Recommendations for Minimising the Risk of Transmission of SARS-CoV-2 (COVID-19) in UK Adult Haemodialysis Units

KQuIP COVID-19 HD Ensuring Patient Safety Work Stream

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This document is the expert opinion of a team of multi-professional clinicians and patients, based on the reported experiences and views of various renal units across the UK as well as published studies and guidance where possible.

KQuIP welcomes feedback on the content of this recommendation. If you wish to provide feedback or contribute to the next version of this document, please email rosie.donne@nca.nhs.uk.

Please refer to the most recent version on the UKKA website. For current government guidance on COVID-19, visit https://www.gov.uk/coronavirus. The devolved nations should consult their nation's public health website as advice may be different.

Recommendations for Minimising the Risk of Transmission of SARS-CoV-2 (COVID-19) in UK Adult Haemodialysis Units

Aim - to provide practical advice to minimise the risk of COVID-19 transmission within both in-centre and satellite adult haemodialysis units according to current knowledge and experience.

What is new in version 4

1. Infographics to illustrate key points, link to printable format (page 7)

2. COVID-19 haemodialysis unit risk assessment tool (page 9)

3. Hierarchy of controls for haemodialysis settings (page 11)

4. Vaccination – we suggest that dialysis units work closely with their hospital and local vaccination hubs to facilitate 3rd or booster doses of an mRNA COVID-19 vaccine according to UKKA and JCVI guidance (page 12).

5. Antivirals (page 15) – patients receiving haemodialysis who have a positive SARS-CoV-2 PCR test and are not in hospital are eligible for new COVID-19 treatments (oral antivirals and intravenous monoclonal antibodies). These are prescribed via local COVID-19 Medicine Delivery Units (CMDUs). Treatment and delivery pathways for haemodialysis patients are currently evolving and updated renal guidance will be on the UKKA website.

6. Testing of asymptomatic patients – we suggest that dialysis units perform SARS-CoV-2 PCR tests once a week when community COVID-19 infection rates are high or rising, especially during winter months (page 13)

7. Step-down of transmission-based precautions (TBPs) (page 16) – after 10 days instead of 14 without the need for a negative swab, providing the patient is apyrexial and asymptomatic apart from persistent cough; immunosuppressed patients should have 1 negative swab. **The COVID-19 isolation rules for the general UK population allow a shorter isolation period following 2 negative lateral flow tests, but we recommend maintaining the 10-day isolation period for dialysis treatment given the vulnerability of our patient population.**

8. Ventilation (page 18) – we suggest that dialysis units optimise fresh air ventilation where possible. As all inside spaces have unique ventilation challenges, it may be helpful to request an assessment of ventilation by the local estates department for advice on how it can be optimised.

9. PPE (page 21) – we suggest that dialysis units refer to the hierarchy of controls and perform a local risk assessment. We suggest the use of FFP3 masks for staff caring for COVID-19 positive patients if the risk of transmission remains unacceptably high.

Contents

Summary of Recommendations

General

- Patients receiving haemodialysis treatment are extremely vulnerable to severe COVID-19 illness and transmission may occur in UK dialysis units.
- COVID-19 is highly infectious and asymptomatic carriage may still occur despite vaccination.
- As new COVID-19 variants emerge, patients may require further boosters or newer modified vaccine. Guidance on this will be updated on the UKKA website.
- Stringent infection prevention and control (IPC) remains a high priority.
- We suggest that a COVID-19 risk assessment in the context of the hierarchy of controls is undertaken at least quarterly to identify areas for improvement.
- We suggest that dialysis care is configured to optimise patient flow and maintain social distancing including during transport, in waiting areas and throughout dialysis.
- We suggest that social distancing between staff is maintained in clinical and non-clinical areas wherever possible.
- We suggest that hand hygiene facilities and face masks are available at entry and exit to the dialysis unit.
- We suggest that ventilation is optimised following discussion with the local estates department, maximising intake of fresh air wherever possible whilst maintaining thermal comfort.

Vaccination

- Vaccination offers the most effective protection against COVID-19 infection.
- Patients and staff should be encouraged to receive vaccination against COVID-19 including any additional and booster doses recommended to achieve maximum protection.
- Patients should be aware that vaccination of household contacts provides additional protection.
- People who are severely immunosuppressed may achieve suboptimal benefit from the COVID-19 vaccine and evidence on optimal strategies is still emerging.

Treatment for non-hospitalised patients with a positive SARS-CoV-2 PCR test

- Patients who have a positive SARS-CoV-2 PCR test and are not in hospital are eligible for COVID-19 treatments (intravenous monoclonal antibodies and oral antivirals). These are prescribed via local COVID-19 Medicine Delivery Units (CMDUs). Treatment and delivery pathways for haemodialysis patients are currently evolving.

Triage and SARS-CoV-2 testing

- We suggest that dialysis units have defined protocols for symptoms screening, testing of symptomatic patients, testing of asymptomatic patients and follow-up of results.

- We suggest that dialysis units have a defined protocol for isolating or cohorting patients who are a "close contact" or have COVID-19 symptoms or a positive test.

- We suggest that dialysis units keep a central record of where and when each patient dialysed, whether they used a shared waiting room or shared transport, as this information may be needed for identification of close contacts.

- If a patient has a positive SARS-CoV-2 test, then all patients who may have been within less than 2m distance during dialysis or in a waiting area or transport are defined as "close contacts". They should be dialysed in isolation or cohorted.

- We suggest that screening SARS-CoV-2 tests are performed weekly in areas of high or rising prevalence to identify asymptomatic COVID-19 positive patients, especially during winter months. They should not be performed in asymptomatic patients who are in the first 90 days following recovery from COVID-19 infection as they are likely to be misleading.

- We suggest that staff perform a lateral flow test (LFT) twice weekly.

Duration of Transmission Based Precautions

- We suggest that step-down of transmission-based precautions (TBPs) for most outpatients can occur at 10 days after the first positive SARS-CoV-2 test providing there has been resolution of fever and symptoms except persistent cough. There is no need for further testing unless the patient is immunosuppressed.

- **The COVID-19 isolation rules for the general UK population allow a shorter isolation period following 2 negative lateral flow tests, but we recommend maintaining the 10-day isolation period for dialysis treatment given the vulnerability of our patient population.**

- For immunosuppressed patients, step-down of TBPs may occur following one negative SARS-CoV-2 PCR test. Discussion with a virologist may be required if the patient's results or clinical course are difficult to interpret.

