



SCST Consensus Recommendations for the Use of Personal Protective Equipment (PPE) for Procedures Performed within Cardiac Physiology

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1. Executive summary

In the absence of clear evidence to support which level of PPE should be worn for each cardiac physiological procedure, the Society for Cardiological Science and Technology (SCST) would recommend a risk assessment approach as outlined below. We would also like to encourage any cardiac scientists who are in a position to collate evidence related to this subject to publish their data, whether it be in the form of observational studies or case reports.

2. Introduction

This guidance provides a consensus opinion on the use of Personal Protective Equipment (PPE) in the context of the current COVID-19 pandemic. It is recognised at this time that SARS-CoV-2 is circulating in the community to varying degrees across the UK and cardiac scientists may be subject to risk of infection by contact or droplet transmission during clinical procedures undertaken on asymptomatic COVID-19 positive patients.

Cardiac science procedures are hugely varied in terms of the environment in which they take place, whether the procedure is invasive or non-invasive, the vulnerability of the patient and the proximity between staff and patient. These factors must all be considered to determine the safe level of PPE for both staff and patient.

The SCST has considered guidance from the following organisations in the development of these consensus recommendations:

- Public Health England (PHE)
- World Health Organisation (WHO)
- European Society of Cardiology (ESC)
- Resuscitation Council UK
- British Society of Echocardiography (BSE)
- British Heart Rhythm Society (BHRS)
- Association for Respiratory Technology & Physiology (ARTP)

3. Infection prevention and control during a pandemic

The COVID-19 pandemic has required cardiac scientists to adopt transition-based precautions in addition to standard infection prevention & control precautions. '[COVID-19: infection prevention & control guidance](#)' published by Public Health England (PHE) details three types of transmission-based precautions based on the method of transmission of the SARS-CoV-2 virus:

Contact precautions - Aim to prevent transmission from direct contact with an infected individual or contact with the immediate care environment. Contact precaution measures include the decontamination of the care environment, hand hygiene for staff/patients and staff PPE.

Droplet precautions - Aim to prevent the transmission of droplets (>5µm) from the respiratory tract of an infected individual over a short distance. Droplet precaution measures include social distancing, PPE for staff/patients and decontamination of the immediate care environment.

Airborne precautions - Aim to prevent the transmission of aerosols (<5µm) from the respiratory tract of an infected individual over larger distances and to the wider care environment. Airborne precautions include the use of enhanced PPE including filtering facepiece class 3 (FFP3) respirators or equivalent as well as further environmental considerations such as room ventilation to allow for adequate air changes. These precautions are required when undertaking high risk Aerosol Generating Procedures (AGPs).

In its 2014 publication '[Infection prevention and control of epidemic-and pandemic prone acute respiratory infections in health care](#)', the World Health Organisation defined an AGP as "any medical procedure that can induce the production of aerosols of various sizes, including droplet nuclei". As such, a great number of medical procedures may be considered aerosol generating. Any AGP has the potential to transmit pathogens capable of causing acute respiratory tract infections from an infected individual. However, an AGP is only deemed high risk for the transmission of COVID-19 by organisations such as PHE and WHO where there is evidence that directly associates the specific AGP with increased transmission of coronaviruses.

The following procedures are deemed high risk AGPs for the transmission of COVID-19 by [PHE](#):

- intubation, extubation and related procedures, for example, manual ventilation and open suctioning of the respiratory tract (including the upper respiratory tract)
- tracheotomy or tracheostomy procedures (insertion or open suctioning or removal)
- bronchoscopy and upper Ear Nose & Throat (ENT) airway procedures that involve suctioning
- upper gastro-intestinal endoscopy where there is open suctioning of the upper respiratory tract
- surgery and post-mortem procedures involving high-speed devices
- some dental procedures (for example, high-speed drilling)
- non-invasive ventilation (NIV); Bi-level Positive Airway Pressure Ventilation (BiPAP) and Continuous Positive Airway Pressure Ventilation (CPAP)
- High Frequency Oscillatory Ventilation (HFOV)
- induction of sputum
- high flow nasal oxygen (HFNO)

Within cardiac science, there are some procedures which are classed as an AGP based on the WHO definition. These procedures include:

- Trans-oesophageal echocardiography (TOE)
- Exercise stress echocardiography
- Exercise tolerance testing (ETT)
- Cardiopulmonary exercise testing (CPET)

TOE involves the passage of a probe into and out of the upper gastro-intestinal tract as well as the use of open suctioning of the upper respiratory tract in conscious-sedated patients. Therefore, this procedure may be deemed a high risk AGP for the transmission of COVID-19 based upon PHE recommendations and airborne based precautions should be utilised.

