New Zealand minimum dataset for a standard transthoracic echocardiogram

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The Cardiac Society of Australia and New Zealand (CSANZ) ensures the high quality of cardiac care across Australasia and provides a range of guidelines pertaining to the provision care and training. This New Zealand guideline was ratified on 13 June 2019 and should be considered in conjunction with other Australasian guidelines for Training and Performance in Adult Echocardiography ratified by the Cardiac Society of Australia and New Zealand board on 30 November 2012, available at http://www.csanz.edu.au/wp-content/uploads/2014/12/Adult_Echo.pdf and the New Zealand Guidelines for Adult Echocardiography 2015: The Cardiac Society of Australia and New Zealand.[1]

The last 10 years have seen substantial developments in ultrasound technology and a change in what constitutes a standard transthoracic echocardiogram.[1] Its portability and ability to provide real-time information regarding cardiac structure and function, as well as its accessibility has resulted in this being the most widely used imaging modality for assessment of cardiac structure and function.

The requirement for a standard minimum echo dataset has been well established with published guidelines within Europe, the UK as well as in the US.[2–4] This not only ensures that all studies are of an acceptable quality, it reduces the chance of pathology being missed and facilitates comparisons with previous studies across sonographers throughout the country and potentially worldwide.

It is recognised that not all echocardiograms, in some clinical situations, require a complete dataset and that this should be predominantly performed outside of urgent clinical situations. Furthermore, it is acknowledged there are certain situations when a focused study may be more appropriate, particularly if there has been a complete study within the last two years, during which period a significant change is considered less likely.

Aims

These guidelines are a group consensus for which the purpose is to define what is considered a complete standard imaging dataset and measurements, to create uniformity nationwide and moreover to provide a template against which studies can be audited as part of quality control recommendations. Included in the guidelines are recommendations regarding reporting and procedures to maintain quality within departments. Disease-specific guidelines can be found elsewhere and are not the focus of this guideline. Minimum requirements for stress echocardiography, contrast echocardiography and transoesophageal echocardiography will not be covered in this document.

The performance of an acceptable echocardiogram requires an appropriate environment to allow this to occur and should include a suitable area with sufficient space for hand washing, patient changing and for reporting. There should be access to equipment to allow the measurement of height, weight and blood pressure and appropriate examination couches with pull-outs to assist in obtaining optimal images.

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Adequate time per study will be dependent on the level of experience of the sonographer, but a recommended time would be 45–60mins,[4] to acquire a complete study and for reporting, with additional time allocated for more complicated cases.

Recommended imaging protocol

The recommended standard views of a complete examination detailed below (Table 1). This includes the structures of interest within that view and the minimum measurements required. It is recommended that, if Doppler data cannot be obtained, a screen is recorded to demonstrate that this was attempted. Quantitative measurements should be provided whenever possible as evidence for conclusions made where images are of good enough quality, to allow an acceptable level of reproducibility.

Global longitudinal strain obtained from 2D speckle tracking imaging has a growing evidence base with clinical utility, particularly in the monitoring of patients undergoing cardio-toxic chemotherapy, prognostication in heart failure and for diagnosis of cardiomyopathies, and so should be performed in laboratories with capable equipment and the bullseye map recorded.

Table 1: Recommended minimum dataset and measurements (those in bold are minimum acceptable).

