

COVID-19: Guidance for infection prevention and control in nuclear medicine

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Bearing in mind the rapid speed with which the situation is changing, this guidance should be read in conjunction with current government and your local Trust advice.

Social distancing and self-isolation are key measures now being enforced by the government to slow down the spread of the Coronavirus. This is in particular for vulnerable groups when prolonged (12 week) isolation is strongly recommended. In keeping with this and the fact that higher proportion of those attending clinics and hospital investigations often have co-existing risk factors, we advise that non-urgent out-patient appointments be postponed until such time that Her Majesty's Government relaxes these measures. In this way, the pressure being placed on the NHS by critically ill patients can be eased, and the risk of COVID -19 infection to patients, their relatives and to NHS staff can be reduced. Nuclear medicine is a specialised procedure and staff cannot be easily replaced in the event of shortage. This also helps ease the pressure in the possible reduced workforce in view of the effect restrictions can have on staffing of the departments.

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Closing departments

Some hospitals are coming under severe stress due to the number of COVID-19 patients admitted. Therefore, some departments of nuclear medicine may be asked to close to concentrate resources of the hospital to deal with COVID-19 patients. This may result in staff being re-assigned to new roles during this crisis or staff may be furloughed. The decision to close a department can only be taken by senior management of the Hospital/Trust.

Some departments may be asked to reduce activity to release staff to other duties. This may mean that only a limited number of tests can be done. Please see Table 1 for guidance.

If your department is no longer able to offer nuclear medicine studies some administrative and clinical staff should remain on duty even if working from home. Any patient who needs an urgent scan or treatment your department cannot offer should be asked if they are willing to travel to a department that can offer that scan or treatment.

If your department remains open and working please consider referrals from those hospitals that have had to reduce or stop activity so that patient scans and treatments are not delayed.

Re-purposing or Sharing Radiopharmacy Facilities

The removal in non-urgent Nuclear Medicine work will result in a reduction of workload in the Radiopharmacy. Alongside this is a potential increase in other aseptic work in the hospital as pharmacy departments are called on to supply increased number of products to critical care, for example. The use of Radiopharmacies for other activities, such as provision of a CIVAS service or to make products such as hand gel for example, may be required. For the larger units, it may be possible to convert part of the facility for this purpose; smaller units may have to use the same areas. For all units, separation of the activities by time should be considered in order to minimise risk of radioactive contamination. If this is being planned, there are a number of factors to be considered, such as licensing status, liaison with the MHRA, training of staff, risk assessments and Local Rules. The UK Radiopharmacy Group will soon have advice on its website on sharing facilities.

Radiopharmacy Contingency Plans

Another consideration for the Radiopharmacy is contingency planning in the event there are insufficient staff to run the service, or to rationalise the use of PPE and cleaning materials. In this case, close liaison with neighbouring Radiopharmacies is important. For example, Radiopharmacy staff in other units could be trained to support a 'supply hub' whereby, should there be staffing shortages at any of the units, the workload could be consolidated in one place. The choice of supply hub should take into account location, experience of providing a centralised service and the existence of procedures and systems already in place to support this. Early training should be undertaken to support this proposal and availability of trained drivers must be taken into account. Any contingencies should be risk assessed, and the MHRA should be informed as well as the local HR department.

Postponing appointments:

Nuclear medicine departments often have administration staff dedicated to their services. Many are likely to have hundreds of scans booked over the next 3 weeks, with many other appointments pre-planned over the next 2 months. To act on these quickly, administration staff from other modalities may have to assist, hence nuclear medicine should co-ordinate with other imaging modalities when considering the approach to postponing appointments as help may be needed, especially as some may begin to isolate.