The evidence base for whether ETT, exercise stress echocardiography or CPET have been associated with increased transmission of coronaviruses has not been established. In the absence of robust evidence to confirm these procedures do not confer increased transmission of COVID-19, the SCST recommends these procedures be considered high risk AGPs and therefore advocates the use of airborne precautions.

The SCST also recognises that there is evidence that some cardiac science procedures, while not being an AGP, have an inherent risk of inducing an adverse event which will necessitate resuscitation protocols being initiated and therefore may lead to a high risk AGP being performed. These procedures include although are not limited to: invasive coronary procedures; cardiac implantable electronic device implantation; and provocative investigations such as head up tilt testing and pharmacological stress echocardiography. Enhanced PPE, specific for airborne precautions, if not worn for the duration of the procedure should be immediately available in case of needing to perform a high risk AGP.

4. Environmental considerations for cardiac science high risk AGPs

The SCST recommends the following cardiac science procedures are deemed high risk AGPs:

- Trans-oesophageal echocardiography (TOE)
- Exercise stress echocardiography
- Exercise tolerance testing (ETT)
- Cardiopulmonary exercise testing (CPET)

Careful consideration should be given to the environment in which these procedures are performed. The SCST suggests the following considerations be made for TOE, exercise stress echocardiography, ETT and CPET. In addition to this guidance, [PHE guidance](#) details environmental considerations for AGPs and the BSE have published guidance for the restoration of [TOE](#) and [stress echocardiography](#) services during the COVID-19 pandemic.

Ventilation - Following a high risk AGP, aerosols may remain airborne within the procedure room for an undetermined duration and may potentially contaminate any surface or equipment within the space. It is therefore necessary to allow time following the procedure for aerosol clearance before the room can be entered without an FFP3 respirator or equivalent and before decontamination procedures can be undertaken. This length of time will depend on the ventilation of the room in terms of the number of air changes per hour. Guidance from PHE, based on guidance from WHO, suggests that one air change will remove an estimated

63% of airborne contaminants. After 5 air changes, it is suggested that less than 1% of airborne contamination will remain. PHE guidance recommends approximately 6 full air changes should occur following a high risk AGP to allow sufficient clearance of airborne contaminants before the room can be safely entered for decontamination procedures to begin. Therefore, to undertake high risk AGPs in cardiac science, an appropriate room with either a high-efficiency particulate air (HEPA) filter or with openable windows should be used. Negative air pressure rooms typically provide 10-12 air changes per hour and therefore may reduce the time required for aerosol clearance after performing a high risk AGP. The number of air changes per hour of the specific room should be measured so that the appropriate clearance time can be calculated to provide 6 air changes before decontamination takes place.

Furniture and equipment - Following a high risk AGP, aerosols have the potential to contaminate equipment and furniture anywhere in the procedure room, therefore only essential furniture should remain in the room. Any furniture should be non-cloth based and wipeable to allow for adequate decontamination after each procedure. Open storage units or shelving containing procedure stock and consumables should not be stored within the procedure room. Disposable covers may be considered for equipment, otherwise full decontamination of all equipment should be performed after each procedure in adherence with manufacturer recommendations. Resuscitation equipment that is required to be accessible for the procedure should be situated inside the procedure room with either an easily removable disposable cover or should be fully decontaminated post procedure. All waste generated from the procedure including used PPE and consumables such as bed roll etc. should be treated as clinical infectious waste and disposed of appropriately. It is advised that any domestic waste receptacles be removed from the procedure room so that only clinical waste receptacles remain. An appropriate linen bag should also be available within the room.