- If a patient is on the active kidney transplant waiting list and has a positive SARS-CoV-2 test, NHS Blood and Transplant should be informed. The patient should be placed in the suspended category for between 4-7 weeks depending on severity of illness and urgency of transplant. A medical review should be performed before re-activation.

Personal Protective Equipment (PPE)

- We suggest that patients wear fluid resistant surgical masks during dialysis, for travel and in waiting areas where this does not compromise clinical outcomes.

- We suggest that staff wear a fluid resistant surgical mask (type IIR) throughout the working day within clinical and non-clinical areas (see below).

- We suggest that clinical staff wear a long-sleeved apron, eye, and face protection where there is a risk of splashing of blood or bodily fluids (e.g. connection and disconnection of vascular access).

- We suggest that staff consider wearing an FFP3 mask or similar in the following situations:
    - Staff caring for patients with confirmed / suspected COVID-19 infection where a local risk assessment suggests an unacceptable risk of transmission remains.
    - During aerosol generating procedures for patients with confirmed or suspected COVID-19 infection
    - During cardiopulmonary resuscitation.

Figure 1 – Infographic of essential steps to keep patients safe from COVID-19 in haemodialysis units

A printable version of this poster can be found here.

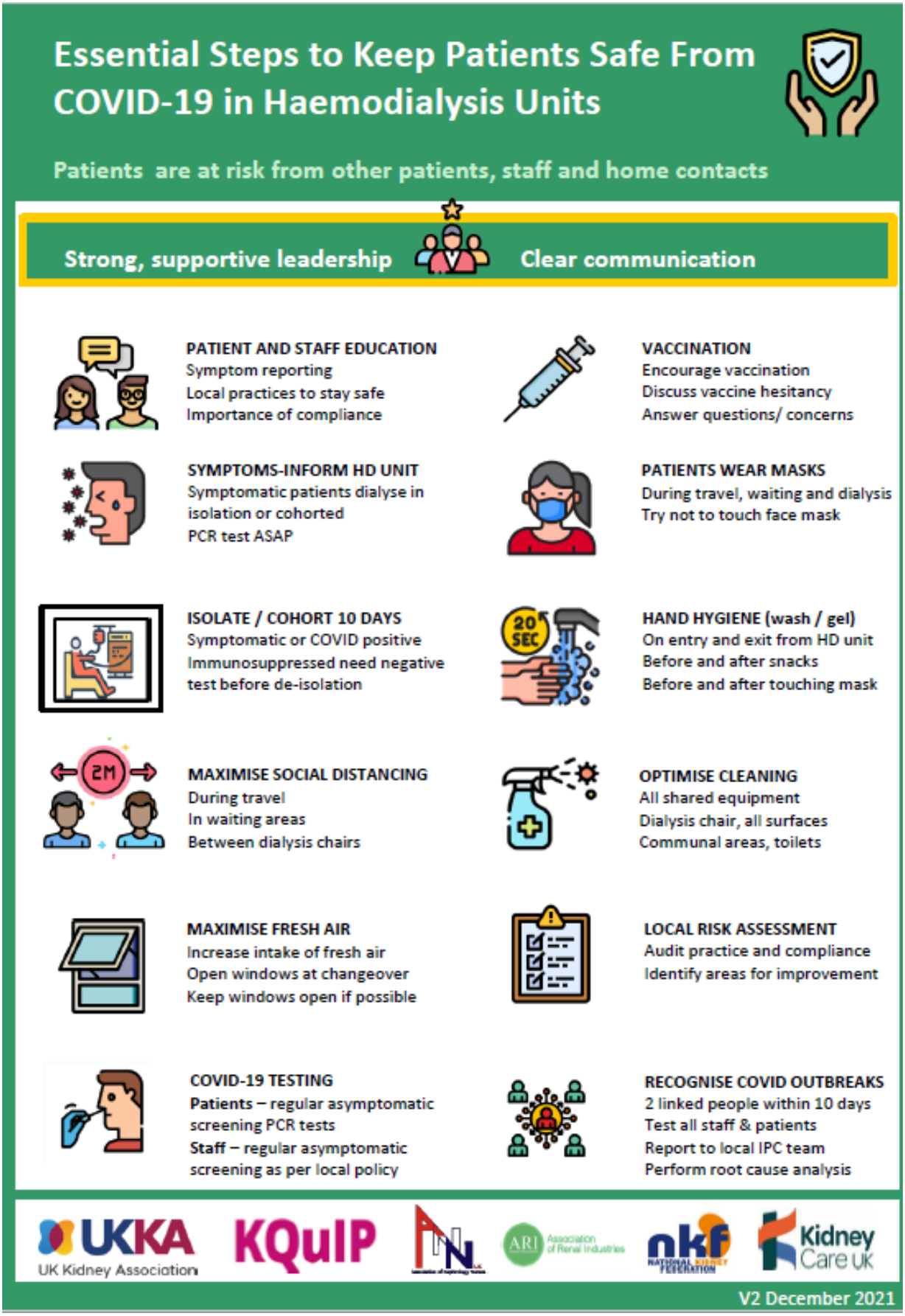


Figure 2 – Infographic of essential steps to keep staff safe from COVID-19 in haemodialysis units

A printable version of this poster can be found here

Figure 3 – Flowchart for care of COVID-19 Positive and Symptomatic Haemodialysis Patients