A suggested pathway for the process of cancelling appointments can be found in Appendix 1. The most important consideration is the assessment of the risk of postponement. It is important that those patients which urgently need their Nuclear Medicine tests are still able to have them. The prioritisation of patient appointments must therefore be carefully considered. Those for chronic conditions have lower priority compared to acute/severe conditions. A traffic light system is proposed in table 1 below to assist with the decision making process using the following guidelines:

- Tests in green category can be cancelled (i.e. postponed) and possibly held in a queue until the situation is clear and/or rebooked as and when needed.
- Amber appointments must be discussed with a clinician beforehand if considering cancelling/rebooking. Note: patients may have had withdrawal of some of their existing drug treatment, and this should be considered when making the decision on whether to postpone or not (for example, thyroid and parathyroid scans when using I¹²³)
- Red appointments should not be cancelled as they are deemed essential, unless under extreme circumstances.

It is recommended that the examination not be re-booked until further advice has been received; rather it should be kept on file and once the department is in a position to reschedule the patient's appointment, then they should be contacted at that point. We understand that patients may have been waiting for these tests for a long time and for some the test has significant impact on their life; if the patient wants to appeal the decision, then they should contact their referring doctor, who should then have a discussion with the Nuclear Medicine Clinician regarding the urgency of the request, if appropriate.

Delivery of radiopharmaceuticals

Nuclear Medicine Europe issued a statement on 25th March 2020. At present there has been no problem with production facilities in both Europe and those centres outside Europe we depend on. However, there may be issues with delivery of these radiopharmaceuticals within Europe partly related by the paucity of flights especially where radiopharmaceuticals are carried as hold luggage in passenger airliners. Also there may be future issues with road transport both across borders and within borders. Please be aware of these possible issues

Table 1: Guidance for rebooking Nuclear Medicine tests

Red	Amber	Green
Do not cancel or rebook unless patient at risk Book all new referrals	Discuss with clinician if there is a need to cancel/rebook. New referrals to be discussed	Rebook without need for discussion with a clinician Do not book new appointments
F-18 FDG new cancer	F-18 FDG follow up	2 phase bones and non-oncology Whole body bone
F-18 FDG sepsis	Ga-68 DOTATATE follow up	Amyloid DPD
Ga PSMA/F-18 Choline new cancer	Ga PSMA/F-18 Choline follow up	Benign I131 thyroid therapy

Ga-68 DOTATATE (staging / therapy decision)	Ga-68 PSMA follow up	C13 UBT
GFR	Lung VQ	Colonic Transit
GI bleed	Mag3	CSF studies
In-111 Pentetreotide (Octreoscan)	MIBG pheochromocytoma	Dacrosintigraphy
Lu-177 DOTATATE	MPS routine (SOB)	DMSA
Lung perfusion	MUGA - cardiac	Gastric Emptying
Meckels	Parathyroid (bear in mind cessation of drug therapy in lead up)	HIDA
MPS acute chest pain	Platelet	I-123 Ioflupane (DaTSCAN)
MUGA Oncology	Thyroid Tc-99m/ I-123 (paeds)	Lymphoscintigraphy
Oncology Bones	White cell (also consider FDG)	MIBG heart
Radium-223		Morphine HIDA
SLN		Platelets
99mTc-EDDA/HYNIC-TOC (Tekrotyd)		Proctoscintigraphy
Y90-SIRT		Red Cell Mass
		Salivary
		Se-75 /Tauroselcholic acid (SeHCAT)
		Small bowel transit
		Thyroid Tc-99m/ I-123 (adults)
		TI-201 hibernation

Booked appointments:

Even for those appointments which are deemed to be urgently required, there is an increased risk of DNA's as patients may develop symptoms themselves, or may be self isolating because of their age, or because someone else in their household has developed symptoms. It is advised that departments contact patients by phone the day before to check their symptoms and to ask if they are still planning to attend. Symptoms which could be associated with the virus are high temperature, cough, and more recently reported, a loss of taste or sense of smell.

Symptomatic patients:

Any patient showing symptoms of the virus (fever, or persistent dry cough) should be told not to attend, and sent home if they do present at the department, and the procedure rebooked, even if they are attending for a high priority (red) procedure, or even if they have been injected with the radiopharmaceutical.

Expensive tests:

Where possible delay these tests until this crisis is over if expensive radiopharmaceuticals are bought in, appointments should be reviewed before booking to avoid expensive DNA's, and it should be confirmed that the product can still be supplied as there may be some disruption to this.

