (WHO) on 30 January 2020 (WHO, 2021).

As of 14 June 2020, the estimated total global deaths from COVID-19 had surpassed 420 000. As *BJN* went to press, this number had risen to 4 307 242 (Johns Hopkins Coronavirus Resource Center, 2021). Information from international healthcare centres, including the Centers for Disease Control and Prevention (CDC), in the USA, was reviewed to assess the risk to transplant patients of acquiring SARS-CoV-2 and of developing severe disease (CDC, 2021). The CDC, among others, identified those people at a higher risk of severe illness, including older adults, people of any age with serious underlying medical conditions and solid organ transplant recipients. Lung transplant recipients were therefore felt to be at higher risk for acquiring SARS-CoV-2 and having more severe COVID-19 disease (Aslam and Mehra, 2020; Pereira et al, 2020).

Lung transplant recipients in Ireland receive lifelong follow-up at the National Lung Transplant Centre in Dublin. Using a multidisciplinary approach, recipients attend the transplant clinic for surveillance of infectious and non-infectious complications post-transplantation. Typically, following lung transplant surgery, patients are reviewed weekly for 4 weeks, then fortnightly for 6 weeks, monthly for 3 months, then every 3 to 4 months lifelong. As the national centre, recipients travel from all around Ireland to attend the clinic. With an average transplant rate of 35 cases per year, Ireland is currently ranked sixth worldwide for the number of lung transplants performed, with 7.75 transplants per million of population (International Registry in Organ Donation and Transplantation, 2020).

At the time of writing (June 2020), there has been an apparent easing of the pandemic and the number of daily reported cases continues to fall. This is an opportune time to pause and reflect on the changes in work practices that were implemented and to acknowledge the achievements made in the first 6 months of 2020. The authors need to make sense of the local response to the challenges of the pandemic in order to see which new practices need to be 'amplified' and which can be 'let go' (Burbidge, 2020).

In order to structure the reflection, the local response will be considered under the headings: anticipating the threat, active response, recovery and the new normal as described by Holm et al (2020).

Anticipating the threat of COVID-19 at an organisational and clinical level

The Mater hospital had been preparing for the COVID-19 pandemic since December 2019 because it houses the national isolation unit for infectious diseases. This facility is designed to admit, isolate and treat patients suspected or diagnosed with

Sara Winward, Registered Advanced Nurse Practitioner, Post Lung Transplantation, National Lung Transplant Centre, Mater Misericordiae University Hospital, Dublin, Ireland, swinward@mater.ie

Iain Lawrie, Clinical Nurse Specialist, National Lung Transplant Centre, Mater Misericordiae University Hospital, Dublin, Ireland.

Susan Talbot Towell, Clinical Nurse Specialist, National Lung Transplant Centre, Mater Misericordiae University Hospital, Dublin, Ireland

Nina Sheridan, Directorate Nurse Manager, Mater Misericordiae University Hospital, Dublin, Ireland

Patricia Ging, Transplant/Pulmonary Hypertension Pharmacist, National Lung Transplant Centre, Mater Misericordiae University Hospital, and Honorary Clinical Associate Professor, Royal College of Surgeons in Ireland, Dublin, Ireland

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highly infectious diseases, including COVID-19, which are referred from all over Ireland. Education and strategic plans were implemented with the objective of managing this novel virus. The admission process was streamlined, so that patients were rapidly assigned to the COVID-19 pathway or for general hospital admission. Patients who tested positive and required admission were cohorted to a specific clinical area and managed by a specific healthcare team. This reduced the risk of COVID-19-positive patients and health staff being dispersed around the hospital and potentially spreading the virus further.

As the number of COVID-19 cases in the Republic of Ireland increased in early March (European Centre for Disease Prevention and Control 2020), the Health Service Executive (HSE) made the decision to cancel elective, non-essential clinical procedures and cancelled most waiting-list surgery and outpatient appointments. This aimed to eliminate all non-urgent patient contact and ease the burden on healthcare facilities and providers. The decision was therefore made to cancel all lung transplant clinic appointments and patients were asked to follow the HSE guidelines for patients considered highly vulnerable from COVID-19 (Department of Health (DH) and HSE, 2021). The recommendation was for lung transplant recipients to stay at home (to 'cocoon') and avoid physical contact with other people outside of the home environment.