A printable version of this poster can be found here

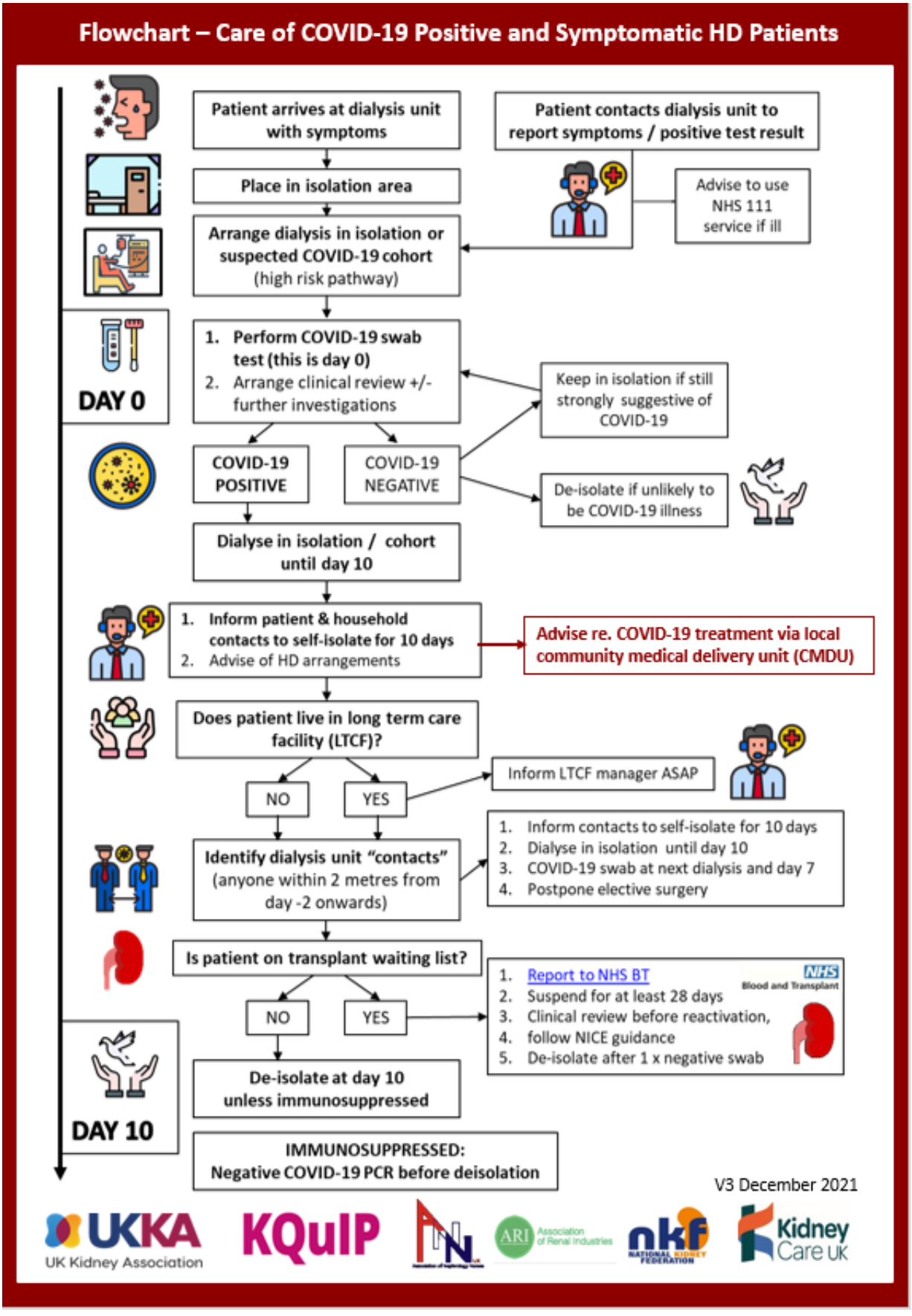


Table 1 - Haemodialysis unit COVID-19 risk assessment tool

No.	Question	Yes	No
1	**Patient education -** do patients know what actions they should take to keep safe from COVID-19, including new patients starting dialysis?		
2	**Staff education -** have all staff been trained on their individual role in protecting staff and patients from COVID-19?		
3	**Vaccination –** what % of patients up to date with COVID-19 vaccine including any recommended additional or booster doses?	%	
5	**Vaccination –** have you provided education for patients who are vaccine hesitant?		
5	**Triage -** do staff screen patients for symptoms and temperature before entry to waiting area?		
6	**Hand hygiene** - are facilities in place before entry to the waiting area/dialysis unit?		
7	**Hand hygiene** - do you regularly audit patient compliance with hand hygiene?		
8	**Hand hygiene** - do you regularly audit staff compliance with hand hygiene?		
9	**Waiting area -** do you have visual prompts for social distancing?		
10	**Waiting area -** are all the chairs at least 2 metres apart?		
11	**Waiting area -** do you regularly audit compliance with social distancing?		
12	**Waiting area** - are chairs cleaned after each use?		
13	**Cleaning -** do you perform regular audits of cleaning practices in the dialysis unit and waiting area?		
14	**Dialysis stations/chairs** - are they separated by at least 2 metres or if not, are screens in place between?		
15	**Staff social distancing** - do you audit staff social distancing including in staff rooms & workstations?		
16	**Ventilation** - have you had an assessment of your ventilation and implemented any suggested improvements including maximising intake of fresh air?		
17	**Patient masks** - do all patients and staff wear fluid repellent/surgical face masks throughout the dialysis process? (exception is when eating and drinking but >2 metres away from others)		
18	**Isolation** - do you isolate confirmed, suspected and "close contacts" in separate groups and away from all other patients?		
19	**COVID-19 PCR testing** – can you test symptomatic patients with results back within 24 hours?		
20	**COVID-19 PCR testing** – do you perform weekly tests on asymptomatic patients?		

