

Cardiac Echo Master Values

Dr. Alice Matthews | amatthews@concorde.edu | alice@deepneuro.ai | deepneuro.ai/alice

Sources: ASE/EACVI Chamber Quantification 2015; Diastolic Function 2016; Valve Stenosis 2009/2017; Valvular Regurgitation 2017; Right Heart 2010; Thoracic Aorta 2015; ACC/AHA VHD 2020; ARDMS AE Content Outline

normal/mildmoderate

severe

LEFT VENTRICLE: DIMENSIONS & VOLUMES (ASE 2015)

Parameter	Men		Women	
	Normal	Severe	Normal	Severe
LVIDd (cm)	4.2–5.8	>6.8	3.8–5.2	>6.1
LVIDd i (cm/m ²)	2.2–3.0	>3.6	2.3–3.1	>3.7
LVIDs (cm)	2.5–4.0	>4.5	2.2–3.5	>4.1
IVSd / PW (cm)	0.6–1.0	>1.6	0.6–0.9	>1.5
RWT	0.24–0.42	>0.52	0.22–0.42	>0.53
LVEDV (mL)	62–150	>200	46–106	>130
LVEDVi (mL/m ²)	34–74	>100	29–61	>80
LVESV (mL)	21–61	>85	14–42	>67
LVESVi (mL/m ²)	11–31	>45	8–24	>40
LV mass (g)	88–224	>292	67–162	>210
LV mass i (g/m ²)	49–115	>148	43–95	>121

LV FUNCTION & GEOMETRY

Parameter	Normal / Cutoff
LVEF biplane (M/F)	52–72% / 54–74%
LVEF preserved (HFpEF)	≥50%
LVEF mid (HFmrEF)	41–49%
LVEF reduced (HFrEF)	≤40%
Fractional shortening	27–45%
LV GLS	–24 to –16%
dP/dt (MR jet)	>1000 mmHg/s
LV Tei index	<0.40

Geometry	LVMi	RWT
Normal	normal	<0.42
Concentric remodel	normal	>0.42
Eccentric hyper	high	<0.42
Concentric hyper	high	>0.42

LVMi normal: M ≤115, F ≤95 g/m²

AORTA (ASE 2015)

Segment	mm	mm/m ²
Annulus	20–31	12–14
Sinus of Valsalva	29–45	15–20
Sinotubular jx	22–36	13–17
Proximal ascending	22–36	13–17
Aortic arch	22–36	n/a
Descending thoracic	20–30	n/a

WATCH: Asc: M ≥45mm, F ≥40mm; Desc ≥55mm surgery; AAA ≥30mm, repair ≥55mm

IVC & RIGHT ATRIAL PRESSURE

IVC (cm)	Collapse	RAP	Range
≤2.1	>50%	3	0–5
≤2.1	<50%	8	5–10
>2.1	>50%	8	5–10
>2.1	<50%	15	10–20

RIGHT VENTRICLE & ATRIA

RV Dimensions (normal ranges)

Parameter	Normal
RVD1 basal	2.0–2.8 cm
RVD2 mid	2.7–3.3 cm
RVD3 length	7.1–7.9 cm
RVOT prox/dist	2.5–2.9 / 1.7–2.3
PA diameter	1.5–2.1 cm
RV wall	<5 mm

RV Function (abnormal cutoffs)

Parameter	Abnormal
TAPSE	<1.7 cm
S' TDI	<9.5 cm/s
RV FAC	<35%
RV EF	<45%
RIMP TDI/PW	>0.54 / >0.43
RV free-wall strain	>–17%

Left Atrium

	Men	Women
LA diameter (cm)	3.0–4.0	2.7–3.8

	LAVI (mL/m ²)
Normal	16–34
Mild	35–41
Moderate	42–48
Severe	>48

Right Atrium

Parameter	Abnormal
RA major	>53 mm
RA minor	>44 mm
RA area	>18 cm ²

DIASTOLIC FUNCTION (ASE 2016)