COVID-19 has had an impact on the lung transplant programme, with fewer lung transplants carried out in 2020-2021 compared to the previous years. Ireland's National Centre for Heart and Lung Transplant performed 38 lung transplants in 2019, with an average of 33 transplant procedures performed annually in the past 5 years (Organ Donation Transplant Ireland, 2019). There have been 10 lung transplant procedures performed in 2021 at the time of going to press, due to the impact that COVID-19 has had on donor offers.

Effects on patients

Prior to the COVID-19 pandemic, there were more than 260 lung transplant recipients attending the lung transplant clinic for review. Annually there are usually more than 1800 scheduled and unscheduled clinic visits. A mean of 40 lung transplant recipients were physically reviewed each week in the lung transplant clinic and upwards of 10 phone calls were received daily from patients or their caregivers. Following the recommendation from the DH and HSE for highly vulnerable people to self-isolate, the number of telephone calls to the lung transplant clinic rose threefold; with upwards of 30 calls from concerned lung transplant recipients and their caregivers daily. Principally, the questions were concerned with the signs and symptoms of COVID-19, what to do in the event of presentation of any symptoms and how to apply the information from government to their personal circumstances. Some examples included patients who had arranged holidays wondering whether they could travel, parents asking whether they should take their children out of school and whether they should stop work or work from home.

These queries were dealt with individually by the multidisciplinary team, taking into consideration the patient's circumstances and medical history. In response to this increase in queries, a text message was sent to each patient to offer support and with advice to follow the DH and HSE guidelines. In addition, information and support was posted on an affiliated Irish transplant website with advice on when and how to contact the transplant service.

Active response to the COVID-19 pandemic

A study of COVID-19 deaths and hospitalisations in mainland China reported an increased risk of poor outcomes for patients once they reach middle age. The analysis found that mortality rose sharply with increasing age (Verity et al, 2020). Lung transplantation is an established treatment option for selected patients with advanced lung disease, despite optimal surgical and medical therapies. However, due to the shortage of donor organs available, careful consideration is given to the risks and benefits of transplantation for each individual patient (Weill, 2018). Patient selection criteria is a multifaceted and complicated decision-making process. Patients are selected for lung transplantation only if they are likely to sustain a survival or quality-of-life benefit from the procedure (Weill et al, 2020).

In this centre, patients are also considered for transplantation based on 'physiological' age rather than chronological age. A potential lung transplant candidate's age, although not the only consideration, is not a barrier for selection in this centre. The authors' hospital's lung transplant group is therefore particularly enriched with older patients who have numerous comorbidities. Many have a higher cardiac risk, are former smokers, and are more at risk from lung cancer and venous thromboembolism. Transplant recipients over the age of 65 years account for 18.8% of all patients transplanted in this centre.

Changes to patient management

Given the complexity of this patient group, a key role of the registered advanced nurse practitioner (ANP) is the co-ordination of care in collaboration with the multidisciplinary team. This includes organising both scheduled and unscheduled access to the transplant clinic for pulmonary and non-pulmonary conditions. Based on the DH and HSE guidance and recommendations for protecting persons considered extremely medically vulnerable to COVID-19 infection, and guided by research studies, a standardised collaborative approach was established (Sidhu et al, 2019; Lesko et al, 2020; DH and HSE, 2021). The transplant consultant and the transplant clinic specialist nurses identified which patients could be reviewed by telephone consultation and managed at home and which patients required face-to-face clinical review. Patients eligible for telephone consultation were 6 months or longer post-lung transplant and lived outside the Dublin area. These patients were in possession of a handheld home spirometer, pulse oximeter, a digital thermometer and home blood pressure monitor. Their GP also had blood results from samples taken in the previous 2 weeks. Exclusion criteria included patients who required specialised tests available only in the hospital, for example radiological tests, patients who requested in-person review or patients whom the medical team felt should be reviewed in person due to specific health concerns. This included patients with test evidence of an acute decline in pulmonary function,

with a decline in forced expiratory volume in the first second (FEV1) of 10% or greater, recorded on home spirometry.