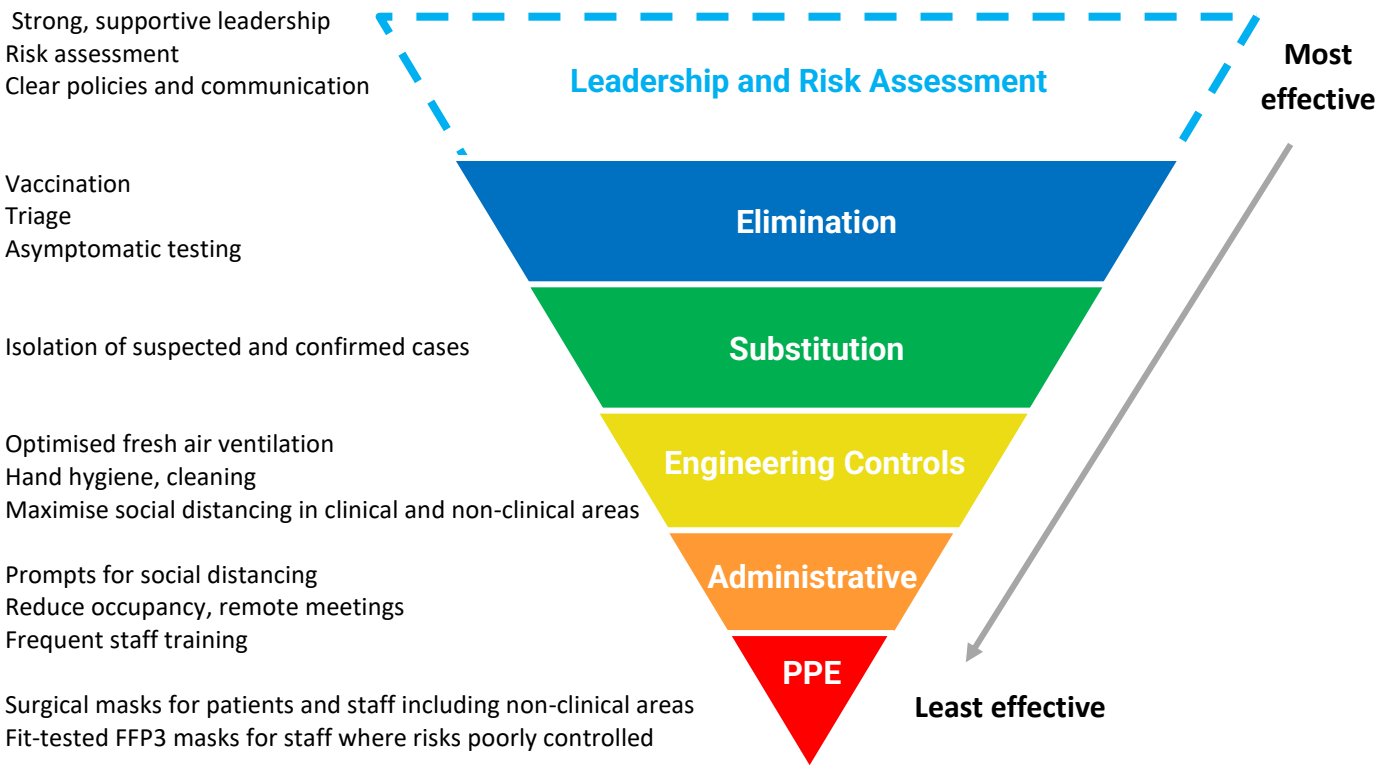
Introduction and hierarchy of controls

People receiving haemodialysis for end stage kidney disease are classified as clinically extremely vulnerable to severe illness from COVID-19. Vaccination offers a high level of protection against severe disease for most patients and staff, but some remain at risk because of suboptimal response, especially in the context of immunosuppression [1,2]. New COVID-19 variants of concern may challenge the level of protection afforded by current vaccines [3]. Dialysis settings remain high risk areas for transmission of COVID-19 due to high patient numbers and difficulties with social distancing. The KQuIP COVID-19 HD Ensuring Patient Safety group has gathered information and advice from renal healthcare professionals, IPC teams, expert patients, public health medicine, published literature and relevant websites in compiling these recommendations. Poulikakos et al. describe the implementation of all the UKKA recommended COVID-19 haemodialysis unit IPC strategies from June to December 2020 before the UK vaccination programme started, using a quality improvement approach. This successfully prevented transmission of COVID-19 in 5 urban dialysis units despite high community prevalence. Mortality rates were the lowest in region and low compared with the national average [4].

The UK Health Security Agency (UKHSA) document Infection prevention and control for seasonal respiratory infections in health and care settings (including SARS-CoV-2) for winter 2021 to 2022 [5] refers to the hierarchy of controls to mitigate the risks of transmission of COVID-19 and other respiratory viruses.

We suggest that dialysis units refer to the hierarchy of controls for a dialysis setting (see figure 4) when considering how the risk of transmission can be mitigated (adapted from Deziel et al. 2020) [6].

Figure 4 – Hierarchy of controls for dialysis settings



Recommendations

We suggest that dialysis units take the following actions to minimise the risk of transmission of COVID-19 in haemodialysis units:

1. Leadership and Risk Assessment

Strong, compassionate leadership with consistent messaging is key to ensuring safe patient care and a resilient workforce. We suggest the following measures:

- Staff are updated on current IPC policies and their individual role in protecting themselves and others from COVID-19 including hand hygiene, safe use of PPE, ongoing training, fitness to work and how to report absence.
- Staff have individual COVID-19 risk assessments to guide working practices.
- Staff have individual wellbeing assessments and access to support where needed.
- Patients are updated on IPC practices in place throughout the dialysis pathway and their individual role in protecting themselves and others from COVID-19 infection. Information should be accessible in a variety of forms and languages.
- Staff direct patients to current information on Coronavirus on the Kidney Care UK website.
- Staff use the RA COVID-19 risk stratification resources to inform discussion with patients about the risks associated with various activities.
- **Dialysis units perform a COVID-19 risk assessment at least quarterly focusing on the hierarchy of controls in the workplace, to identify areas for improvement.**

2. COVID-19 Vaccination

We recommend that patients receiving dialysis receive a primary course of COVID-19 vaccine and any additional or booster doses according to current Joint Committee on Vaccination and Immunisation (JCVI) and UKKA guidance. We suggest the following additional measures:

- Patients who have received significant immunosuppression within the last 6 months (see appendix 3) or during their primary vaccination course receive a third primary dose of an mRNA vaccine and recommended booster doses. The UKKA recommendations on COVID-19 vaccines can be found here [8].
- Dialysis units maintain records of COVID-19 vaccination history to identify patients requiring additional doses and those who have not yet received a primary course.
- Dialysis units address vaccine hesitancy by regular discussion and signposting patients to reliable sources of information. The Kidney Care UK website provides up to date information for patients about COVID-19 and vaccination [9]. Patient information on the UKKA website can be found here. The "Green Book" information on COVID-19 vaccination can be found here [10].

- We recommend that healthcare workers are offered a primary course and booster of the COVID-19 vaccine according to JCVI guidelines.

Rationale: Several studies have shown high efficacy of the COVID-19 vaccine in patients receiving haemodialysis, with up to 95% of patients showing detectable antibodies after 2 doses [1,2]. Carr et al. reported that the mRNA vaccine BNT162b2 (Pfizer-BioNTech) induced comparable antibody titres in haemodialysis patients compared with healthy controls [11]. However, the adenoviral-vectored vaccine AZD1222 (Oxford-AstraZeneca) induced suboptimal antibody titres against all variants of concern, including the delta variant. Kidney transplant recipients have diminished humoral and cellular immune responses to both vector and mRNA vaccines [12,13]. The optimal vaccination strategy for patients receiving haemodialysis is not yet known, especially for those with a current or recent history of immunosuppression. Emerging evidence suggests that patients receiving dialysis and kidney transplant recipients are likely to benefit from a third primary dose of an mRNA vaccine [14].

3. Triage

We recommend that dialysis units triage all patients before entry to identify those with symptoms, a fever, a recent positive test, or close contact with an individual with COVID-19 infection.

The symptoms screening checklist in Appendix 1 can be used to ensure completeness and to use the opportunity to reinforce the "hands, face, space" message.

