1. Exercise room

Location

1.1. Should be close to the outpatient department, cardiac department or cardiac ward. It is essential that medical and nursing staff are close by and able to reach the exercise room within one minute of cardiac arrest being raised.

1.2. Room must be large enough to allow resuscitation procedures to be performed and for a stretcher trolley to enter the room.

1.3. Room should:
   - be air conditioned, ventilated and appropriately temperature-controlled;
   - have piped oxygen or portable oxygen supply;
   - have piped or portable suction.

2. Cardiac arrest alarm

2.1 A suitable alarm system must be installed so that help can be summoned immediately should an arrest occur.

2.2 The alarm must be tested once per week.

2.3 Cardiac arrest drills must be rehearsed by those involved or likely to be involved in the procedure.

3. Resuscitation equipment

Full resuscitation equipment including defibrillator, cardiac arrest trolley, intravenous infusion equipment etc must be present in the exercise room. The equipment must be checked prior to each exercise stress testing (EST) session.

4. Booking arrangements/request forms

4.1 A request form must be completed and signed by a physician. It should include relevant medical details and a statement that the physician has seen and examined the patient and the resting ECG, that none of the contra-indications to EST exist and that it is safe to proceed with a cardiac physiologist managed exercise stress test (EST).

4.2 Each patient should receive an information leaflet explaining the procedure and detailing any instructions e.g. medication. This leaflet should be sent with the appointment to enable the patient to read and understand the information away from the hospital environment.

4.3 The practitioner leading the test must obtain the patient's written informed consent for the EST immediately before the test.

4.4 The request form, consent form and information sheet should be designed and prepared locally by the senior chief of the cardiac department and the cardiologist supervising activities within it.
For departments offering “Open access” EST, paragraphs 4.1 – 4.4 still apply. However, prior to the EST, the cardiac physiologist should complete a questionnaire documenting current symptoms, past and recent cardiac events, history and current medication, and a resting 12 lead ECG should be recorded. The questionnaire should be designed and produced by the senior chief of the cardiac department and the cardiologist supervising activities within it.

5 Protocol for treadmill or cycle exercise stress testing

5.1 Number of staff required

Two cardiac physiologists or one physiologist and one health care professional holding a certificate of Society for Cardiovascular Science and Technology (SCST) competence.

5.2 Grade of cardiac physiologist in charge

One MTO3 or above with an appropriate certificate of SCST competence, assisted by one MTO2 or an appropriately trained health care professional (who hold a certificate of SCST competence).

5.3 Qualification as trained

Certified by senior chief or chief (with an interest or responsibility for EST practice). The requirements for the competent practitioner are:

1. 50 ETT supervised by a competent practitioner, 5 of those to be assessed by the stress testing practitioner/senior chief /chief cardiac physiologist.
2. Demonstrate the ability to use all relevant equipment within the exercise room.
3. Hold a current resuscitation certificate (minimum ILS)
4. Must understand the indications/contra indications for performing ESTs.
5. Have a proven knowledge of the physiology, electrocardiography and pharmacology related to exercise stress testing.

5.4 Before the test

1. The patient’s case notes must be available on the day of the test.
2. The cardiac physiologist in charge will check the patient’s history before the test begins. If it has changed markedly from the date of the request, then the cardiac physiologist will check with the physician or deputy whether they are to proceed with the test.
3. The physiologist must know about the patient’s medication. This should be indicated on the request form. eg. B-blockers, calcium channel blockers, nitrates.
4. Patients will be exercised on full medication unless the request form specifically requests that any of the medication be stopped. This should be made clear on the request form and the patient instructed to stop medication prior to EST.
5. The physiologist must follow guidelines for Contra-indications and Cessation of test (5.6).

