Clinical/Diagnostic Problem	Investigation	Recommendation (Grade)	Dose	Comment
E01. **Acute chest pain syndromes (ACPS)[1]**				
A) ST elevation MI	CXR	Indicated [B]	☢	A CXR may be obtained for initial evaluation, but it should not delay assessment for immediate revascularization unless the diagnosis of STEMI is in question.
	Coronary Angiography	Indicated [A]	☢☢	Indicated if primary PCI is the revascularization strategy.
	ECHO	Indicated only in specific circumstances [B]	0	For assessment of LV function and if post-MI complication is suspected.
	MPI (SPECT or PET)	Indicated only in specific circumstances [B]	☢☢	• May be used in the assessment of stable patients with late presentation MI. • For assessment of LV viability in patients with severe LV dysfunction and guidance regarding the revascularization strategy.
	MRI	Indicated only in specific circumstances [B]	0	For assessment of LV viability in patients with severe LV dysfunction and guidance regarding the revascularization stratgey: most accurate for assessment of LV function and for post-MI complications.
	MUGA	Specialized investigation [B]	☢☢	For assessment of LV function.
B) Non-STEMI / high risk ACS (including unstable angina)	CXR	Indicated [B]	☢	If CHF or diagnosis of NSTEMI/ACS is in question.
	Coronary Angiography	Indicated only in specific circumstances [A]	☢☢ – ☢☢☢	Studies have demonstrated that patients with NSTEMI and high risk ACS can benefit from the early invasive strategy (early coronary angiography). However decisions to proceed with the early invasive strategy should not be made in isolation but clinicians must weigh the risks and benefits of the early invasive strategy and patient co-morbidities should be considered.
	ECHO	Indicated only in specific circumstances [B]	0	For assessment of LV function and if post-MI complication is suspected.
	MPI (SPECT or PET) or	Indicated only in specific circumstances Indicated [B]	☢☢	Assessment of patients where the conservative (non-invasive) strategy is deemed reasonable. For assessment of LV viability in patients with severe LV dysfunction and guidance regarding the revascularization strategy.

1   Diagnostic Imaging should be guided by clinical assessment, ECG and biomarkers.

Clinical/Diagnostic Problem	Investigation	Recommendation (Grade)	Dose	Comment
B) Non-STEMI / high risk ACS (including unstable angina) *(continued)*	Stress ECHO	Indicated only in specific circumstances [B]	0	Assessment of patients where the conservative (non-invasive) strategy is deemed reasonable. For assessment of LV viability in patients with severe LV dysfunction and guidance regarding the revascularization strategy. It is a feasible modality but requires local expertise.
	MRI	Indicated only in specific circumstances [B]	0	For assessment of LV viability in patients with severe LV dysfunction and guidance regarding the revascularization strategy. Accurate for assessment of LV function and for post-MI complications.
	MUGA	Specialized investigation [B]	☢☢	For assessment of LV function.
	CTA	Not indicated [C]	☢☢ – ☢☢☢*	May be considered as an alternative to the early invasive strategy in centres where coronary angiography and SPECT/stress ECHO are not available or feasible, and the diagnosis of acute coronary syndrome remains uncertain but its value in this population remains uncertain.
C) Non-high risk ACS	CXR	Indicated [B]	☢	Useful for the evaluation of possible causes for chest pain.
	MPI (SPECT or PET)	Indicated [B]	☢☢	Useful to risk stratify patients with lower risk ACS or ACPS where CAD is suspected.
	Stress ECHO	Indicated [B]	0	Useful to risk stratify patients with lower risk ACS or ACPS where CAD is suspected.
	ECHO	Indicated [A]	0	For assessment of LV function and other cardiac causes of chest pain.
	CT Chest or Coronary CTA	Indicated only in specific circumstances [B]	☢☢ – ☢☢☢*	May be indicated to exclude CAD as a potential etiology of CP in the low or intermediate probability group. May rule in or out other causes for acute chest pain such as dissection or PE. Coronary CT if suspicion of CAD is higher; CT Chest if suspicion of dissection or PE is higher.
	Coronary Angiography	Indicated only in specific circumstances [B]	☢☢☢	May be used when a non-invasive strategy is felt clinically to be inappropriate.
	MRI	Specialized investigation [B]	0	Gated Cardiac MRI with perfusion imaging, (+/- pharmacological stress), delayed enhanced imaging, T2 imaging and ventricular function analysis can be used to assess for significant CAD and other causes of acute chest pain in hemo-dynamically stable patients.
	MUGA	Specialized investigation [B]	☢☢☢	For assessment of LV function.

