

Week 10: Cumulative Registry Review & Mock-Board Prep

CVSG2280 Cardiovascular Registry Review by Dr. Alice Matthews

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Registry weight this week: W10 is the capstone; it touches *every* domain on both boards. **ARDMS RDCS (Adult Echo V24.2):** Anatomy/Physiology 15%, Pathology 40%, Clinical Care/Safety 11%, Measurement/Views 25%, Instrumentation 9% (these are the whole exam). **CCI RCS:** Domain A 9%, Domain B 24%, Domain C 25%, Domain D 29%, Domain E 13% (these are the whole exam). Because this is the cumulative review, treat all five CCI domains and all five RDCS content areas as in scope. The two biggest single buckets to over-prepare are CCI Domain D (Anatomy/Physiology/Hemodynamics, 29%) and RDCS Pathology (40%).

Note to students: This consolidation follows the same free ASE landing pages used all term: [ASE Chamber Quantification](#), the [ASE 2025 LV Diastolic Function update](#) and the [ASE 2025 Right Heart and Pulmonary Hypertension guideline](#), and [ASE native valvular regurgitation](#). Exam structure is from the [CCI RCS blueprint](#) and the [ARDMS RDCS outline](#). **What last week gave you:** Week 9 closed the content arc (congenital, masses, ethics and scope of practice); this week reassembles W1 through W9 into one timed, test-ready package. Always defer to the protocol your clinical site follows.

At a Glance: this week in one box

Must-know numbers (memorize cold). EF preserved $\geq 50\%$; severe AS: AVA $< 1.0 \text{ cm}^2$, mean gradient $\geq 40 \text{ mmHg}$, DI < 0.25 ; severe MS: MVA $< 1.0 \text{ cm}^2$; E/A normal 0.8 to 2.0; average E/e' normal < 8 , abnormal > 14 ; TR Vmax $\leq 2.8 \text{ m/s}$ normal; mean PAP $> 20 \text{ mmHg}$ defines pulmonary hypertension; surgical aorta $\geq 5.5 \text{ cm}$ (or $> 2.75 \text{ cm/m}^2$ if Marfan/bicuspid); Qp/Qs > 1.5 is a significant shunt.

Formulas you will reuse. $\Delta P = 4V^2$; AVA = $(CSA_{LVOT} \times VTI_{LVOT}) / VTI_{AV}$; MVA = $220 / PHT$; EROA = $(2\pi r^2 V_{alias}) / V_{max}$; RVSP = $4(V_{TR})^2 + RAP$; E/e'; Qp/Qs.

Top 3 EOM traps. (1) PSAX chordal level shows **basal** segments, not mid. (2) E/A normal is **0.8 to 2.0**, not a single diastolic grade. (3) AFib LA thrombus lives in the **LAA**, not the interatrial septum.

Master Formula Table (W1 through W9, Consolidated)

This is not new content; it reassembles nine weeks into one test-ready package. ★ Every number in this guide is the canonical value shared across all ten guides; if a practice question disagrees, trust these.

Cardiac dimensions and chamber quantification.

Quantity	Formula	Reused in
Ejection fraction (Simpson biplane)	$EF = (EDV - ESV) / EDV \times 100\%$	W1, W7
Fractional shortening	$FS = (LVIDd - LVIDs) / LVIDd \times 100\%$	W1, W7
LV mass (Devereux)	$1.04 \times [(LVID + PW + IVS)^3 - LVID^3] - 13.6 \text{ g}$	W7
Stroke volume	$SV = CSA_{LVOT} \times VTI_{LVOT}$	W1, W4
Cardiac output / index	$CO = SV \times HR$; $CI = CO / BSA$	W1, W7
LA volume / index	$LAV = (A_1 \times A_2 / L) \times 0.85$; $LAVi = LAV / BSA$	W1, W7

Doppler and hemodynamic measurements. The high-yield core (Bernoulli, continuity AVA, DI, PHT MVA, PISA EROA, RVSP, E/e') is boxed in Essential Formulas at the end. The pressure and resistance estimates are below.