Following HSE guidelines for the management of virtual outpatient clinics, the consultation outcome was recorded in the medical notes, a letter was forwarded to the GP and a follow-up appointment was scheduled (HSE, 2020).

The clinic schedule was reviewed in advance to determine who was attending. Each patient was assessed individually to determine if their case required a physical or telephone consultation, with the aim of avoiding non-emergency clinic appointments for patients who were clinically stable. Face-to-face appointments were prioritised for patients with urgent medical conditions and those who had been recipients of a lung transplant within the preceding 6 months. Before their appointment, each patient was contacted by a lung transplant specialist nurse and asked questions about their health, including specific respiratory health questions. A checklist was put in place for key questions around symptoms to assess the likelihood of COVID-19. This checklist was completed by each patient in advance of their visit to the clinic. Patients were advised to follow HSE guidelines in relation to symptom identification and contact their GP if they had symptoms or the emergency services if the GP could not be reached.

One specific challenge that the authors' team encountered were the differences in control measures taken in different countries. The Irish Government slogan '#stay at home, #stay safe' was remarkably effective and the rate of detection of COVID-19 in the lung transplant population was 8 out of 266 patients. By June 2020 the first wave of COVID-19 had abated, with national hospital inpatient numbers reduced by 85% and numbers in intensive care reduced by 76% compared to April. (Health Protection Surveillance Centre, 2020). Other countries have taken different approaches to COVID-19 travel restrictions, physical distancing and testing. These received extensive coverage in the media and were somewhat confusing for patients.

Changes to the working environment

The authors' lung transplant centre used several strategies to meet the recommended Irish control guidelines within the working environment. At an organisational level, meetings, including internal office meetings, were held using teleconferencing software to ensure compliance with Irish physical distancing requirements. Specialist nurses in the transplant clinic reorganised their working week to work longer hours in a 4-day week to improve physical distancing. There were considerable enhancements in the practice of infection control and the importance of physical distancing was emphasised. Work and rest breaks were staggered. Education and training were provided on the correct use of personal protective equipment and the correct procedure for hand hygiene. All staff were instructed to clean and disinfect their work area at the start and end of each shift. A local protocol was put in place in the event of an employee becoming unwell with suspected COVID-19 and included any contacts being sent home to self-isolate.

In the clinical workplace, the lung transplant nursing workforce were required to be flexible and responsive to service pressures within the wider hospital. Transplant clinic staff were trained in invasive and non-invasive ventilator management. The workforce in the ward area was reduced owing to health professionals being exposed to patients with COVID-19 and then being sent home to self-isolate. This required the ANP taking on a greater organisational role in the ward in overseeing patient care. This included managing admissions and discharges to the inpatient transplant ward.

Patient education

Patients were empowered to share the responsibility for their health and develop confidence to engage in self-care practices. As all aerosol-producing procedures such as pulmonary function tests were cancelled, all patients were instead provided with a handheld home spirometry device to monitor their respiratory status at home. Patients received education about the correct use of the spirometry device and how to interpret the readings. All patients were advised to contact the transplant clinic if the readings were consistently 10% below their usual baseline for more than 3 days. During the telephone clinic, patients were asked for their spirometry readings to identify any significant decline in respiratory status and to compare these to formal pulmonary functions tests performed in hospital. The measurements of home and hospital spirometry showed good agreement, with the FEV1 $\pm$ 3% of the baseline recorded in the pulmonary function laboratory. At the time of writing, there has been no observed significant decline in home spirometry readings.

In addition, patients were advised to record their blood pressure, pulse oximetry and digital thermometer readings daily. The main difficulty in interpreting readings was the accuracy of the device and whether it was used according to instructions. A range of parameters were given, and patients were advised to contact their GP or the specialist nurses in the transplant clinic to report any abnormal readings. During a routine consultation, one patient reported a significantly low oxygen saturation reading while exercising, which she had not reported contemporaneously. Further questioning ascertained that the patient was concerned that she would need to be admitted and she did not want to be a burden to the health service. To address this barrier, all patients then attending the transplant clinic (n=266) were contacted by the lung transplant specialist nurses, either by text or telephone, to provide reassurance that the transplant team were there to support them and to contact the transplant clinic directly with any questions or concerns.