Section E: Cardiovascular

Clinical/Diagnostic Problem	Investigation	Recommendation (Grade)	Dose	Comment
E02. Suspect CAD, Non acute symptoms				
A) High pre-test probability	CXR	Indicated only in specific circumstances [B]	☢	May be helpful if signs or symptoms are suggestive of CHF.
	MPI (SPECT or PET)	Indicated [B]	☢☢	• Assessment of patient prognosis. • For assessment of LV viability in patients with severe LV dysfunction and guidance re: revascularization is needed.
	ECHO/ Stress ECHO	Indicated [B]	0	• For assessment of LV function / Assessment of patient prognosis. • For assessment of LV viability in patients with severe LV dysfunction and guidance re: revascularization is needed.
	MUGA	Indicated only in specific circumstances [B]	☢☢☢	For assessment of LV function.
	Stress perfusion MRI	Specialized investigation [B]	0	MRI myocardial perfusion with vasodilator stress has been shown to be as good as coronary angiography, PET and Nuclear SPECT and can be superior to stress echo especially in patients with a poor acoustic window. Availability may be limited to large centers.
	Coronary Angiography	Specialized investigation [B]	☢☢☢ or ☢☢	Indicated if patient has uncontrolled symptoms on optimal medical therapy, CCS 3 or 4 angina, high risk non-invasive test results, suggestion that patient may benefit from revascularization.
	Coronary CT	Not Indicated [C]	☢☢ – ☢☢☢*	Not indicated except for unusual circumstances where invasive angiography cannot be performed.
B) Low to intermediate pre-test probability	CXR	Indicated [B]	☢	Useful to assess heart size and pulmonary vasculature. May show non cardiac causes of chest pain.
	Coronary CT	Indicated [B]	☢☢ – ☢☢☢*	CT coronary angiography has an excellent negative predictive value and is very useful for excluding coronary obstructive disease in low and intermediate risk populations. Useful for demonstrating coronary anatomy in preoperative cardiac surgery patients at low risk for CAD.
	MPI (SPECT or PET)	Indicated [B]	☢☢	Diagnosis and risk stratification of patients when IHD is suspected.
	ECHO / Stress ECHO	Indicated [B]	0	For assessment of LV function and risk stratification of patients when IHD is suspected.

Clinical/Diagnostic Problem	Investigation	Recommendation (Grade)	Dose	Comment
B) Low to intermediate pre-test probability *(continued)*	MRI	Indicated only in specific circumstances [B]	0	Useful for differentiating ischemic from non-ischemic cardiomyopathies and identifying specific causes such as sarcoidosis, amyloidosis, and iron overload. Technique of choice for demonstrating myocarditis.
E03. Known chronic ischemic heart disease[2]	MPI (SPECT or PET)	Indicated [B]	☢☢	Assessment of patient prognosis. For assessment of LV viability in patients with severe LV dysfunction and guidance re: revascularization is needed.
	Stress ECHO	Indicated [B]	0	Assessment of patient prognosis. For assessment of LV viability in patients with severe LV dysfunction and guidance re: revascularization is needed.
	MRI	Indicated [B]	0	For assessment of LV function, viability and possible post-MI complications.
	CXR	Indicated only in specific circumstances [B]	☢	A CXR should only be obtained if there are signs or symptoms suggestive of CHF.
	ECHO	Indicated only in specific circumstances [A]	0	For assessment of LV function. Can be used sequentially, particularly if hemodynamic clinical deterioration is noted.
	Coronary Angiography	Indicated in specific circumstances [B]	☢☢☢	Indicated if patient has uncontrolled symptoms on optimal medical therapy, CCS 3 or 4 angina, high risk non-invasive testing, suggestion that patient may benefit from revascularization.
	MUGA	Specialized investigation [B]	☢☢☢	For assessment of LV function.
E04. Chest pain: aortic dissection[3]	CXR	Indicated [B]	☢☢	A CXR is indicated primarily to exclude other causes of chest pain. It is rarely diagnostic of aortic dissection.
	CT	Indicated [B]	☢☢☢	CT with IV contrast is readily accessible, rapid and accurate. Cardiac gating should be considered to minimize pulsation artefact and for assessment of the aortic root, sinuses and coronaries.

2   Diagnostic Imaging should be guided by clinical assessment and ECG. Exercise treadmill stress test is currently recommended as the 1st line non-invasive investigative strategy.

3   Diagnostic Imaging should be guided by clinical assessment including history of predisposing conditions such as hypertension and genetic syndromes.

