



British Heart
Foundation

ECHOCARDIOGRAPHY

Guidelines for Valve and Chamber Quantification

**FIGHT
FOR EVERY
HEARTBEAT**

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In partnership with



**British Society of
Echocardiography**

Affiliated to the British Cardiovascular Society

Explanatory note & references

These guidelines have been developed by the Education Committee of the British Society of Echocardiography. They have been adapted from the international recommendations and guidelines referenced below. Where there are differences between published values, or there is a lack of clear evidence, recommended values have been developed on the basis of consensus opinion.

It is vital that echocardiographic measurements are made using standard, correct techniques and that all values are reported and interpreted in clinical context.

Valve Quantification

Recommendations for the echocardiographic assessment of native valvular regurgitation: an executive summary from the European Association of Cardiovascular Imaging.

Lancelotti et al *EJCI* 2013; 14:611-644

Guidelines on the management of valvular heart disease (version 2012). The Joint Task Force on the Management of Valvular Heart Disease of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS).

Vahanian et al *EJCI* 2012; 33:2451-2496

Aortic Dimensions

Adapted from:

Two-dimensional echocardiographic aortic root dimensions in normal children and adults. Roman MJ et al. *Am J Cardiol* 1989; **64**:507-12

Echocardiography in aortic diseases: EAE recommendations for clinical practice
Evangelista et al *EJCI* 2010; 11:645-658

Aortic stenosis

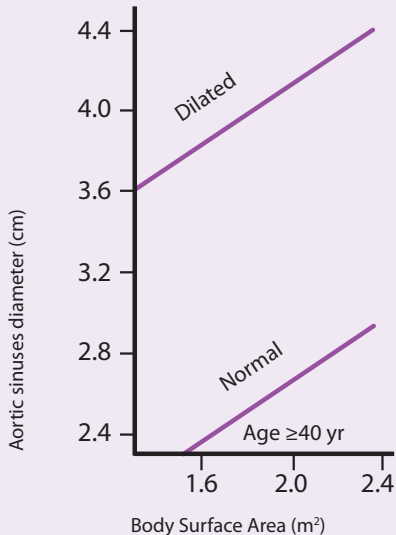
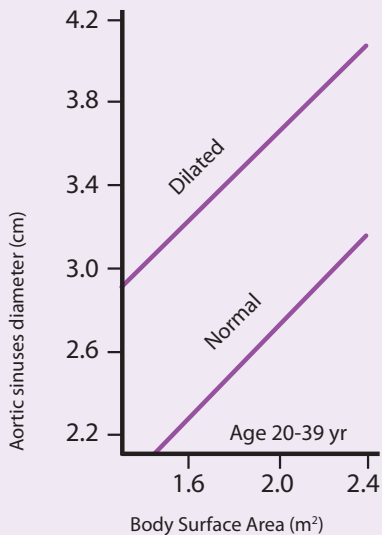
	Mild	Moderate	Severe
Peak velocity (m/s)	<2.9	3.0-3.9	>4.0
Mean pressure drop (mmHg)	<25	25-40	>40
Valve area (cm ²)	1.5-2.0	1.0-1.4	<1.0
Velocity or VTI ratio	≥0.5	0.25-0.5	≤0.25

Aortic regurgitation

Mild Moderate Severe

Vena contracta width (cm)	<0.3		>0.6
Jet width/LVOT diam. (%)	<25		≥65
Regurgitant volume (mL)	≤30	31-59	≥60
Regurgitant fraction (%)	≤30	31-49	≥50
Regurgitant orifice area (cm²)	≤0.10	0.11-0.29	≥0.30
Pressure half time (ms)	>500		<200
End Diastolic Velocity (upper DAo) (cm/s)			≥20

Aortic dimensions



Z score (BSA indexed): Dilated - $>2.1\text{cm}^2/\text{m}^2$

Mitral stenosis

	Mild	Moderate	Severe
Pressure half time (ms)	71-139	140-219	≥ 220
Mean pressure drop (mmHg)	< 5	5-10	> 10
Valve area (cm ²)	1.6-2.0	1.0-1.5	< 1.0

Mitral regurgitation (Primary Organic)