We recommend that patients are advised to report in advance if they have symptoms or are a close contact of an individual with COVID-19 infection so they can be isolated appropriately.

4. SARS-CoV-2 (COVID-19) testing

We suggest that each dialysis unit has a clear policy on requirements for SARS-CoV-2 testing, follow-up of positive results and actions to be taken.

We suggest that SARS-CoV-2 (COVID-19) tests should be performed in the following situations:

- Suspected SARS-CoV-2 infection
    - patients with COVID-19 symptoms (may be atypical)
    - patients with a positive SARS-CoV-2 lateral flow test result
    - patients who are a "close contact" of a person with COVID-19 infection or symptoms
- On discharge from a hospital admission
- New patients starting dialysis
- Patients moving to a different dialysis unit
- Surveillance testing asymptomatic patients (see below)

Surveillance testing of asymptomatic patients in haemodialysis units

- We suggest that dialysis units perform weekly surveillance SARS-CoV-2 tests where community infection rates are high or rapidly rising, especially during winter months when transmission risks are higher. Testing should occur in collaboration with local COVID-19 laboratory services to ensure rapid turnaround of results.

- Dialysis units in areas with lower levels of infection may also wish to perform surveillance COVID-19 swabs given the risk of asymptomatic infection.

Rationale: Asymptomatic COVID-19 infection is common in patients receiving haemodialysis [4,15,16], which is an ongoing risk for transmission and persists despite vaccination. Dialysis units employing surveillance testing as part of a package of IPC measures report complete prevention of COVID-19 outbreaks and low COVID-19 mortality compared with regional and national data [4]. A KQuIP survey in August 2021 showed that 65% of UK renal units were performing regular surveillance testing of asymptomatic patients [17]. The benefits of asymptomatic testing are likely to be greatest where community prevalence is high or other controls such as fresh air ventilation are compromised.

Surveillance testing of asymptomatic staff

- Dialysis units should encourage regular asymptomatic testing for staff to minimise the risk of asymptomatic transmission, e.g. by twice weekly home COVID-19 lateral flow testing.

- Dialysis units should have a clear policy regarding fitness to work for staff who are fully vaccinated but are a close contact of a person with COVID-19 infection. Policy should be guided by a local risk assessment balancing the risks of transmission with the risk and implications of staff shortages.

5. Actions to be taken for patients with suspected or confirmed COVID-19 infection

We suggest that the following actions are taken without delay for patients with suspected or confirmed COVID-19:

1. Arrange dialysis in isolation (see section 5).
2. Inform the patient and advise that household contacts should self-isolate according to current government policy.
3. If the patient lives in a care home or similar, contact the manager without delay.
4. Arrange frequent medical assessment to monitor clinical progress.
5. Refer to current NICE guidance on monitoring and treatment for COVID-19.
6. Identify and inform any "close contacts" in the dialysis unit and arrange their PCR tests.
7. Inform the patient that they should be contacted separately about antiviral treatments (see below).
8. **For patients on the transplant waiting list:**
    a. Report to Organ Donation and Transplant [18] by using the downloadable forms.
    b. Place in the suspended category of the transplant list for at least 4 weeks but preferably 7 weeks in symptomatic patients.

c. The timing of reactivation should be based on an individual risk assessment of the patient, weighing up the severity of COVID-19 illness with the urgency of transplant. Consult NICE guidance[19] for further information on reactivation.

Antivirals for non-hospitalised patients

Patients with a positive SARS-CoV-2 PCR test who are at home should be contacted by their local COVID-19 Medicine Delivery Unit (CMDU) to arrange antiviral treatments including intravenous monoclonal antibodies and oral antivirals. Treatments are recommended to be given as soon as possible for maximal benefit. Information about COVID-19 community treatments and NHS referral pathways is found here.

Most patients should receive a letter via NHS England during December 2021 – January 2022 informing them of new treatments and that they will be automatically contacted by a CMDU in the event of a positive PCR test.

Treatment delivery pathways for haemodialysis patients are currently evolving. Updated guidance on the UKKA website is found here.

Actions to be taken if there is an outbreak of COVID-19 infection in a dialysis unit:

An outbreak is defined as 2 or more patients with a positive SARS-CoV-2 (COVID-19) test linked in time and place during a 10-day period. If the patients have not been within 2 metres distance at any time, this may represent a community-based cluster and advice should be sought from infection control on whether this represents an outbreak.

1. Perform SARS-CoV-2 PCR test on all patients on the same shift as the index cases and repeat after 7 and 10 days.
2. Perform root cause analysis to identify modifiable risk factors which may have contributed to transmission.
3. Seek advice from local infection control and public health teams.
4. Depending on the extent of the outbreak, consider whether patients on other shifts and staff should also be tested.
5. Use the COVID-19 risk assessment at the front of this document to highlight modifiable risk areas.

6. Isolation and cohorting

We suggest that dialysis units have an agreed policy for isolation in a side room or cohorting of patients with suspected or confirmed COVID-19 to minimise the risk of transmission to other patients. The policy should define dialysis arrangements for the following patient groups:

	Patient Group	Dialysis arrangement
A	Positive SARS-CoV-2 test	Isolate or cohort for at least 10 days (see below).
B	Suspected COVID-19 (symptomatic, awaiting PCR result)	Isolate (not cohorted) until PCR result
C	Asymptomatic "close contact" of a positive case	Isolate for 10 days from start of contact (not cohorted) If become COVID positive, restart 10 days isolation.
D	Patients not in the above groups	Usual dialysis

- We suggest that patient groups are separated from each other as much as possible, either by physical location or by use of shifts. If separated by shifts, make group A the last shift of the day.

- We suggest that staff working practices are designed to minimise movement of staff between patients in group D and other patients, especially on the same day.

- If the number of asymptomatic "close contacts" overwhelms the available isolation space, we suggest that these patients are asked to perform daily lateral flow tests at home to allow decision-making about best use of resources.

- Transmission based precautions for blood borne viruses should be maintained throughout.

Step-down of Transmission Based Precautions (TBPs) - see Figure 3 flowchart

Patients whose fever has resolved for at least 48 hours and there is clinical improvement in symptoms may be considered for de-isolation with the following criteria:

- **Patients who are not immunosuppressed**
  - Outpatients - after 10 days without the need for a negative SARS-CoV-2 (COVID-19) test.
  - For patients who were admitted to hospital due to COVID-19 illness, a 14-day isolation period is recommended (UKHSA).