Clinical/Diagnostic Problem	Investigation	Recommendation (Grade)	Dose	Comment
E04. Chest pain: aortic dissection *(continued)*	US Transthoracic Echocardiography (TTE)	Specialized Investigation [B]	0	TEE is a useful and accurate portable technique for unstable patients, but it is not as good as CT for diagnosing aortic arch or abdominal aorta dissection. It can assess root and provides dynamic information including presence of aortic regurgitation and it accurately identifies the true lumen.
	MRI	Specialized investigation [B]	0	MRI is accurate, but practical difficulties limit its use in critically ill or unstable patientsIt is most appropriate for assessing stable patients with chronic dissection, and it is Useful for follow-up. It assesses any change in longitudinal extent and but practical difficulties can limit imaging potential in critically ill or unstable patients. Can provide dynamic information including the presence of aortic regurgitation.
E05. Pulmonary embolism **(See also E13)**	Risk Assessment using Wells Criteria and D-dimer	Indicated [A]	0	The Wells criteria for clinical likelihood of PE is extensively validated and triages patients into three pre-test probability groups: low, intermediate and high. A PE can be safely excluded in patients with a low or moderate pre-test probability and a negative ELISA D-dimer.
	CXR	Indicated [B]	☢	CXR is the best initial imaging modality to demonstrate consolidation and pleural effusion. A CXR might suggest a pulmonary embolus, but does not exclude a pulmonary embolus.
	CT Pulmonary Angiography (CTPA)	Indicated [A]	☢☢ – ☢☢☢*	CTPA is the best imaging modality for the detection of pulmonary emboli,. It is the best modality for patients with COPD or an abnormal CXR, and may be used following a non-diagnostic V: Q scintigram.
	NM (ventilation / perfusion scintigraphy)	Indicated [B]	☢☢	Planar and SPECT Ventilation / perfusion (V:Q) scintigraphy is diagnostic if used selectively in patients without COPD or consolidation on CXR (Normal CXR) A normal perfusion scintigram excludes clinically significant pulmonary emboli. Can be used when CTPA is contraindicated such as contrast allergy or elevated serum creatinine. Should be used for follow up assessment of pulmonary embolism.
	MRA	Specialized investigation [B]	0	May be considered when there is a contraindication to CTPA and abnormal CXR making ventilation / perfusion scintigraphy unlikely to be diagnostic.
E06. Pericarditis, pericardial effusion	ECHO	Indicated [B]	0	ECHO is the best initial imaging modality. It can diagnose and assess the size of a pericardial effusion and suitability for drainage. It is also the best modality for follow-up.
	CXR	Indicated [B]	☢	CXR is indicated to diagnose concomitant pathology (e.g. tumour) or calcification in the pericardium. It should include a left lateral view.

Clinical/Diagnostic Problem	Investigation	Recommendation (Grade)	Dose	Comment
E06. Pericarditis, pericardial effusion *(continued)*	CT	Specialized investigation [B]	☢☢	CT may be ordered to assess pericardial thickening +/- calcification, pericardial effusions and other relevant thoracic pathology.
	MRI	Specialized investigation [B]	0	Will show thickening, effusion and can assess for functional impact of pericardial disease and other important cardiac and thoracic findings. Less sensitive for identification of pericardial calcification than CT.
E07. Suspected valvular cardiac disease	CXR	Indicated [B]	☢	CXR is indicated for an initial assessment and when there is a change in the clinical picture such as signs suggesting heart failure.
	ECHO	Indicated [B]	0	ECHO is the best imaging modality for initial assessment and for follow-up. TEE may be needed to assess prosthetic valves, suspected endocarditis or if there is a poor acoustic window.
	MRI	Specialized investigation [B]	0	Complementary to echo especially if difficulty with acoustic windows. Can assess severity of valvular regurgitation and is the most accurate method for assessment of ventricular volumes, function and mass. Rarely contraindicated for prosthetic valves.
	CT	Specialized investigation [B]	☢☢ – ☢☢☢*	Can assess valve area and degree of valvular calcification with ECG Gated CT . Useful for assessment of aortic root and ascending aortic size.
E08. Hypertension – See H02 – H03.				
E09. Suspected cardiomyopathy, myocarditis	CXR	Indicated [B]	☢	Used for initial assessment and when there is a change in the clinical picture such as suggestion of new heart failure.
	ECHO	Indicated [A]	0	ECHO is the best modality, allowing clear assessment of dilated, hypertrophic, and constrictive or restrictive cardiomy-opathy and associated cardiac abnormalities. It is not as useful for arrhythmogenic RV dysplasia. TEE may be required to distinguish constrictive from restrictive cardiomyopathy.
	MRI	Indicated [B]	0	MRI may be ordered for differentiating ischemic from non-ischemic cardiomyopathies and for identifying specific etiologies such as sarcoidosis, amyloidosis, Arrhythmogenic Right Ventricular Cardiomyopathy , noncompaction and iron overload. It is the best imaging modality for demonstrating myocarditis, and it is useful for detecting myocardial scars.
	NM MPI (SPECT or PET)	Indicated [B]	☢☢☢	Myocardial perfusion imaging may help to differentiate ischemic and dilated cardiomyopathy and to assess myocardial ischemia in hypertrophic cardiomyopathy.