Funding for the spirometry equipment was provided by the HSE for those patients who hold a 'medical card'. Eligibility for a medical card is assessed on income. For those patients not eligible for a medical card, the equipment, including the home blood pressure monitor, pulse oximeter and digital thermometer, was self-funded or funded using charitable donations from the Irish Heart and Lung Transplant Association and Cystic Fibrosis Ireland.

Medication

Lung transplant recipients follow a complicated medical regimen that requires a dedicated multidisciplinary team support system to manage and monitor drug levels and observe for any unwanted side effects (Snell et al, 2014; McDermott and Girgis, 2018).

A complex medical management approach must therefore be considered to avoid adverse events. This includes frequent blood tests to monitor renal function, immunosuppression drug levels and observe for cytopenia. To minimise unnecessary hospital visits, patients who required domiciliary visits for blood testing were identified. Primary care teams including GPs, public health nurses and the community intervention team were arranged to provide a blood test service in the patients' own homes. Specific instructions for blood tests were provided, including information on drug level monitoring and contact details for the lung transplant clinic. The results were subsequently reviewed by the ANP or, in her absence, a member of the lung transplant medical team. The main difficulty experienced was the retrieval of the results in a timely manner. Obtaining results took approximately 4-5 days when bloods were taken by the community team as opposed to 1-2 days if taken by the hospital phlebotomy department.

Prescriptions

The ANP is a registered nurse prescriber. This prescribing ability was very beneficial due to the redeployment of a number of the medical prescribers to the COVID-19 service. Patients were advised to have a 1-month stock of medication, including immunosuppression medication, available at any time but to avoid stockpiling. To help avoid any delay in obtaining long-term medications, the Irish Government brought in legislation to facilitate the electronic transfer of prescriptions and extend the validity of a prescription from 6 months to 9 months. Under a statutory instrument signed by the Minister for Health, The Medicinal Products (Prescriptions and Control of Supply Amendment) Regulations 2020 (Government of Ireland, 2020), was passed, allowing for the electronic transfer of prescriptions to a pharmacy via the HSE Healthmail system. This further reduced the pressure on the transplant team.

Medications

The majority of frequently occurring medical complications following lung transplantation are related to the lifelong immunosuppressive therapy and the multiple concomitant drugs, resulting in long-term polypharmacy, with the potential for adverse effects and drug interactions (Bhorade and Stern, 2009; Snell et al, 2014). One of the most common interactions seen is with the frequently prescribed antimicrobial clarithromycin. This results in a significant elevation in the drug levels of the immunosuppressants tacrolimus or ciclosporin as clarithromycin inhibits the hepatic enzyme cytochrome P450 3A4 through which tacrolimus and ciclosporin are metabolised. This interaction can result in acute kidney injury requiring hospitalisation. Further examples of interacting medications are non-steroidal anti-inflammatory drugs (NSAIDs), such as ibuprofen or 'azole' anti-fungal agents.

The cancellation of clinics raised a number of issues in the management of lung transplant patient medications. There was a concern from the lung transplant clinic staff that patients were afraid to contact the transplant clinic if they become unwell or to attend the clinic in the hospital due to the fear of becoming infected with COVID-19. This concern was confirmed following a telephone conversation with a patient with respiratory symptoms who had delayed contacting the clinic because of concerns about requiring admission to hospital. It was noted that patients were directly contacting their GP, rather than the transplant service. During post-transplant education patients are instructed to advise the clinic of any new medications prescribed so that a suitability check can be performed. Patients assumed the transplant service would be too busy to interact with them. Unfortunately, this led to patients taking contraindicated medications. One example of this was a patient who took the NSAID ibuprofen for lower back pain on the advice of his GP. This resulted in a 3-day admission to the transplant unit to treat an acute kidney injury.

