



Echocardiography: Guidelines for Valve Quantification

Echocardiography: Guidelines for Chamber Quantification

British Society of Echocardiography Education Committee

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BEATING HEART DISEASE TOGETHER



British
Society of
Echocardiography

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

Adapted from:

ACC/AHA 2006 guidelines for the management of patients with valvular heart disease. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines. Bonow RO et al. *J Am Coll Cardiol* 2006;**48(3)**:e1–148

EAE Recommendations for the Assessment of Valvular Regurgitation:

Part 1: Lancelotti et al. *EJE* 2010;11:223-244

Part 2: Lancelotti et al. *EJE* 2010;11:307-322

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

Aortic stenosis

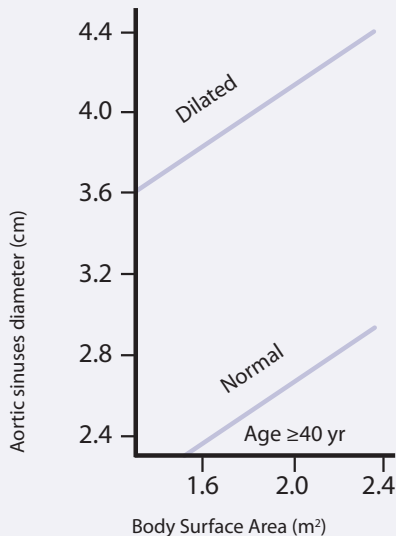
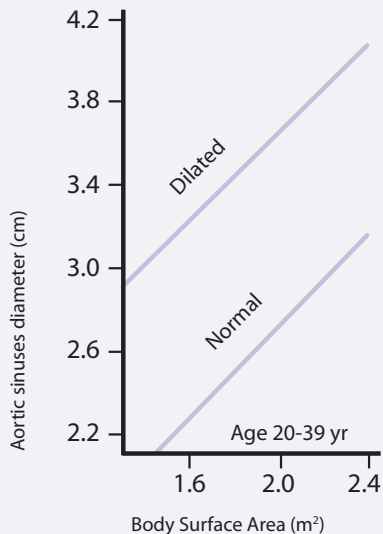
	Normal	Mild	Moderate	Severe
Peak velocity (m/s)	-	<2.9	3.0-3.9	>4.0
Mean pressure drop (mmHg)	-	<25	25-40	>40
Valve area (cm ²)	>2.0	1.5-2.0	1.0-1.4	<1.0
Velocity/VTI ratio	-	≥0.5	0.25-0.5	≤0.25

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
VTI diastolic flow reversal (upper DAA) (cm)			15
Pressure half time (ms)	>500		<250

Aortic dimensions



Mitral stenosis

	Normal	Mild	Moderate	Severe
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Pressure half time (ms)				
	40-70	71-139	140-219	>219
Mean pressure drop (mmHg)				
		<5	5-10	>10
Valve area (cm ²)				
	4.0-6.0	1.6-2.0	1.0-1.5	<1.0

Mitral regurgitation

	Mild	Moderate	Severe
Jet area / LA (%)	<20%		>40%
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 (cm²)	<0.20	0.21-0.39	≥0.40

Tricuspid regurgitation

	Mild	Moderate	Severe
Jet area (cm ²)	<5	5-10	>10
VC width (cm)	Not defined	<0.7	>0.7
PISA radius (Nyquist 40cm/s)	<0.5	0.6-0.9	>0.9
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

Tricuspid stenosis

Normal

Severe

Mean pressure drop (mmHg)

-

≥ 5

Inflow velocity-time integral (cm)

> 60

Valve area (cm²)

> 7.0

< 1.0

Pulmonary stenosis

Mild

Moderate

Severe

Peak velocity (m/s)

< 3

3-4

> 4

Valve Quantification

Pulmonary regurgitation

	Mild	Moderate	Severe
Jet size (CFM) (cm)	Narrow, <1.0	Intermediate	Wide, large
Regurgitant fraction (%)	<40	40-60	>60
CW jet density/deceleration rate	Soft/slow	Dense/variable	Dense/steep
RVOT_{VTI} / LVOT_{VTI}	↑	↑↑	↑↑↑

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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				
LV mass (g)	66-150	151-171	172-182	>182
LV mass / BSA (g/m ²)	44-88	89-100	101-112	>112
LV mass, men				
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

Chamber Quantification

Left ventricular diastolic function

	Normal	Mild ↓ Relaxation Abnormal relaxation	Moderate ↓ Relaxation ↓ Compliance ↑ LVEDP Pseudo-Normal	Severe ↓ Relaxation ↓ Compliance ↑↑ LVEDP Restrictive filling
LV inflow Doppler				
E/A ratio	1-2	<1	1-2	>2
IVRT (ms)	50-100	>100	50-100	<50
DT (ms)	150-200	>200	150-200	<150
Pulmonary venous Doppler				
PV_s / PV_d	$PV_s > PV_d$	$PV_s > PV_d$	$PV_s < PV_d$	$PV_s \ll PVD$
PVa (m/s)	<0.35	<0.35	≥ 0.35	≥ 0.35
$a_{dur} - A_{dur}$ (ms)	<20	<20	≥ 20	≥ 20
Mitral annular tissue Doppler				
E_m / A_m	1-2	<1	<1	<<1
E / E_m (average)	<8	-	-	>13

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
Base to apex length (RVD3) (cm)	>8.6

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

	0-5mmHg	5-10	10-15	15-20	>20
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IVC					
size (cm)	<1.5	1.5-2.5	1.5-2.5	>2.5	>2.5
Respiratory/ sniff variation	collapse	↓>50%	↓<50%	↓<50%	No change
Other					
RA size	normal	normal	↑	↑↑	↑↑
Hepatic vein size				↑	↑↑

Heart and circulatory disease

Heart and circulatory disease is the UK's biggest killer. Identifying signs of heart disease as early as possible can be crucial in saving a patient's life or limiting the impact on their quality of life. That's why the British Heart Foundation (BHF), the UK's heart charity, has allocated over 6 million pounds to improving the standard of echocardiography. This includes funding trainee echo technicians across the UK, providing continuing professional development funding for echocardiographers and funding the development of an online accreditation website to support departmental accreditation and quality assurance within echo services.

But we urgently need help. As a charity we rely on donations of time and money to continue our life saving work. To find out more about the BHF vision visit **bhf.org.uk**



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