- **Patients who are immunosuppressed** (see appendix 2 for details) - after 1 negative test

If in doubt, we suggest that decisions about step-down of TBPs are discussed with a virologist.

Although the COVID-19 isolation rules for the general UK population allow a shorter isolation period following 2 negative lateral flow tests, we recommend maintaining the 10-day isolation period for dialysis treatment given the vulnerability of our patient population.

Rationale: Considerable experience has now been gained in UK dialysis units managing transmission-based precautions in the above way, with no reported transmission following de-isolation. Patients who are immunosuppressed may experience more prolonged viral shedding, therefore specialist advice may be needed for individual cases.

7. Identification and management of "close contacts" of an individual with COVID-19 infection

A "close contact" is defined by the UKHSA as a person who has been close to someone who has tested positive for COVID-19. This includes contact during the time from 2 days before until 10 days after onset of symptoms or the date of the positive test [20]. Staff wearing appropriate PPE are not classed as close contacts.

In dialysis units which can maintain effective social distancing of at least 2 metres distance between patients throughout the dialysis process, a patient who tests positive for COVID-19 will have very few "close contacts".

Table 2 – Examples of a "close contact" in a haemodialysis unit

UKHSA defined "close contact"	Example in a dialysis setting
A person who was been within 2 metres of someone for more than 15 minutes	• Patient within 2 metres distance during dialysis • Patient within 2 metres distance in a waiting room for >15 minutes (includes patients on a different shift) • Patient who shared hospital transport
A person who had face-to-face contact within 1 metre	• Driver who had physical contact with a patient but was not wearing PPE • Nurse who had physical contact and was not wearing PPE • Patients having a conversation without social distancing

Practical steps to reduce the number of patients who are likely to be "close contacts"

- We suggest that dialysis units perform a COVID-19 risk assessment to identify areas where social distancing is suboptimal.
- We suggest that dialysis units keep a record of dialysis station, waiting room and transport details for all patients to use retrospectively following a positive case.
- We suggest that if dialysis stations are <2m apart, patient movement within the dialysis unit and between shifts is minimised.

We suggest the following actions are taken for patient "close contacts" in a dialysis unit

- Inform all dialysis unit "close contacts" as soon as possible, advising them to follow government guidance on isolation rules [21].
- Arrange dialysis in isolation according to local dialysis unit policy (see isolation and cohorting)
- For "close contacts" living in a high-risk setting, e.g. long term care facility or prison, inform the care facility manager without delay.
- Arrange SARS-CoV-2 PCR at the next dialysis, then at days 7 and 10, retesting if symptoms develop.

- Ask the patient to perform daily lateral flow tests at home according to government guidance. This will help with prioritisation of dialysis isolation facilities.
- **Patients who are on the transplant waiting list should be placed in the suspended category** for at least 10 days and until a medical review to ensure fit to be reactivated. If the have a positive SARS-CoV-2 PCR test, they should remain in suspend category until for 28 – 49 days depending on the urgency of transplant (see section 5).
- **Elective surgery should be postponed** until at least the end of self-isolation or according to local trust policies.

8. Ventilation

We suggest that dialysis units optimise fresh air ventilation by keeping windows open where possible whilst maintaining thermal comfort and balancing the risks of noise and air pollution.

- We suggest that dialysis units use shift change-over periods to maximise fresh air ventilation by opening windows and doors, explaining the importance of this to patients and staff.

- Dialysis units may benefit from a professional assessment of the ventilation system in both clinical and non-clinical areas to inform their COVID-19 risk assessment and understand how improvements can be made. A link to the Health and Safety Executive guidance on ventilation and air conditioning during the COVID-19 pandemic is found here [22].

- We suggest that air recirculation is avoided if possible. If unavoidable, advice should be sought regarding current air filtration efficiency, disinfection, and regular servicing requirements.

- Where ventilation is found to be inadequate, we suggest that dialysis units seek advice from their infection control team on steps which may be taken to mitigate the risk including limitation of number of occupants, PPE and any potential role for air purifying devices.

Rationale: Outbreaks of COVID-19 in UK dialysis units have been linked to poor ventilation in clinical or non-clinical areas (personal communication). Dialysis units may be ventilated by natural (windows) or mechanical systems with unique characteristics and challenges. Ventilation of the indoor environment plays a critical role in removing exhaled virus-laden air and replacing it with clean air, thus reducing the risk of airborne transmission. When infected and susceptible individuals share the same space, the risk of transmission increases. Natural ventilation is dependent on window opening sizes, weather conditions and localised air flows. It may be easily increased in some settings but more difficult in cold weather, noisy or polluted environments. Mechanical heating, ventilation, and air conditioning (HVAC) systems are designed for individual buildings. A professional assessment is therefore needed to effectively reduce the risk of airborne transmission of COVID-19 whilst maintaining appropriate temperature, humidity, and air flow [23].

The Centers for Disease Control and Prevention (CDC) recommends 6 air changes per hour for general ward settings, but 12 air changes per hour for airborne infection isolation rooms [24]. The air change rate for an individual dialysis unit or room may not be known, particularly if it was built many years ago, but a professional assessment is likely to be helpful in assessing the risk. CO_2 monitoring of indoor air may be a useful surrogate to identify poorly ventilated spaces. The SAGE Environmental Monitoring Group (EMG) state that a CO_2 level

of >1500 ppm (absolute value) is likely to indicate poor ventilation [25]. Where ventilation cannot be optimised, portable air purification devices such as high efficiency particulate air (HEPA) filter units could prove useful in certain circumstances [26] but SAGE EMG concluded that further research on real-world application is needed.

9. Environmental cleaning and disinfection

COVID-19 is highly infectious with transmission via respiratory droplets, aerosols, bodily fluids and contact with infected surfaces and equipment. Routine procedures for the cleaning and disinfection of dialysis stations and equipment are adequate to prevent transmission of COVID-19 via surfaces providing they are rigorously followed, paying particular attention to frequently touched surfaces and shared areas [5,27].

The same cleaning and disinfection practices should occur in both COVID-19 negative and positive areas as asymptomatic carriage of COVID-19 is common.

We suggest that dialysis staff employ the following cleaning practices:

- Cleaning commences once the patient has left the area.
- Disinfect or discard all surfaces, supplies or equipment located within 2 metres of the patient, including protective screens and remote controls.
- Choose an appropriate cleaning agent and concentration for the surface / equipment, according to manufacturer's instructions.
- Clean shared medical equipment after each patient use, e.g. blood pressure cuffs, oxygen saturation monitor, scales.
- For side rooms, allow adequate time for air change between patients. This depends on the type of ventilation used (negative or neutral pressure) so local guidance may need to be sought from infection control.
- In waiting areas, chairs are cleaned after each patient has vacated their seat.
- Communal areas e.g. toilets, wash basins and scales are cleaned frequently to minimise the risk of transmission via surfaces.