Patient areas:

Look at patient wait areas try to ensure these do not get crowded ask patients coming to cold wait not to arrive more than 5 minutes before their appointment. Ideally the patient should attend by themselves, but if they need to have another person with them – for example, a carer, interpreter or driver, a maximum of one adult can come with them. No children should accompany them. After injections if possible the patients should be asked to keep distance and if possible to wait outside (including in the cars) and arrive back 5 minutes before the given imaging time. Keep the hot wait for those who cannot physically leave the department. All patient wait areas should be wiped down with appropriate sanitiser at least every 2 hours.

Patient hand hygiene:

Patients should be asked to clean their hands when they arrive and before they come in to the scanning rooms, preferably by handwashing, although alcohol gel can also be used. Signage is helpful with this.

Staff Hand hygiene:

Staff should clean their hands at regular intervals during the day for 20 seconds each time using soap and running water. Ideally gloves should be worn when handling patients, for example, when helping them on and off the bed. These must be changed between each patient contact. Staff should also wash/sanitise hands before / after every patient, even if wearing gloves. Hand moisturisers must be used to ensure the skin does not become affected by repeated washing. Avoid touching face with hands.

PPE:

Please follow your local policy for which PPE to wear. Example guidance on what PPE to wear in nuclear medicine and when to wear it is given in **Appendix 4** and supplies may have to be centralised. PPE should be kept in all injection rooms (i.e. more than one location) in case of inaccessibility due to radioactive contamination. Different PPE may need to be worn outside of Nuclear Medicine, for example, on the ward. Follow Local Trust Policies for this. Regular stock takes should be made to ensure there will be no shortage.

Equipment:

- If possible, one camera should be set aside for non-symptomatic patients only (out or inpatients) with a different cameras being reserved for symptomatic / unconfirmed / confirmed patients whenever possible.
- *Cleaning & Decontamination:* camera rooms should be cleaned down after each patient and surfaces such as couch, chairs wiped down with a sanicloth or equivalent. After a symptomatic / confirmed Covid-19 patient and sufficient time should be allowed between patients to allow for air re-circulations. Please refer to your room specification (often held by hospital estates department) as to how much time is needed for room re-circulations which is room/air-con specific.
- Symptomatic / unconfirmed / confirmed Covid-19 patients should be brought immediately into the camera room and not left waiting anywhere else.
- The ideal time to perform scans of infectious patients is in the afternoon to minimise cross contamination after use. However, in the afternoon, you will end up injecting more particles

of MMA (unless the MAA is prepared at lunch time). Also, the Kr generator will be weaker. So morning appointments are preferred.

Legal Considerations:

Environmental Permitting Regulations / Radioactive Substances Act (for Northern Ireland):

If applicable, departments should review their procedure for timing of radioactive waste collection. A slightly earlier prompt to start the consignment procedure is advised in case of disruption to the courier service. For example, those with a 90day permit, may want to consider a prompt to begin preparing for consignment at 65 rather than 70 days, assuming the contents can be consigned at this date from a transport regulations perspective.

IRMER:

Departments should keep to their usual equipment QC procedures and schedules. But it is advised to consider contingency planning for lack of immediate MPE advice, such as provision of MPE advice remotely if possible. Effective communication is important, particularly in the event any of the results are borderline and the MPE is not available for advice.

Departments should perform vetting procedures as usual , but prepare for situations where the practitioner, or those delegated to authorise tests, are not available in the department due to Covid-19.