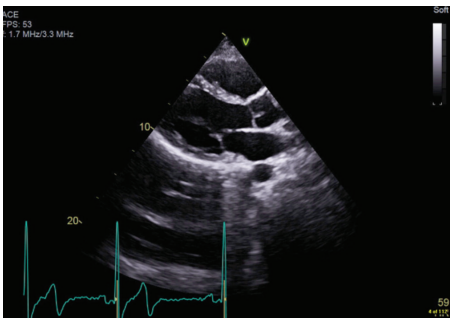
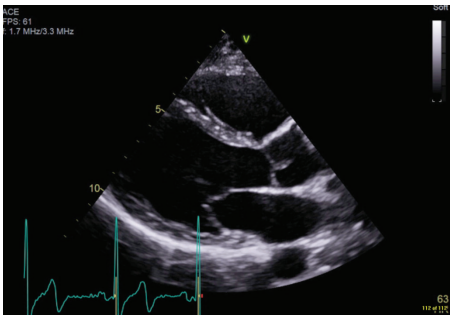
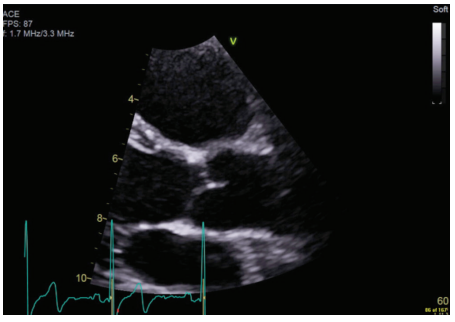
	View	Attention to	Perform/measure
1	PLAX increased depth		
		Pericardial space	
2	PLAX left ventricle		
		LA MV LV LVOT AV IVS RV	**LV EDD** LV ESD LV EF (Teicholtz) LA Dimension **IVS end diastole** **PWd diastole**
3	PLAX zoomed AV		
		AV	Aortic annulus diameter **LVOT diameter** **Aortic SOV diameter** **STJ diameter** **Colour Doppler**

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Table 1: Recommended minimum dataset and measurements (those in bold are minimum acceptable) (continued).

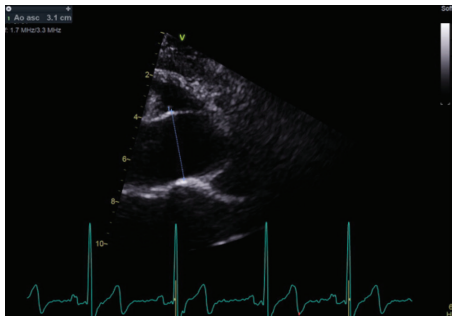
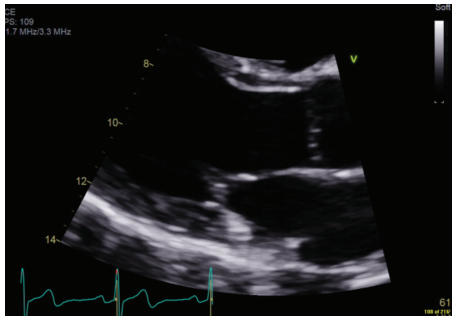
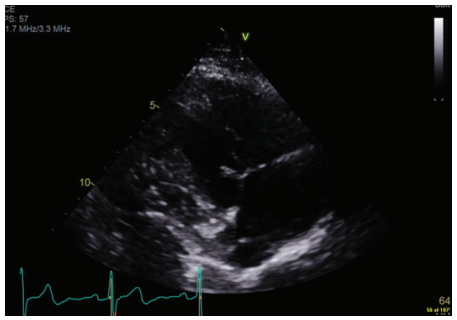
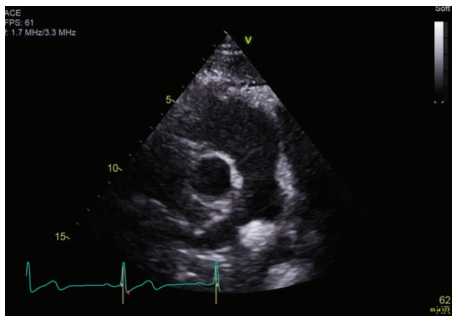
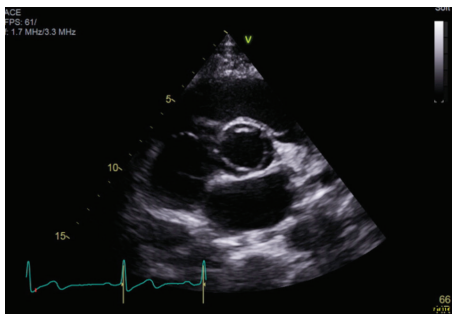
4	PLAX zoomed ascending aorta		
		Asc Aorta	**Asc aorta diameter**
5	PLAX zoomed MV		
		MV LA	**Colour Doppler**
6	PLAX RV inflow		
		RA TV RV	**Colour Doppler** **CW - Vmax** Vmax
7	PSAX RVOT focus		
		AV RA RVOT PV PA PA branches	**Colour Doppler** **PV CW –V max** PR PW -VTI **CW PRend** RVOT PW -VTI
8	PSAX, AV focus		
		AV LA RA RVOT TV PV IAS	

Table 1: Recommended minimum dataset and measurements (those in bold are minimum acceptable) (continued).