Number of individuals present - The minimum number of staff required to safely carry out the procedure should be present for any high risk AGP. All members of staff present should wear level 3 PPE as outlined in the "PPE for staff" section of this guidance below. Patients' relatives, carers or chaperones should not be present in the procedure room during or following a high risk AGP. It may be necessary to prohibit training in high risk AGPs particularly if the patient has confirmed or suspected COVID-19. The SCST does however recognise training will eventually need to resume and this may be considered for low risk patients where a thorough risk assessment has been carried out also taking into account the trainee's individual risk.

5. Important considerations prior to determining level of PPE

During the initial acute phase of the COVID-19 pandemic, cardiac science procedures carried out have been limited to only those that would directly impact immediate patient management and therefore many procedures will have been deferred or cancelled. Now that the National Health Service (NHS) is in the recovery phase of the pandemic, there is a need to resume non-urgent services where risk assessment allows. Before procedures can take place however, there are some important considerations which need to be taken into account to decide whether it is safe and appropriate for the procedure to be performed:

Triage of referrals - All referrals for cardiac science procedures should undergo triage to determine whether it is appropriate and necessary for the patient to undertake the procedure at this time. The clinical need to perform the procedure must be considered against the risk

to both the patient and the staff due to perform the procedure. This decision to proceed may differ depending on the patient's COVID-19 status, their vulnerability status, and the care environment where the procedure will take place. PHE guidance details which patient groups are currently deemed vulnerable and extremely vulnerable. Alternative investigation modalities that may confer a lower risk of COVID-19 transmission should be considered wherever possible. Multi-disciplinary discussion may also prove valuable to aid triage to consider the likelihood and appropriateness of treatment/intervention before initial investigations are carried out.

Patient screening prior to attendance for cardiac science procedures - Once triage has taken place, the patient should be contacted prior to their attendance so that they can be screened to establish their COVID-19 status and to confirm any existing or unknown vulnerability status. Screening questionnaires should aim to:

- Establish whether the patient has symptoms of COVID-19 or has been in contact with an individual who is COVID-19 positive or who may have had symptoms suggestive of COVID-19 within the last 7 days (symptoms as defined by current guidance from PHE).
- Confirm whether the patient is deemed to be in a vulnerable or extremely vulnerable group as defined by PHE.
- Establish whether the patient is able to travel safely to the care provider alone or if they require assistance.
- Establish whether the patient is currently awaiting a COVID-19 test or test result.

Patient screening upon arrival for cardiac science procedures - All patients are currently advised to wear a face covering to attend any appointment in a healthcare setting. Screening questionnaires should be repeated upon the arrival of the patient for their procedure. Temperature checks may also be performed. Compliance with any specific pre-procedure instructions should also be confirmed and any further PPE required to be worn by the patient should be provided.

6. PPE for staff and patients for specific cardiac science procedures

The following guidance suggests a framework that may be used to determine the appropriate level of PPE for specific cardiac science procedures taking into account current PHE guidance regarding patient use of face coverings; the procedure environment; the patient's COVID-19 status; and individual risk assessment of the staff involved.

PPE for patients - All adult patients should be asked to wear a face covering to attend their appointment, except for those who are unable to due to an existing medical condition. In the case of ETT, exercise stress echocardiography and other provocative cardiac science procedures (for example head up tilt testing and pharmacological stress echocardiography), the SCST recognises that patients may have difficulty wearing a face covering for the provocative stages of the procedure and this may lead to a submaximal test. We would therefore advise a pragmatic approach as to whether processes can be put in place to allow patients to complete these stages without a face covering, for example, in the positioning of all staff behind the patient during provocative stages.

PPE for staff:

The SCST suggests three levels of staff PPE:

Level 1 = Fluid resistant surgical mask, disposable apron, disposable gloves

Level 2 = Eye protection (goggles/visor), fluid resistant surgical mask, disposable apron, disposable gloves

Level 3 = Full visor eye protection, FFP3 respirator or equivalent, disposable long-sleeved gown, two pairs of disposable gloves

Where will the procedure take place?