Precautions for Lung Imaging:

VQ Scan for known Covid-19 patients

- The decision on whether to proceed with the VQ should be discussed with the referrer before booking.
- Most in-patient referrals are for VQ scans and these could include suspected or confirmed in-patient Covid-19 positive patients. Please consider all in-patient VQs with uncertain COVID-19 status as potentially positive and wear appropriate PPE
- The use of a perfusion only scan is unlikely to be of any benefit if Covid-19 infection is suspected as the Coronavirus response PROBABLY alters MAA distribution. In other words, it is unlikely for a perfusion only study to be normal.
- The majority of referrals to VQ in most departments are the pregnant patients and the perfusion only scan is often normal, with no requirement to proceed to more “intimate” contact through use of masks. This is only possible in department with hot reporting (as the study is finished) to determine if patient needs ventilation in some cases
- Pregnant patients are in a higher risk category and should be in the department for as short a time as possible.
- If using Krypton, proceed with a dual energy Tc-MAA/Kr-gas VQ to complete the test quickly
- Only perform ventilation at the same time if you have Krypton-81m available. Other ventilation agents may not be suitable due to the time required to be with the patient, and the unsatisfactory distribution due to likely patient non-compliance. If Technegas or aerosol is used follow the manufacturer’s guidance <https://www.cyclomedica.com/wp-content/uploads/sites/20/2020/03/Technegas-and-COVID-19-letter.pdf>

- For non-pregnant, and non hypertensive patients, consider increasing the DRL from 200MBq to 300MBq to bring about rapid SPECT imaging (5mins cp 12 mins). It would also reduce the time the patient and accompanying ward staff are in the department. Note: all referrals must be vetted by the ARSAC licence holder in this case as it involves an increased DRL.
- Patients with pulmonary hypertension should only receive 200MBq and always injected soon after preparation of MAA to reduce the number of particles (this usually means in the morning).
- If more than one referral is made, these should be booked and performed consecutively, allowing for sufficient room re-circulations. National guidance states “A minimum of 20 minutes i.e. 2 air changes, in hospital settings where the majority of these procedures occur is considered pragmatic”
- For all other VQ scans (i.e. those non-symptomatic for Covid-19), whether in-patient or outpatient, the operator should wear a surgical mask, gloves and gown.
- Use disposable tourniquets and any disposable waste from the procedure should be bagged in suitable waste bags as recommended by the local hospital
- When performing a VQ scan on suspected or confirmed Covid-19 patients, the NM operator of choice would be those with no other medical conditions.
- Government guidance is available on how to minimise spread of infection: <https://www.gov.uk/government/publications/wuhan-novel-coronavirus-infection-prevention-and-control>
- From this guidance, the VQ scan may not be considered an actual aerosol. However, given the patient’s likely symptoms (cough), the test warrants extra PPE as per **appendix 4**. The operator (injector, and mask fitter) should wear the full PPE – gloves, FFP3 mask, visor, and gown as there is a time during this test when the operator must be in close contact with the patient’s mouth in order to fit the aerosol mask.
- A proposed plan for VQs can be found in appendix 5.

Special Advice for booking Sentinel Lymph Node (SLN)

Nuclear Medicine Departments are advised to liaise frequently with the SLN services they support as these procedures are likely to be altered due to their own internal priority systems.

Reporting Nuclear Medicine and MDTs:

- Once scans are being / have been performed, remote reporting options could be explored in conjunction with radiology/PACS/ IT teams.
- Participation in MDTs can be limited in line with national guidance, please ensure ability to dial in remotely and rotation of staff attending MDTs

PET-CT:

- We expect that demand for PET-CT may reduce a little with less “follow up” scans but generally there will still be a significant work load. If you have separate uptake rooms not being used for PET, consider using these areas for “at risk” patients from the rest of imaging.
- Be prepared to use any spare CT capacity on the machine for acute chest CTs as throughout put on CT scanners may be reduced by need to clean room between patients

- We advise reviewing the CT component of PET-CT on lung windows to check that patients do not have incidental signs of viral infection before they leave the scanner. If there are signs the scanner needs to be cleaned prior to the next patient in case the patient has Covid-19. Please see information on the BSTI website for CT appearances that are seen in Covid-19: <https://www.bsti.org.uk/covid-19-resources/>.

SPECT-CT:

- We advise reviewing the CT component of PET-CT on lung windows to check that patients do not have incidental signs of viral infection before they leave the scanner. If there are signs the scanner needs to be cleaned prior to the next patient in case the patient has Covid-19. Please see information on the BSTI website for CT appearances that are seen in Covid-19: <https://www.bsti.org.uk/covid-19-resources/>.