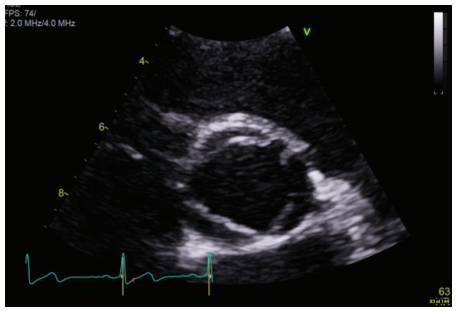
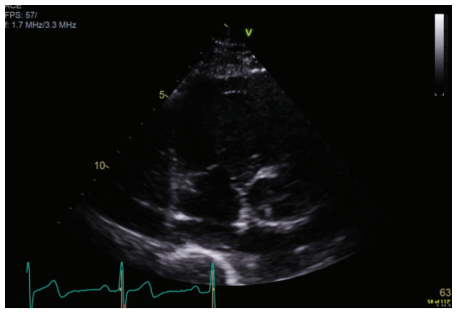
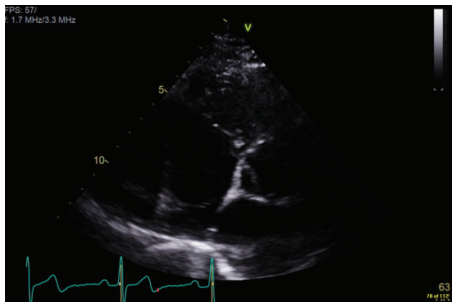
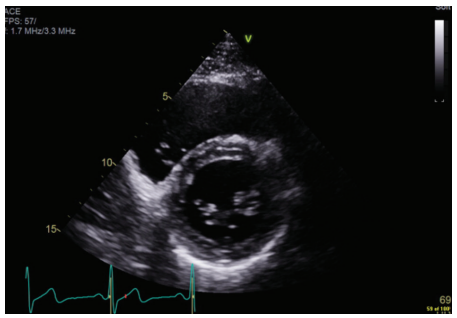
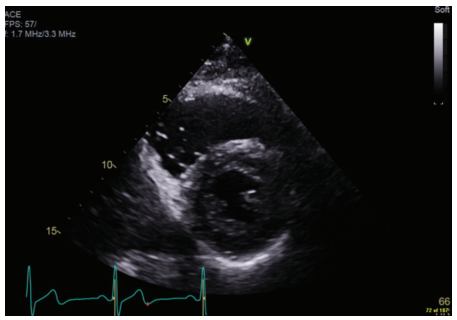
9	PSAX, AV zoom		
		AV (NCC/LCC/RCC)	**Colour Doppler**
10	PSAX TV focus		
		RA TV RV	**Colour Doppler** **CW RVSP**
11	PSAX IAS		
		LA RA IAS	**Colour Doppler**
12	PSAX, LV level MV		
		RV IVS AMVL PMVL LV	Colour Doppler
13	SAX, LV mid ventricle		
		Papillary muscles RV IVS LV	

Table 1: Recommended minimum dataset and measurements (those in bold are minimum acceptable) (continued).