Recovery phase

At the time of writing, in June 2020, the number of daily reported positive cases of COVID-19 are falling in Ireland and attention has turned to look at the impact of lockdown measures on non-COVID-19 related illnesses in the lung transplant population. The impact of the lockdown was that non-urgent, routine follow-up care was postponed and the most essential care, including treating patients with severe COVID-19 symptoms, was prioritised. As the level of COVID-19 infections begins to stabilise in the community, there is an impetus to reschedule appointments, surgeries and procedures that were deferred during the pandemic. The full impact of this delay in the presentation and screening of symptoms will not be apparent for some time and is of concern in this population, who are at high risk for malignancy.

The 'new normal'

As elective procedures and outpatient departments begin to resume, consideration must be given to safely managing patient flow within the department and protecting patients and healthcare providers in the clinical area due to the fear of a second wave of COVID-19 coinciding with the influenza season. It is likely that many current measures will need to continue; hence a new normal may have to be established for managing the transplant clinic. This may present an opportunity to further explore and utilise interactive technologies such as virtual clinics and telemedicine.

To minimise the spread of COVID-19, the centre's team have had to rethink and rework how health care is delivered to patients. There is a need to reduce the number of patients attending at any one time. There will need to be consideration of the methods used in clinic delivery, to accommodate the continued volume of patients requiring review. Patients will continue to be screened by telephone for symptoms of COVID-19 in advance of attendance. Symptomatic patients presenting with a cough, fever or shortness of breath are advised to self-isolate, contact their GP immediately to discuss the symptoms and the potential need for COVID-19 testing. The rules of physical distancing require the continuation of staggered appointments and the reconfiguration of the clinic's seating area to avoid overcrowding. The capacity and the number of patients seen in any one transplant clinic will necessarily be reduced due to these essential infection control and physical distancing measures required.

KEY POINTS

- Lung transplant recipients are at high risk of acquiring the virus SARS-CoV-2 and developing severe COVID-19 disease
- The national Irish lung transplant centre had to reorganise patient care for lung transplant recipients during the COVID-19 pandemic, including use of telephone clinics and home spirometry and blood testing
- The role of the advanced nurse practitioner was vital in coordinating post-lung transplant patient care during the pandemic

CPD reflective questions

- What have been the key challenges in your nursing practice during the COVID-19 pandemic?
- Think about how you responded to these challenges
- Which changes in practice will you try to sustain in the 'new normal' phase?

There has been positive feedback from patients regarding the use of scheduled telephone review in preference to attending the transplant clinic, which may require a lengthy car journey and a potential wait for review. The implementation of remote patient monitoring technology with the use of telephone and video consultations, home spirometry and home blood testing will provide a platform to allow safe monitoring of many patients. These strategies will become increasingly important as the team looks to provide safeguards to protect patients and health staff from being exposed to COVID-19.

The changes that have been made in response to the pandemic such as the implementation of domiciliary venepuncture and home spirometry were a great success. They are making a positive contribution to healthcare provision with the reduction in the number of patients attending the transplant clinic, and reducing the duration of time spent in the hospital. New communication skills have been developed by the team with the use of virtual consultations and these look set to be a part of the team's ongoing healthcare practice. One of the main learning points from reviewing the experience of the COVID-19 surge was that patients were fearful of contacting the transplant unit in case they were a burden or were asked to come into the hospital for review. The team will be more proactive in providing information and education to patients in future to ensure that they understand that the transplant team continues to be available to answer their queries or concerns.

Considerations for future

The transplant team has recently recruited a nurse to co-ordinate the implementation and utilisation of a mobile application (app) for lung transplant recipients. The mobile app will have the capability to track patient-reported outcomes, blood pressure, pulse oximetry and pulmonary function tests. Clinical staff will review laboratory and patient-centred data in real time through a monitoring portal. With the use of this app, patients requiring urgent intervention can be identified earlier than the current standard of care, with capacity made available for deferring appointments for more stable patients. This app will allow stable lung transplant recipients to undergo remote monitoring from home supported by the transplant team. **BJN**

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