Step 1: Is dysfunction present? (3–4 of 5 positive)

Criterion	Abnormal
Septal e'	<7 cm/s
Lateral e'	<10 cm/s
Average E/e'	>14
TR velocity	>2.8 m/s
LAVI	>34 mL/m ²

Step 2: Grade

	Grade I	Grade II	Grade III
E/A	<0.8	0.8–2.0	>2.0
DT (ms)	>200	150–200	<150
Avg E/e'	≤8	9–14	>14
TR vel	≤2.8	>2.8	>2.8

Gr II = pseudonormal; E/A reverses with Valsalva

NORMAL VALVE AREAS

Valve	Normal (cm ²)
Aortic	2.5–4.0
Mitral	4.0–6.0
Tricuspid	7.0–9.0
Pulmonic	2.5–4.0

VALVE STENOSIS

Aortic Stenosis (ASE 2017)

	Mild	Mod	Severe
Vmax (m/s)	2.6–2.9	3.0–3.9	≥4.0
Mean PG	<20	20–39	≥40
AVA (cm ²)	>1.5	1.0–1.5	<1.0
DVI	>0.50	0.25–0.50	<0.25

Mitral Stenosis

	Mild	Mod	Severe
MVA (cm ²)	>1.5	1.0–1.5	<1.0
Mean PG	<5	5–10	>10
PASP	<30	30–50	>50

Tricuspid & Pulmonic

TS significant	PS grading
Mean PG ≥5 mmHg	Mild: Vmax <3, PG <36
MVA ≤1.0 cm ²	Severe: Vmax >4, PG >64

VALVE REGURGITATION

Aortic Regurgitation (ASE 2017)

	Mild	Mod	Severe
VC width	<0.3	0.3–0.6	>0.6
Jet/LVOT	<25%	25–64%	≥65%
EROA (cm ²)	<0.10	0.10–0.29	≥0.30
Regurg vol	<30	30–59	≥60
Regurg frac	<30%	30–49%	≥50%
PHT (ms)	>500	200–500	<200
Desc Ao rev	brief	intermed.	holodiast.

Mitral Regurgitation (ASE 2017)

	Mild	Mod	Severe
VC width	<0.3	0.3–0.69	≥0.7
EROA (cm ²)	<0.20	0.20–0.39	≥0.40
Regurg vol	<30	30–59	≥60
Jet area/LA	<20%	20–40%	>40%
Pulm vein	S dom	S blunting	S reversal

Tricuspid Regurgitation (ASE 2017)

	Mild	Mod	Severe
VC width	<0.3	0.3–0.69	≥0.7
EROA (cm ²)	<0.20	0.20–0.39	≥0.40
PISA radius	≤0.5	0.6–0.9	>0.9
Hepatic vein	S dom	S blunting	S reversal

KEY HEMODYNAMIC FORMULAS

Name	Equation
Bernoulli	$\Delta P = 4V^2$
Full Bernoulli	$\Delta P = 4(V_2^2 - V_1^2)$ if $V1 > 1.5$
Continuity	$\frac{\pi(d/2)^2 \times VTI_{LVOT}}{VTI_{AV}}$
DVI	VTI_{LVOT} / VTI_{AV}
MVA by PHT	$220 / PHT$
Ejection Fraction	$\frac{EDV - ESV}{EDV} \times 100$
Stroke Volume	$CSA_{LVOT} \times VTI_{LVOT}$
Cardiac Output	$SV \times HR$
Cardiac Index	CO / BSA
PASP	$4V_{TR}^2 + RAP$
PADP	$4V_{PR,ED}^2 + RAP$
PISA EROA	$\frac{2\pi r^2 \times V_{alias}}{V_{max}}$
Regurgitant Vol	$EROA \times VTI_{regurg}$
Regurgitant Frac	$RVol / SV_{total} \times 100$
Frac Shortening	$\frac{LVIDd - LVIDs}{LVIDd} \times 100$
dP/dt	$32 / \Delta t$ (1 → 3 m/s)
Tei Index	$(IVCT + IVRT) / ET$
Qp:Qs	$\frac{CSA_{RVOT} \times VTI_{RVOT}}{CSA_{LVOT} \times VTI_{LVOT}}$