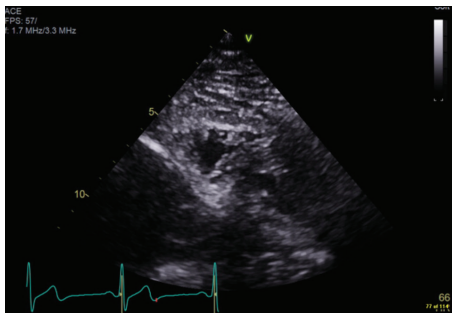
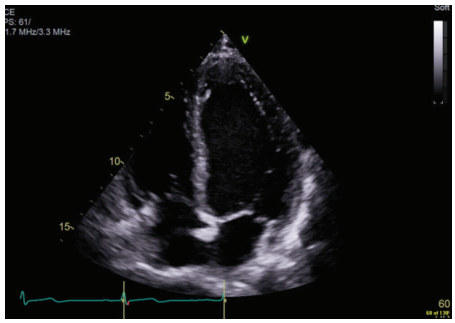
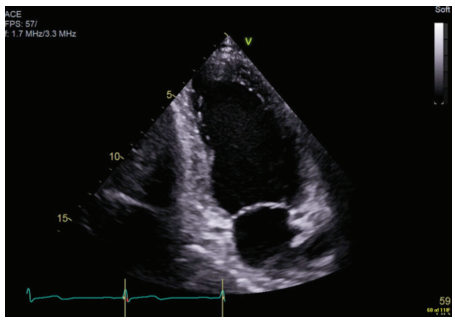
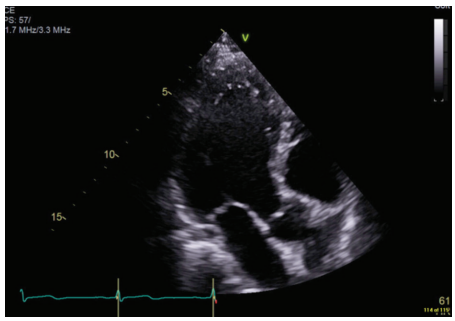
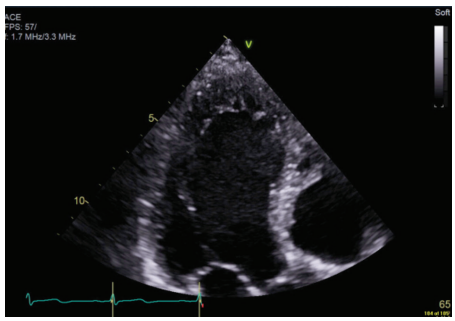
14	SAX, LV apex		
		LV apex	
15	Apical 4C		
		MV LV IVS RV TV RA IAS PVeins	**LA volume** **Colour Doppler MV** **MV PW E, A, DT,** **Lateral TDI é** **Septal TDI é** **PVeins PW S/D/ a reversal** **Valsalva** MV CW MS VTI MR CW VTI/Vmax
16	Apical 2C		
			**Colour Doppler** **LA volume**
17	Apical long-axis		
		LA MV LV LVOT AV	**Colour Doppler MV and AV** AV CW V max/VTI
18	Apical long axis reduced depth LV		
		LV RWMA	*LV GLS *3D volumes

Table 1: Recommended minimum dataset and measurements (those in bold are minimum acceptable) (continued).