Quantity	Formula	Cutoff
Regurgitant volume / fraction	$RVol = EROA \times VTI_{regurg}$; $RF = RVol / SV \times 100\%$	severe $RF \geq 50\%$
dP/dt (contractility)	$dP/dt = \Delta P / \Delta t$ ($\Delta P = 32$ mmHg, 1 to 3 m/s)	normal > 1200 mmHg/s
PA diastolic pressure	$PADP = 4(PR \text{ end-diastolic vel})^2 + RAP$	n/a
Mean PA pressure	$mPAP = 1/3 \text{ PASP} + 2/3 \text{ PADP}$	PH if > 20 mmHg
Pulmonary vascular resistance	$PVR = 10 \times (TR \text{ Vmax} / RVOT \text{ VTI}) + 0.16$	normal < 3 Wood units

Diastolic, strain, and shunt flow. E/A ratio = peak early / peak atrial mitral inflow (normal 0.8 to 2.0); E/e' = E velocity / e' (average normal < 8); myocardial strain = $(L_2 - L_1) / L_1 \times 100\%$ (GLS normal -17 to -24% men, -18 to -26% women); shunt ratio $Q_p/Q_s = RVOT \text{ SV} / LVOT \text{ SV}$ (significant left-to-right if > 1.5); shunt fraction = $(Q_p - Q_s) / Q_p \times 100\%$.

Common Trap

A practice question gives you a mitral prosthesis with a long pressure half-time and asks you to compute valve area with $MVA = 220 / PHT$. The arithmetic is easy. **What is the error?**

The 220 constant was derived for *native* rheumatic mitral valves and is invalid on a prosthesis. On a prosthetic mitral valve, a new or rising mean gradient versus the patient's baseline study is the red flag, not a calculated area. The same caution applies in significant aortic regurgitation, where AR shortens the decay slope and falsely lowers the apparent MVA.

Master Normal Values and Cutoff Tables (All Weeks)

LV systolic function. ★

Parameter	Normal	Mildly reduced	Moderately reduced	Severely reduced
LVEF (%)	≥ 50 (preserved)	41 to 49	30 to 40	< 30
Fractional shortening (%)	25 to 45	18 to 24	10 to 17	< 10
dP/dt (mmHg/s)	> 1200	800 to 1200	n/a	< 800
LVOT VTI (cm)	18 to 22	n/a	n/a	n/a
Cardiac output (L/min)	4 to 8	n/a	n/a	< 4
Cardiac index (L/min/m ²)	2.5 to 4.0	n/a	n/a	< 2.0

LV diastolic function grading (ASE/EACVI 2016 algorithm, registry standard). ★

Grade	E/A	DT (ms)	Lateral e' (cm/s)	E/e'	LAVi (mL/m ²)	Pattern
Normal	0.8 to 2.0	160 to 200	> 10	< 8	< 28	S $>$ D
I (impaired relaxation)	< 0.8	> 200	< 10	8 to 14	normal or elevated	S $>$ D
II (pseudonormal)	0.8 to 2.0	160 to 200	< 10	> 14	> 34	S blunted/reversed

Grade	E/A	DT (ms)	Lateral e' (cm/s)	E/e'	LAVi (mL/m ²)	Pattern
III (restrictive)	> 2.0	< 160	< 10	> 14	> 34	S reversed

At a Glance: this week in one box

ASE 2025 update (labeled; the 2016 cutoffs above remain the registry answer). The 2025 ASE LV Diastolic Function and HFpEF update lowered the tissue-Doppler cutoffs and added a strain variable. Show both: use the 2016 numbers on the registry unless a question explicitly references the 2025 guideline. Lateral e' abnormal ≤ 7 cm/s (was < 10); septal e' abnormal ≤ 6 cm/s (was < 7); average e' abnormal ≤ 6.5 cm/s (new averaged variable); site-specific E/e' (average ≥ 14 , septal ≥ 15 , lateral ≥ 13); and LA reservoir strain $\leq 18\%$ as a new variable. The single biggest change: lateral e' < 10 becomes ≤ 7 cm/s.