Contra-indications

1. Severe angina/rest angina
2. Angina < 1 month post-MI, post-PTCA/stent, post-CABG
3. Known left main stem stenosis
4. Aortic stenosis/hypertrophic obstructive cardiomyopathy
5. Hypotension eg. SBP <90mm Hg
6. Uncontrolled raised BP eg: SBP >180mm Hg; DBP >100mm Hg
7. History of ventricular arrhythmias – eg. VT or VF
8. LBBB on ECG, ventricular pacemaker implanted
9. Tests for provocation of arrhythmia
10. Screening tests for pilots, LGV, PCV licensing when physiologist is unfamiliar with the requirements from Licensing Authority.

- The request form signed by the doctor should exclude these conditions.
- A locally-designated pro-forma may be helpful.
5.5 **During the test**

1. The Bruce protocol will be used unless an alternative is clearly requested.

2. All tests will be symptom-limited or maximal, whichever is sooner (unless specifically requested otherwise).

3. BP will be recorded:
   - @ baseline and before each progression into next stage.
   - @ peak of exercise
   - @ 3 minute intervals throughout recovery until return to baseline.

4. Heart rate will be monitored throughout to ensure a steady rise throughout the test.

5. A 12-lead ECG will be recorded at baseline and then every 3 minutes during EST and through recovery stage.

6. The ST segment markers will be set at J point plus 80ms unless an alternative is specifically requested.

7. The time from start to onset of symptoms and/or ECG changes will be noted.

8. The total exercise time will be noted.

5.6 **Indicators for Cessation of Test**

It is acknowledged that these are criteria for physiologist managed tests and that medical staff may extend the test.

1. Severe chest pain or dyspnoea or patient wanting to stop

2. SBP falling >20mm Hg

3. SBP rise to >230mm Hg

4. Heart rate falling >20% of starting rate

5. Severe dizziness or unsteadiness of gait

6. >3mm ST depression

7. >2mm ST elevation. Rapid ST elevation and pain will cause test to be stopped immediately

8. Exercise induced arrhythmias – AF, SVT, VT, frequent VPBs, multifocal VPBs, heart block

9. Loss of ECG signal or uninterpretable trace due to poor quality/movement or treadmill dysfunction

10. Predicted maximum heart rate maintained for one minute.

5.7 **Emergency contingency plans must be in place before EST**

A medical team must always be contactable in a case of an untoward event.

- cardiac arrest
- severe hypotension
- profound/long-lasting ST depression or elevation during test
- arrest team
- patient’s consultant or deputy (SHO or SpR) or a nominated doctor/team

- The arrangements for medical cover must be clearly defined for each department performing physiologist led EST e.g. the appropriately trained doctor on call that day may be responsible for advice about a patient and should be contactable by bleep.
6 The report

A modern computer assisted system for EST is essential.

6.1 The Report will be written immediately after the test.
6.2 All reports will include:

- The protocol used
- The resting ECG appearances
- Exercise time
- % of predicted maximum heart rate achieved
- Reason for termination
- Maximum ST changes in which lead and when
- Patient’s cardiac symptoms – what, when, associated ECG changes, where on ECG.
- Patient’s other symptoms – claudication, dizziness, fatigue
- BP response

6.3 Recovery phase. A record of time taken for ECG and BP to return to baseline values.

6.4 Comment about the patient’s appearance before, during and after the exercise test.

6.5 The cardiac physiologist will provide a factual report on the procedure.

7 Discharge of patient

7.1 Patient may be allowed home after completing the recovery phase of the EST without seeing a doctor if:

- Free of symptoms
- BP and ECG returned to normal or baseline after EST

7.2 If the physiologist in charge of EST is concerned about the patient’s condition or EST result, then the doctor providing medical cover should be asked to see the patient before the patient leaves the department.

7.3 The report and the EST record plus the case notes must go back to the referring doctor the same day or on the next day.

7.4 The result of the test will not be given to the patient. The physiologist will tell the patient that the results will be forwarded to the consultant.

8 Other stress tests

Dobutamine stress test
Radio-nuclide stress test
Stress echocardiography

requires physician supervision

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