Clinical/Diagnostic Problem	Investigation	Recommendation (Grade)	Dose	Comment
E09. Suspected cardiomyopathy, myocarditis *(continued)*	MUGA	Specialized investigation [B]	☢☢☢	Rest radionuclide angiography is indicated in the determination of initial and serial LV and RV performance in patients with myocarditis or dilated, hypertrophic and restrictive cardiomyopathy and in patients receiving chemotherapy with doxorubicin.
E10. Congenital heart disease	CXR	Indicated [B]	☢	Cardiac configuration, pulmonary vascularity and other thoracic findings may suggest diagnosis.
	ECHO	Indicated [B]	0	ECHO is the best initial imaging modality. It provides anatomic and functional information, and is useful for follow-up.
	MRI	Indicated [B]	0	MRI may be requested to supplement ECHO, particularly for assessment of complex congenital heart disease. It can also be used for valvular assessment and shunt quantification, and it is the most accurate modality for assessment and follow-up of ventricular size, mass and function.
	CT	Specialized investigation [B]	☢☢ – ☢☢☢*	CT can also be used for defining complex congenital disease in patients where MRI is contraindicated, but it provides limited functional data compared to ECHO and MRI. It should be used judiciously and with appropriate dose reduction protocols in the newborn or pediatric age group.

E11. Aortic aneurysm

A) Thoracic aneurysm[4]	CXR	Not Indicated [C]	☢	Low diagnostic accuracy.
	CT	Indicated [A]	☢☢ – ☢☢☢*	Helical multidetector CT allows accurate, reproducible short-axis measurements. Gated study accurately measures root and sinuses. Can also assess for presence of CAD and morphology of aortic valve.
	MR	Indicated [A]	0	Typically for younger patients in whom radiation exposure is a concern. Can provide dynamic information including valve morphology and presence of aortic regurgitation.
	US Transthoracic Echocardiography (TTE)	Not Initially Indicated	0	Limited acoustic window limits visualization of aortic arch. Can provide dynamic information including valve morphology and presence of aortic regurgitation.

4   Imaging surveillance based on size criteria, interval growth and co-existing surgical conditions. If present in isolation, surgical correction is warranted for thoracic aneurysms >5.5-6.0 cm or growing >0.5cm/year. If present with co-existing surgical conditions (CAD, valve disease), surgical correction warranted for thoracic aneurysms > 4.5 cm.

Clinical/Diagnostic Problem	Investigation	Recommendation (Grade)	Dose	Comment
B) Abdominal aneurysm[5]	Abdomen X-Ray	Not Indicated	☢	Low diagnostic accuracy.
	US	Indicated [A]	0	US is useful for screening, but it can be limited in obese patients and those with bowel gas. It is imprecise in assessing relationship to renal vessels and measuring aneurysm size for surveillance, but it is portable and low cost. CT is preferable for a suspected leak.
	CT	Indicated [A]	☢☢ – ☢☢☢*	Accurate for assessing relationship to renal and iliac vessels to guide percutaneous management. High reproducibility is advantageous for surveillance. Accurately assesses rupture.
	MR	Special Investigation [B]	0	Similar in accuracy to CT.
E12. Deep vein thrombosis (DVT)	Risk Assessment using Wells Criteria and D- dimer	Indicated [A]	0	The Wells criteria for DVT extensively triages patients in the outpatient population into High and Low pre-test probability groups. Patients with a low pre-test probability and a negative ELISA D-dimer do not require further investigation.
	US (Compression US)	Indicated [A]	0	Compression US is the best initial imaging modality for the diagnosis of DVT. It may also show other lesions.
	CTA	Indicated only in specific circumstances [C]	☢☢ – ☢☢☢*	May be required in cases not technically assessable or equivalent by compression/Doppler ultrasound.
	MRA	Indicated only in specific circumstances [C]	0	May be required in cases not technically assessable or equivalent by compression/Doppler ultrasound.
	Venography	Indicated only in specific circumstances [C]	☢☢	May be required in cases not technically assessable or equivalent by compression/Doppler ultrasound.
E13. Peripheral vascular disease	Angiography	Specialized investigation [A]	☢☢☢	Local policy needs to be determined in agreement with vascular surgeons, especially with regard to therapeutic interventions. US used in some centres as first investigation.
	CTA / MRA	Specialized investigation [C]	☢☢☢ / 0	CTA and MRA are increasingly used for diagnosis.

5   Imaging screening based on age, gender and family history. Imaging surveillance based on size criteria.

* Newer CT technology with prospective gating +/- iterative reconstruction technique can reduce CT dose up to 80% for some examinations.
Dose varies from institution to institution depending equipment and protocol