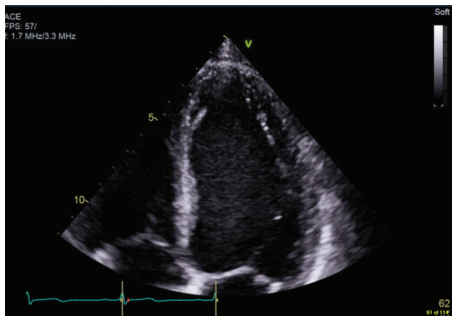
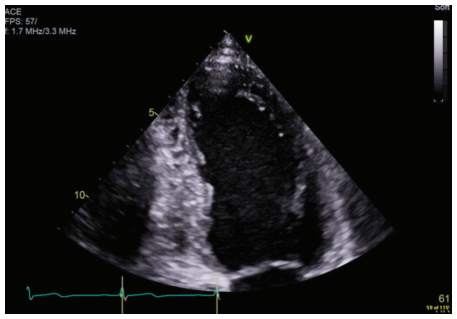
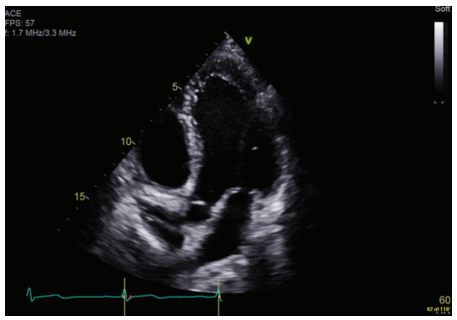
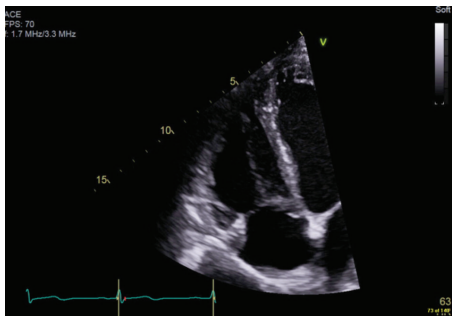
19	Apical 4C LV reduced depth		
		LV RWMA	LV EDV LV ESV LV EF (Simpsons) *LV GLS *3D volumes/EF
20	Apical 2C LV reduced depth		
		LV RWMA	LV EDV LV ESV LV EF (Simpsons) *GLS *3D Volumes
21	Apical 5C		
		LA MV LV IVS LVOT RA RV	**Colour Doppler – AV /LVOT** **LVOT PW Vmax/VTI** **AV CW Vmax/VTI**
22	Apical 4C posterior/RV tilt		
		RA TV RV	**Colour Doppler TV** **TV CW Vmax RVSP** **RV TAPSE** **RV ś** RA area RAV RV base and mid diameter RV length

Table 1: Recommended minimum dataset and measurements (those in bold are minimum acceptable) (continued).

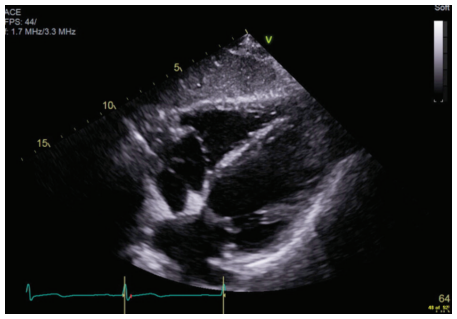
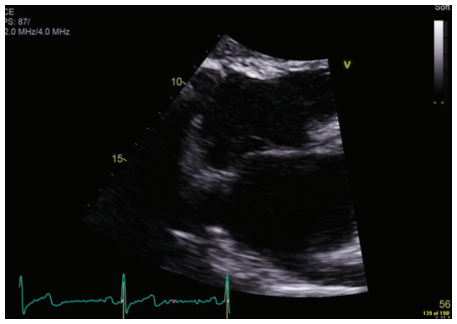
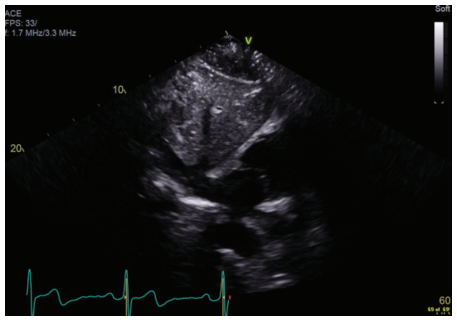
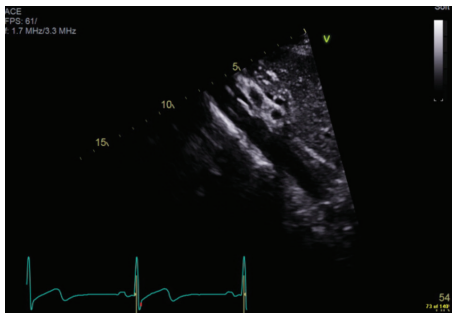
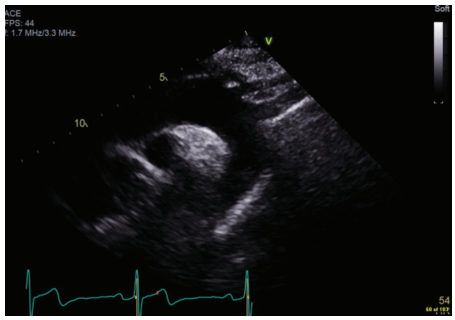
23	Subcostal 4C		
		LV MV RV TV IAS IVS RA LA Pericardium	
24	Subcostal 4C IAS Zoom		
		IAS	**Colour Doppler IAS**
25	Sub-costal long axis		
		IVC Hepatic veins	**Colour Doppler** **Hepatic veins** **Hepatic vein PW** **IVC dimension** IVC sniff (M Mode)
26	Subcostal abdominal aorta		
		Abdominal aorta	**Colour Doppler** **PW**

Table 1: Recommended minimum dataset and measurements (those in bold are minimum acceptable) (continued).