Score	
1	Outpatient department
1	Domiciliary visit
1	Inpatient ward – No COVID-19 positive or suspected patients. No high risk AGPs
3	Inpatient ward – No COVID-19 positive or suspected patients. High risk AGPs in progress on ward.
3	Inpatient ward – With COVID-19 positive or suspected patients. No high risk AGPs.
3	Inpatient ward – With COVID-19 positive or suspected patients. High risk AGPs in progress on ward.
3	Invasive/surgical procedure environment (Cardiac catheterisation laboratory / theatre)

What is the patient's COVID-19 status?

Score	
1	Presumed COVID-19 negative. No symptoms by patient questionnaire +/- negative temperature check
1	Not tested. No symptoms by patient questionnaire +/- negative temperature check
3	Presumed COVID-19 negative but identifying symptoms by patient questionnaire +/- positive temperature check (Inpatient activity only – defer outpatient activity)
3	Not tested. Symptoms highlighted by questionnaire +/- positive temperature check (Inpatient activity only – defer outpatient activity)
3	Confirmed COVID-19 positive (Inpatient activity only – defer outpatient activity)

What procedure will be performed?

Score	
1	ECG / NIBP / fitting and removal of ambulatory monitoring
1	Face to face (F2F) cardiac device interrogation / reprogramming (ILR/PPM/CRT/ICD)
2	Trans-thoracic echocardiography
3	Exercise tolerance testing or Cardiopulmonary exercise testing
3	Trans-oesophageal echocardiography
3	Exercise stress echocardiography
2(3)*	Pharmacological stress echocardiography
1(3)*	Head-up tilt testing
1(3)*	Any non-scrubbed role within the cath lab (DCCV, Device implant, Cardiac catheterisation, EP study)
1(3)*	DCCV outside cath lab

* Level 3 PPE should be immediately available should a high risk AGP be required and if not already worn for the duration of the procedure.

PPE score:

Score ≥ 5 = Minimum (see below) **Level 3 PPE** – Full visor eye protection, FFP3 respirator or equivalent, disposable long-sleeved gown, two pairs of disposable gloves

Score 4 = Minimum (see below) **Level 2 PPE** – Eye protection (goggles/visor), fluid resistant surgical mask, disposable apron, disposable gloves

Score 3 = Minimum (see below) **Level 1 PPE** – Fluid resistant surgical mask, disposable apron, disposable gloves

What is my individual risk as a member of staff involved in the procedure?

Individual staff risk assessment should be carried out to highlight any additional risk to the member of staff due to take part in the procedure. Enhanced PPE may be required for certain members of staff depending on their individual circumstances.

SCST Council
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7. Links to relevant guidance

Current PHE guidance: [Coronavirus \(COVID-19\): personal protective equipment \(PPE\) hub](#)

PHE Infection prevention and control guidance including AGP list:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/893320/COVID-19_Infection_prevention_and_control_guidance_complete.pdf

WHO Infection prevention and control of epidemic-and pandemic prone acute respiratory infections in health care. WHO guidelines. 2014:

https://www.who.int/csr/bioriskreduction/infection_control/publication/en/

WHO coronavirus guidance: <https://www.who.int/publications/i/item/10665-331495>

BSE guidance for TTE post COVID-19: <https://www.bsecho.org/Public/Education/Post-COVID-clinical-guidance/TTE/Public/Education/Post-COVID-clinical-guidance.aspx?hkey=f532ef18-89d8-4e58-b82e-c43beb6821bc>

BSE guidance for TOE post COVID-19:

<https://www.bsecho.org/Public/Education/Post-COVID-clinical-guidance/TOE/Public/Education/Post-COVID-clinical-guidance-TOE.aspx?hkey=d64254c2-e6ea-4074-abab-7ec010ccba7f>

BSE guidance for stress echocardiography post COVID-19:

<https://www.bsecho.org/Public/Education/Post-COVID-clinical-guidance/Stress-echo/Public/Education/PC-stressecho.aspx?hkey=1dc68272-e7f6-482f-b446-891cba749600>