	Mild	Moderate	Severe
Vena contracta (cm)	<0.3		≥0.7
PISA radius (Nyquist 40cm/s)	<0.4		>1.0
Regurgitant volume (mL)	≤30	31-59	≥60
Regurgitant fraction (%)	≤30	31-49	≥50
Regurgitant orifice area (cm ²)	<0.20	0.21-0.39	≥0.40
MV Inflow ^(VTI) /LVOT ^(VTI)			>1.4

Tricuspid regurgitation

Mild

Moderate

Severe

VC width (cm)

Not defined

<0.7

>0.7

EROA (mm²)

≥40

Regurgitant volume (mL)

≥45

CW jet density/contour

Soft/
parabolic

Dense/
variable

Dense/
triangular early
peaking

RA/RV/IVC size

Normal

Normal/dilated

Usually dilated

Hepatic vein flow

Systolic
dominance

Systolic
blunting

Systolic
reversal

Valve Quantification

Tricuspid stenosis

Severe

Mean pressure drop (mmHg)	≥ 5
Inflow velocity-time integral (cm)	> 60
Valve area (cm ²)	< 1.0

Pulmonary stenosis

Mild

Moderate

Severe

Peak velocity (m/s)	< 3	3-4	> 4
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Valve Quantification

Pulmonary regurgitation

Severe

Jet width % of RVOT width

>65%

Pressure half-time

<100ms

Doppler PR index

< 0.77

(duration relative to diastolic cycle)

CF Doppler origin of PR jet.

From bifurcation
of branch PA

Doppler timing of PR

Pre-systolic

Explanatory note & references

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Chamber Quantification

Adapted from:

Recommendations for Chamber Quantification: A Report from the American Society of Echocardiography's Guidelines and Standards Committee and the Chamber Quantification Writing Group, Developed in Conjunction with the European Association of Echocardiography, a Branch of the European Society of Cardiology. Lang RM et al. *J Am Soc Echocardiogr* 2005; **18**:1440–1463
Right Ventricular Function

Adapted from:

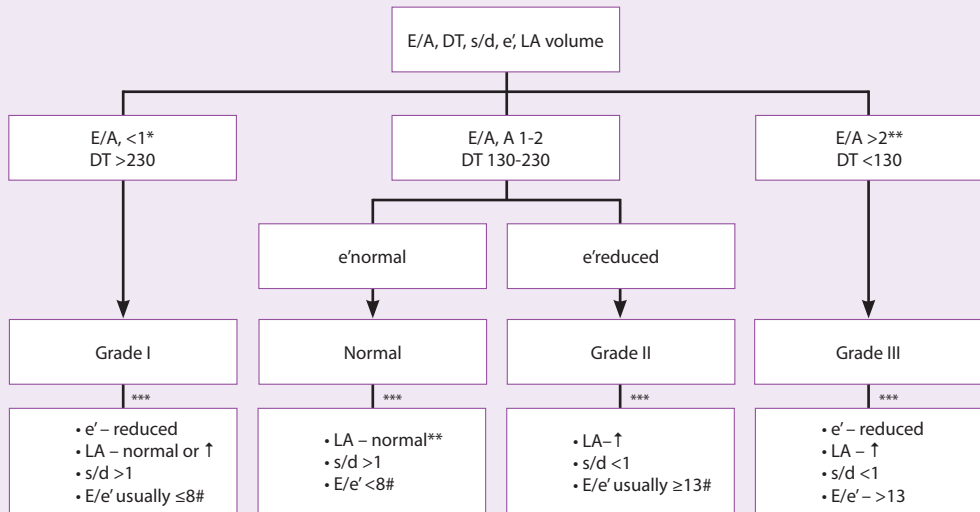
Guidelines for the Echocardiographic Assessment of the Right Heart in Adults: A Report from the ASE Endorsed by the EAE, and the CSE. Rudski, LG, et al. *J Am Soc Echocardiogr* 2010; **23**:685-713.