NORMAL CHAMBER PRESSURES (MMHG)

Chamber	Syst	Diast	Mean
Right atrium	n/a	n/a	0–8
Right ventricle	15–30	0–8	n/a
Pulmonary art	15–30	4–14	9–16
Left atrium	n/a	n/a	2–12
Left ventricle	90–140	5–12	n/a
Aorta	90–140	60–90	70–105

WATCH: PASP >35 = elevated | mPAP >25 = PH | PADP >15 = elevated

PISA METHOD

Step	How
1. Zoom valve	Color, Nyquist 30–40
2. Shift baseline	Enlarge aliasing shell
3. Measure <i>r</i>	Hemisphere radius (cm)
4. EROA	$2\pi r^2 \times V_{alias} / V_{max}$
5. RVol	$EROA \times VTI_{regurg}$

NORMAL DOPPLER VALUES

Measurement	View	Normal
LVOT VTI	PW, A5C	18–22 cm
LVOT diameter	2D, PLAX	1.8–2.2 cm
Peak AV vel	CW, A5C	<2.5 m/s
Mitral E	PW, MV tips	60–100 cm/s
Mitral A	PW, MV tips	40–70 cm/s
E/A ratio	PW, MV tips	0.8–1.5
Septal e’	TDI, A4C	≥8 cm/s
Lateral e’	TDI, A4C	≥10 cm/s
Avg E/e’	calc	<14
DT	PW, MV tips	150–220 ms
IVRT	PW/TDI	60–90 ms
TR peak vel	CW, A4C	<2.8 m/s
Stroke vol	calc	60–100 mL
SV index	calc	33–47 mL/m²
Cardiac output	calc	4–8 L/min
Cardiac index	calc	2.5–4.0 L/min/m²

ELEVATED FILLING PRESSURES (ASE 2016)

Assess all 4 criteria:
1. Average E/e’ ≥15
2. Septal e’ <8 or lateral e’ <10 cm/s
3. TR velocity >2.8 m/s
4. LAVI >34 mL/m²
3–4 pos = elevated | 2 = indeterminate | 0–1 = normal

PERICARDIAL EFFUSION

Grade	Size (mm)	Volume
Small	<10	<300 mL
Moderate	10–20	500–700 mL
Large	>20	>700 mL

CORONARY TERRITORIES (17-SEG)

Segments	
Level	Segments
Basal (6)	1–6 (Ant sep, Ant, Inf sep, Inf, Lat, Post)
Mid (6)	7–12
Apical (4)	13–16
Apex (1)	17

Artery Distribution

Artery	Segments
LAD	1, 2, 7, 8, 13, 14, 17
LCx	5, 6, 11, 12, 16
RCA	3, 4, 9, 10, 15

WALL MOTION SCORING

Score	Finding	Thickening
1	Normal	>30%
2	Hypokinetic	10–30%
3	Akinetic	<10%
4	Dyskinetic	Paradoxical
5	Aneurysmal	Diast deform

WMSI = sum / # segs; **normal = 1.0**; >1.7 = significant

DOPPLER MODES

	PW	CW	Color
Range gate	Yes	No	2D map
Vel limit	Nyquist	Unlimited	Nyquist
Best for	E/A, VTI	AS, MR, TR	Jets, PISA

STANDARD ECHO VIEWS

View	Key Measurements
PLAX	LVOT, root, IVS, PW
PSAX	AoV, PA, RVOT
A4C	RV, TAPSE, TR, e’
A2C	LV volumes (Simpson’s)
A5C	LVOT VTI, AV velocity
Subcostal	IVC, RAP
Suprasternal	Aortic arch

All values from ASE/EACVI guidelines unless noted. For adult patients. Always index to BSA where indicated. Valve grading uses an integrated approach (never rely on a single parameter).