27	Suprasternal		
		Ascending aorta Aortic arch Descending aorta	**Colour Doppler descending aorta** **Descending aorta PW** **Descending aorta CW**

PLAX – parasternal long axis, PSAX – parasternal short axis, LA – left atrium, MV – mitral valve, LV – left ventricle, LVOT – left ventricular outflow tract, AV – aortic valve, IVS – inter-ventricular septum, RV – right ventricle, EDD – end diastolic dimension, ESD – end systolic dimension, EF – ejection fraction, PWd-posterior wall in diastole, STJ-Sinotubular junction, Asc A- ascending aorta, RVOT – right ventricular outflow tract, PV – pulmonary valve, PA – pulmonary artery, RA – right atrium, SOV sinus of valsalva, PSAX – parasternal short axis, IAS – inter-atrial septum, NCC-non coronary cusp, LCC-left coronary cusp, RCC – right coronary cusp, AMVL – anterior mitral valve leaflet, PMVL – posterior mitral valve leaflet, PVeins – pulmonary veins, EDV – end diastolic volume, ESV – end systolic volume, CW – continuous wave, Vmax – maximum velocity, PW – pulsed wave, VTI – velocity time integral, Prend – pulmonary regurgitation end velocity, RVSP – right ventricular systolic pressure, DT – deceleration time, TDI – tissue Doppler imaging, S – systole, D – diastole, GLS – global longitudinal strain, 3D – 3 dimensional, TAPSE – tricuspid annular plane systolic excursion, RV – right ventricle, IAS – inter-atrial septum, IVC-inferior vena cava, 4C – 4 chamber, 5C – 5 chamber, 2C – 2 chamber, 3C – 3 chamber, TV – -tricuspid valve, RWMA – regional wall motion abnormalities, NCC – non coronary cusp, LCC – left coronary cusp, RCC – right coronary cusp, RAV – RA volume.
*GLS and 3D volumes—is recommended when resources are available and there is moderate or more valvular disease, when there is screening for or presence of LV dysfunction, including monitoring of cardio-toxic agents[5] and cardiomyopathies, PR – pulmonary regurgitation.

3D left ventricular volumes and ejection fraction should be measured in laboratories that have capable equipment, in those undergoing evaluation of valve disease and in those requiring monitoring of left ventricular function, since this improves measurement reproducibility and correlates closely with MRI.[6]

Reporting

Reports should contain all the key measurements and comments on all structures listed in Table 1, in addition to the height, weight and blood pressure of all patients. Physicians interpreting echocardiograms should preferably have advanced cardiology fellowship training in echocardiography, and in centres where this is not possible a quality assurance programme is recommended.[1]

Physicians should be allowed sufficient time to assess all cardiac structures and the performance of all measurements. The time required will depend on complexity, equipment used, the report generated and the experience level of the sonographers and physician.

A summary should be provided with clinical correlation and comparisons made with previous studies when appropriate.

All reports should where possible include a log of name, date and time of all who re-access or modify the electronic report for future reference.

Quality and assurance

Performance of a good-quality echocardiogram will depend on regular participation in quality control and continued professional development to maintain competency. Quality improvement programmes are particularly important and should be performed; and are essential in centres where all echocardiograms are not reported by an imaging cardiologist.

Recommendations include

Audits of a percentage of complete studies both as a department and individually. Annual individual reviews of 5–10 studies per sonographer to quantify the adherence to imaging protocols. In centres where sonographers perform in isolation, it is recommended they are invited to participate in regional quality assurance programmes.

Competing interests:
Nil.

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