Therapeutic Nuclear Medicine:

- Each patient needs to be assessed on an individual basis.
- Radioiodine therapy appointments for benign Hyperthyroidism may have to cease, since they are in the main, non-urgent, and would pose radiation protection issues should they be admitted to ITU. However, consideration should be given to giving the treatment to those patients who are unable to tolerate anti-thyroid medications, or those who have other severe comorbid issues, whereby a delay in treatment would cause more harm than good.
- Administration of radioiodine ablation therapy to Thyroid cancer patients needs careful consideration. Please follow the RCR Thyroid Cancer guidance for actions to be taken for low, medium and high risk patients in terms of delay of treatment and measures to be taken should the decision be made to go ahead with treatment.
- Lutathera for patients with low and medium grade Neuroendocrine tumours will need to be reviewed in light of local risk assessments/guidelines. However, since these patients could be considered as at risk due to possible marrow depletion post procedure, it may be safer to defer treatment for a few months. Each patient should be reviewed in their own clinical and local contexts.
- Radium-223 dichloride can be administered as an outpatient procedure, provided the patients do not have comorbidities that would put them at high risk due to low immunity. Please review each patient in their own clinical and local contexts.

Appendix 1: Proposed Pathway for Rationalising Imaging Outpatients

- Immediate actions:**
- General message to be sent out to referrers
 - Cancellation letter to be drafted and added to automatic systems
 - Script for cancellation to be agreed to avoid panic

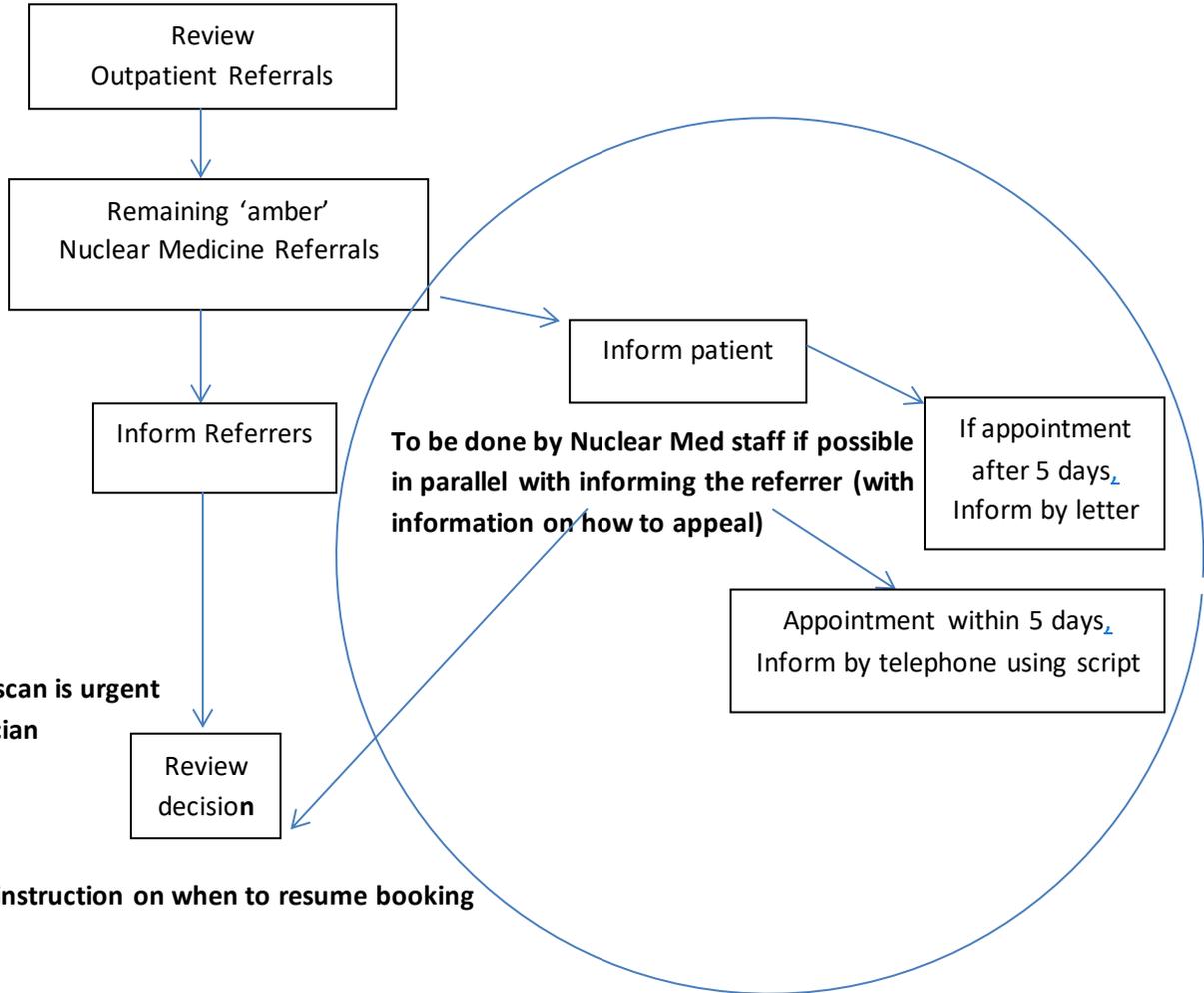
'Green' patient appointments to be removed (low risk)
Referrers instructed to contact to appeal if disagree
All 'red' patient appointments to be booked as normal