Left ventricular size, mass & function

	Normal	Mild	Moderate	Severe
LV wall thickness				
IVSd / PWd (cm)	0.6-1.2	1.3-1.5	1.6-1.9	≥2.0
LV dimension, women				
LVIDd (cm)	3.9-5.3	5.4-5.7	5.8-6.1	≥6.2
LVIDD / BSA (cm/m ²)	2.4-3.2	3.3-3.4	3.5-3.7	≥3.8
LV dimension, men				
LVIDd (cm)	4.2-5.9	6.0-6.3	6.4-6.8	≥6.9
LVIDD / BSA (cm/m ²)	2.2-3.1	3.2-3.4	3.5-3.6	≥3.7
LV volume, women				
LV diastolic volume (mL)	56-104	105-117	118-130	≥131
LV systolic volume (mL)	19-49	50-59	60-69	≥70
LV volume, men				
LV diastolic volume (mL)	67-155	156-178	179-201	≥202
LV systolic volume (mL)	22-58	59-70	71-82	≥83
LV volume index				
LV diastolic volume/BSA (mL/m ²)	35-75	76-86	87-96	≥97
LV systolic volume/BSA (mL/m ²)	12-30	31-36	37-42	≥43
LV function				
Fractional shortening (%)	25-43	20-24	15-19	<15
Ejection fraction (%)	≥55	45-54	36-44	≤35
EF by Biplane Simpson's method*				
LV mass, women 2D				
LV mass (g)	66-150	151-171	172-193	>193
LV mass / BSA (g/m ²)	44-88	89-100	101-112	>112
LV mass, men 2D				
LV mass (g)	96-200	201-227	228-254	>254
LV mass / BSA (g/m ²)	50-102	103-116	117-130	>130

*Please see explanatory note

Left ventricular diastolic function



*E/A 1 without any additional evidence of diastolic dysfunction can be normal above 60 years of age.

**E/A and/or increased LA size without structural heart disease can be seen in young subjects and athletes.

*** Combined with one or more parameters from below. Confidence of categorisation increases with increasing number of corroborative parameters.

If E/e' is between 9 and 12, additional measurements should be used (see text)

Left atrial size

	Normal	Mild	Moderate	Severe
LA size, women				
LA diameter (cm)	2.7-3.8	3.9-4.2	4.3-4.6	≥4.7
LA volume (mL)	22-52	53-62	63-72	≥73
LA size, men				
LA diameter (cm)	3.0-4.0	4.1-4.6	4.7-5.2	≥5.3
LA volume (mL)	18-58	59-68	69-78	≥79
LA size, index				
LA diameter (cm/m ²)	1.5-2.3	2.4-2.6	2.7-2.9	≥3.0
LA volume (mL/m ²)	16-28	29-33	34-39	≥40

Right ventricular size & function

Abnormal

RV dimensions (apical 4 chamber)

Basal RV diameter (RVD1) (cm)	>4.2
Mid RV diameter (RVD2) (cm)	>3.5
RV wall thickness (mm)	>5.0

RVOT diameters (parasternal SAX)

RVOT at AV level (RVOT1) (cm)	>3.5
RVOT at PV annulus (RVOT2) (cm)	>2.7

PA diameter (parasternal SAX)

Main PA (PA1) (cm)	>2.2
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RV area

RV diastolic area (cm ²)	>25
RV systolic area (cm ²)	>14

RV function

Fractional area change (%)	<35
TAPSE (mm)	<16

Right atrial pressure

<5mmHg

>15mmHg

IVC

size (cm)

≤ 2.1

> 2.1

Respiratory/
sniff variation

$\geq 50\%$

$< 50\%$

Other

RA size

normal



Hepatic Vein Flow

systolic dominant

systolic reversal

British Society of Echocardiography Education Committee

Richard Steeds (Chair), Gill Wharton (Lead Author), Katherine Collins, Jane Allen,
Jane Graham, Richard Jones, Bushra Rana, Liam Ring, Navroz Masani



British Heart
Foundation

Coronary heart disease is the UK's single biggest killer.

For over 50 years we've pioneered research that's transformed the lives of people living with heart and circulatory conditions. Our work has been central to the discoveries of vital treatments that are changing the fight against heart disease.

But so many people still need our help.

From babies born with life-threatening heart problems to the many Mums, Dads and Grandparents who survive a heart attack and endure the daily battles of heart failure.

Join our fight for every heartbeat in the UK. Every pound raised, minute of your time and donation to our shops will help make a difference to people's lives.

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