10. Hand hygiene

We recommend that dialysis unit staff and patients follow established hand hygiene practices ensuring hand hygiene facilities are available in key areas including:

- Regular audit of compliance and prompt intervention to address any deficiencies.
- Patients perform hand hygiene (either with soap and water or hand sanitiser) at key stages during the dialysis process, supported by appropriate facilities and prompts.

Please see figure 1 for an infographic summary and link to a patient-friendly poster.

A UKHSA hand washing best practice pictorial guide can be found here.

11. Patient Transport

We suggest that the dialysis unit discusses with each patient the safest mode of transport whilst minimising the risk of COVID-19 infection. We suggest the following additional measures:

- Patients are encouraged to retain their independence wherever possible including provision of free parking at the dialysis unit where needed.
- Where NHS transport is needed, it is COVID safe with at least one unused seat and row between passengers and frequent cleaning to agreed standards.
- Patients with suspected COVID-19 travel alone.
- Patients with confirmed COVID-19 may share transport with each other but not with other patient groups

12. Social distancing

We suggest that dialysis units maintain social distancing wherever possible to minimise close contact between individuals, by staggering appointment times and maximising physical distance between patients.

We suggest the following regarding entry / exit points and waiting areas :

- Use of waiting areas is minimised wherever possible and chairs are separated by 2 metres, with appropriate signage.
- **Patients with suspected or confirmed SARS-CoV-2 infection** use a separate entry / exit point and waiting area from other groups of patients, signed appropriately.
- **"Close contacts"** do not share the same waiting area as any other patient group.

Staff social distancing

We suggest the following measures:

- Staff maintain social distancing wherever possible throughout working practices, during handovers and break times.
- Chairs and computer workstations are placed at least 2m distance apart in all areas.
- A risk assessment is carried out to identify areas and working practices where social distancing is compromised.
- Practical solutions for maintaining social distancing are explored with the Trust's IPC and management teams.

13. Personal Protective Equipment (PPE)

PPE for patients

We suggest that all patients wear fluid resistant surgical face masks (FRSM) throughout the dialysis process from leaving the house until they arrive back home [28,29].

We suggest the following additional measures:

- Fluid resistant surgical face masks are supplied by the dialysis unit with an adequate supply of at least 1 mask per dialysis session (patients may need more if the mask becomes contaminated and needs to be replaced).
- Masks may be removed to allow eating and drinking (only touching the outer side) but should be replaced immediately afterwards.
- If removing a face mask to eat or drink, patients use hand sanitiser before and after removing and replacing the mask.
- Anyone taking their mask off maintains a 2-metre distance between them and all other people on the unit, including staff and other patients receiving dialysis.

PPE for staff

We suggest that all staff should wear a fluid resistant surgical face mask throughout the working day, including during break times, meetings and in non-clinical areas.

We suggest the following additional measures:

- Staff are trained on the safe use of PPE.

- Staff use a long-sleeved gown or apron, eye and face protection during connection and disconnection of vascular access for dialysis as there is a risk of splashing of blood or bodily fluids.

- Dialysis units have a defined policy for PPE use guided by a local risk assessment, following UKHSA guidance (see table 3). Many units may find that the risk of COVID-19 transmission remains unacceptable despite implementing the hierarchy of controls because of factors relating to patient characteristics, occupancy levels, building layout and poor ventilation. In this situation, use of an FFP3 mask may be beneficial.

- All clinical staff are fit tested for available FFP3 masks. If a staff member fails the fit test for all available FFP3 masks, they do not carry out patient care which requires an FFP3 mask.

- Staff use a fit tested FFP3 mask during cardiopulmonary resuscitation [30,31]. There should be a reliable supply of appropriate PPE (fluid resistant surgical gowns and fit-tested FFP3 masks) for use during cardiopulmonary resuscitation (CPR).
    - Guidance on donning of PPE for airborne precautions is available here.
    - Guidance on doffing of PPE for airborne precautions is available here.

Table 3 - The UKHSA guidance on PPE for staff within 2 metres distance of a patient is below:

Patient Group	Staff PPE
Positive SARS-CoV-2 test	Fluid resistant surgical mask (FRSM) or FFP3 mask*, eye and face protection, long sleeved gown or apron
Suspected COVID-19 (symptomatic, awaiting PCR result)	FRSM or FFP3 mask*, eye and face protection, long sleeved gown or apron
Asymptomatic "contact" of a positive case	FRSM, eye and face protection, long sleeved gown or apron
Patients not in the above groups	FRSM, eye and face protection, long sleeved gown or apron

*sessional use FFP3 or other respiratory protection if undertaking AGP or if unacceptable risk of transmission remains following rigorous application of the hierarchy of control.

Rationale for staff PPE: Staff providing care for COVID-19 positive patients remain at risk of developing infection themselves and then transmitting it to other individuals. These risks are reduced but not eliminated by vaccination. A fit-tested FFP3 mask provides superior protection against airborne spread and may be preferred by staff providing care to patients with confirmed or suspected COVID-19 infection. The WHO guidance (December 2020) stated that FFP2 or FFP3 masks may be used in these settings where availability and cost are not a problem. The benefits of an FFP3 mask over a type IIR FRSM are particularly relevant where other risks are poorly controlled, e.g. suboptimal ventilation, providing care to high-risk patients who are coughing. UKHSA guidance states that a fit-tested FFP3 mask may be used where unacceptable risk of transmission remains following rigorous implementation of the hierarchy of controls. Gray et al. described a high rate of dialysis staff infection when caring for COVID-19 positive haemodialysis patients [32]. Following adoption of FFP3 masks from August to December 2020 before the vaccination programme, no further staff infections occurred in staff caring for COVID-19 positive haemodialysis patients [4] . A KQuIP UK dialysis unit survey performed in August 2021 found that 78% of dialysis units use FFP3 masks for the care of patients with confirmed or suspected COVID-19 infection [17].