Remaining referrals reviewed by Nuclear Medicine clinician
Consider when booking - cancer, chest pain, trauma

Message re postponement e-mailed to referrers.
Grouped if possible
Individual discussion at discretion of Imaging Clinician

Patients asked to contact referrer if they believe their scan is urgent
Referrers to be asked to e-mail Nuclear Medicine Clinician if they disagree with postponement; they will discuss and rebook as necessary

Patient to be added back to waiting list; await further instruction on when to resume booking



Appendix 2: Suggested template for departmental signage



HM Government



CORONAVIRUS

Have you been to an affected place in
the last 14 days

or

had contact with somebody
with Coronavirus,

and

do you have any of these symptoms?



Cough



Fever



Shortness of
breath

If yes, to protect yourself and others please go home
and phone your GP or NHS 24 (111) for advice.

Please do not enter this building

Find out more at [gov.uk/coronavirus](https://www.gov.uk/coronavirus)

Appendix 3: Coronavirus symptoms compared with flu and the common cold

Symptoms	Coronavirus Symptoms range from mild to severe	Cold Gradual onset of symptoms	Flu Abrupt onset of symptoms
 Fever	Common	Rare	Common
 Fatigue	Sometimes	Sometimes	Common
 Cough	Common* (usually dry)	Mild	Common* (usually dry)
 Sneezing	No	Common	No
 Aches and pains	Sometimes	Common	Common
 Runny or stuffy nose	Rare	Common	Sometimes
 Sore throat	Sometimes	Common	Sometimes
 Diarrhea	Rare	No	Sometimes for children
 Headaches	Sometimes	Rare	Common
 Shortness of breath	Sometimes	No	No

Sources: World Health Organization, Centers for Disease Control and Prevention

Appendix 4: Suggested PPE Guidance

<i>Patient type</i>	<i>Change in guidance</i>
For symptomatic, unconfirmed in-patients meeting the COVID19 case definition, not having a lung scan	Operators must wear : <ul style="list-style-type: none">- Regular surgical mask- gloves- apron- strict hand hygiene
For confirmed cases of COVID-19, and for all in-patient unconfirmed VQ lung scans	Operators must wear full PPE: <ul style="list-style-type: none">- FFP3 mask or respirator hood- disposable eye protection , preferably visor- long sleeved gown- gloves.- Scrubs- Strict hand hygiene
For possible and confirmed cases of COVID-19 requiring an aerosol generating procedure	Full PPE ensemble as per previous guidance for confirmed cases: FFP3 respirator, disposable eye protection, preferably visor, long sleeved disposable gown and gloves.

Appendix 5: Proposed Plan for VQs