Appendix 1 – Symptoms screening checklist for patients attending for dialysis

Ask the following questions to each patient every time:

1. **Do you have any of the following symptoms of COVID-19?**
   - Loss of taste or smell
   - A new persistent cough
   - A high temperature
   - Feeling hot and cold (new symptom)
   - More short of breath than usual

2. **For members of your household / social bubble, has / is anyone:**
   - Had any of the above symptoms within the last 10 days
   - Had a positive COVID-19 test within the last 10 days
   - Been advised to have a COVID-19 test
   - Still waiting for a test result within the last 10 days

3. **Have you had a COVID-19 swab test at another place during the last 10 days?**
   - If yes, what was the result?
   - Why was it done?
     e.g. before surgery / symptoms / household contact / routine screening

4. **Have you been told to self-isolate or advised to have a COVID-19 test during the last 10 days?**

5. **Please help to keep us all safe when you attend for dialysis today**

   - Wash your hands with soap and water when you enter and leave the dialysis unit.
   - Wear your mask covering your nose and mouth from when you arrive until you get home.
   - Keep at least 2 metres distance from people wherever possible.
   - We will open the windows at changeover times to improve fresh air ventilation

Appendix 2 – Definition of Severely immunosuppressed as defined in the Green Book on Immunisation

- immunosuppression due to acute and chronic leukaemias and lymphoma (including Hodgkin's lymphoma)
- severe immunosuppression due to HIV/AIDS (British HIV Association advice)
- cellular immune deficiencies (such as severe combined immunodeficiency, Wiskott-Aldrich syndrome, 22q11 deficiency/DiGeorge syndrome)
- being under follow up for a chronic lymphoproliferative disorder including haematological malignancies such as indolent lymphoma, chronic lymphoid leukaemia, myeloma and other plasma cell dyscrasias
- having received an allogenic (cells from a donor) stem cell transplant in the past 24 months and only then if they are demonstrated not to have ongoing immunosuppression or graft versus host disease (GVHD)
- having received an autologous (using their own stem cells) haematopoietic stem cell transplant in the past 24 months and only then if they are in remission
- those who are receiving, or have received in the past 6 months, immunosuppressive chemotherapy or radiotherapy for malignant disease or non-malignant disorders
- those who are receiving, or have received in the past 6 months, immunosuppressive therapy for a solid organ transplant (with exceptions, depending upon the type of transplant and the immune status of the patient)
- those who are receiving, or have received in the past 12 months, immunosuppressive biological therapy (such as monoclonal antibodies), unless otherwise directed by a specialist
- those who are receiving, or have received in the past 3 months, immunosuppressive therapy including:
    - adults and children on high-dose corticosteroids (>40mg prednisolone per day or 2mg/ kg/day in children under 20kg) for more than 1 week
    - adults and children on lower dose corticosteroids (>20mg prednisolone per day or 1mg/kg/day in children under 20kg) for more than 14 days
    - adults on non-biological oral immune modulating drugs, for example methotrexate >25mg per week, azathioprine >3.0mg/kg/day or 6-mercaptopurine >1.5mg/kg/day
    - children on high doses of non-biological oral immune modulating drugs

Appendix 3 – "When to clean your hands" poster

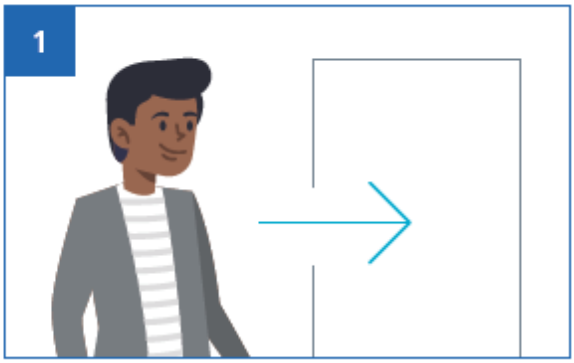
Printable version of this poster available here.

When to clean your hands

Hand hygiene is important to help protect you and other patients from infection.
You can clean your hands with soap and water, hand wipes or handrub.

When entering or leaving the dialysis unit/outpatient area.

1



After using the toilet.

2

Before and after touching your dialysis access (Fistula, dialysis line) , mouth, face or nose.

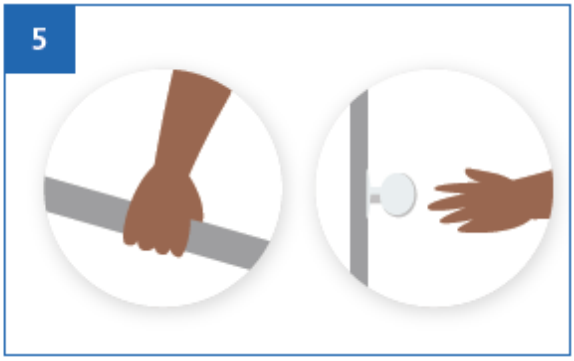
3

After removing or replacing your mask.

4

After touching surfaces touched by many people (e.g. door handles, handrails, dialysis machine)

5



Before and after eating, drinking, taking medicines.

6

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Members of the KQuIP COVID-19 Patient Safety Workstream

Fiona Loud	Policy Director, Kidney Care UK
Andrea Brown	Chief Executive, National Kidney Federation
Karen Jenkins	Consultant Nurse East Kent Hospitals University NHS Foundation Trust Clinical Vice-President, UK Kidney Association Co-chair Kidney Patient Safety Committee; President ANN UK
Helen Cronin	Lead Nurse Haemodialysis Services King's College Hospital NHS Foundation Trust
Gail Williams	National Lead Nurse, Welsh Renal Clinical Network
Dr Andrew Frankel	Consultant Nephrologist, Imperial College Healthcare NHS Trust
Dr Emma Montgomery	Consultant Nephrologist, Newcastle Upon Tyne NHS Trust
Dr Mick Kumwenda	Consultant Nephrologist, Glan Clwyd Hospital, Rhyl NHS Trust
Dr Stewart Lambie	Consultant Nephrologist, Raigmore Hospital, NHS Highlands
Susan Spence	Welsh Renal Clinical Network Manager
Rachel Gair	KQuIP programmes lead
Julie Slevin	KQuIP QI programme manager
Catherine Stannard	KQuIP QI programme manager
Amanda Bevin	Renal Counsellor, East Kent Hospitals University NHS Foundation Trust
Gill Manning	Chair, Association of Renal Industries
Neluka Weerasooriya	Head of Contracts, Renal Services and DaVita
Dr Kolitha Basnayake	Medical Director, Fresenius Medical Care (UK) Ltd
Dr Rosie Donne (Chair)	Consultant Nephrologist, Salford Royal NHS Foundation Trust KQuIP North West Medical Lead