Memory hook: Grade I is **impaired relaxation** (slow, stiff start), Grade II is **pseudonormal** (looks normal but pressures are up), Grade III is **restrictive** (high pressure, fast filling). Read the ladder in that order and the e prime and E/e prime tell you which rung you are on.

Strain. Normal GLS is -17 to -24% (men) and -18 to -26% (women); abnormal is worse than -16% (i.e., closer to 0, such as -12%). RV free wall strain normal $-29 \pm 4.5\%$ (abnormal worse than -20%); LA reservoir strain normal $\geq 39\%$ (abnormal $< 23\%$). ★ Amyloid shows **apical sparing** (apex less negative than base, ratio ≥ 2).

Valvular stenosis (ASE 2017). ★

Valve	Parameter	Mild	Moderate	Severe
Aortic	Peak velocity (m/s)	< 3.0	3.0 to 4.0	≥ 4.0
Aortic	Mean gradient (mmHg)	< 20	20 to 40	≥ 40
Aortic	AVA (cm ²)	> 1.5	1.0 to 1.5	< 1.0
Aortic	Indexed AVA (cm ² /m ²)	> 0.85	0.60 to 0.85	< 0.60
Aortic	Dimensionless index	> 0.50	0.25 to 0.50	< 0.25
Mitral	Mean gradient (mmHg)	< 5	5 to 10	> 10
Mitral	MVA (cm ²)	> 1.5	1.0 to 1.5	< 1.0
Mitral	PHT (ms)	< 150	150 to 220	> 220
Pulmonic	Peak velocity (m/s)	< 3	3 to 4	> 4
Pulmonic	Peak gradient (mmHg)	< 36	36 to 64	> 64

Valvular regurgitation, severe cutoffs (ASE 2017).

Valve	VC (cm)	EROA (cm ²)	RVol (mL)	RF (%)
Aortic	> 0.6	≥ 0.30	≥ 60	≥ 50
Mitral (primary/organic)	> 0.7	≥ 0.40	≥ 60	≥ 50
Mitral (sec-ondary/functional)	> 0.4	≥ 0.20	≥ 30	≥ 50
Tricuspid	≥ 0.7	n/a	n/a	n/a

Aortic dimensions (ACC/AHA 2022). Normal: annulus 1.8 to 2.6 cm, sinuses of Valsalva 2.1 to 3.5 cm, sinotubular

junction 1.7 to 3.4 cm, ascending < 3.6 cm (men) / < 3.4 cm (women), arch < 3.8 cm, descending thoracic < 3.0 cm, abdominal < 2.0 cm. ★ Surgical threshold ≥ 5.5 cm (or > 2.75 cm/m² indexed in Marfan/bicuspid).

Common Trap

Two questions in a row use aortic root numbers. The first uses an absolute diameter, the second indexes to body surface area and the answer choices are in cm/m². A student applies the 5.5 cm surgical threshold to both. **What is the error?**

The indexed Marfan/bicuspid surgical threshold is > 2.75 cm/m², not 5.5 cm. Absolute thresholds (sinus < 4.0 normal, ≥ 5.5 surgical) are simpler and used most often on the registry, but when the units are cm/m² you are in the indexed pathway. Read the units before you read the number.

Right heart and PA pressure (ASE 2025). ★ Normal: TAPSE ≥ 1.7 cm, RV S' (TDI) ≥ 10 cm/s, TR Vmax ≤ 2.8 m/s, IVC < 2.1 cm with $> 50\%$ collapse. Abnormal flips each of these. Mean PAP > 20 mmHg now defines pulmonary hypertension.

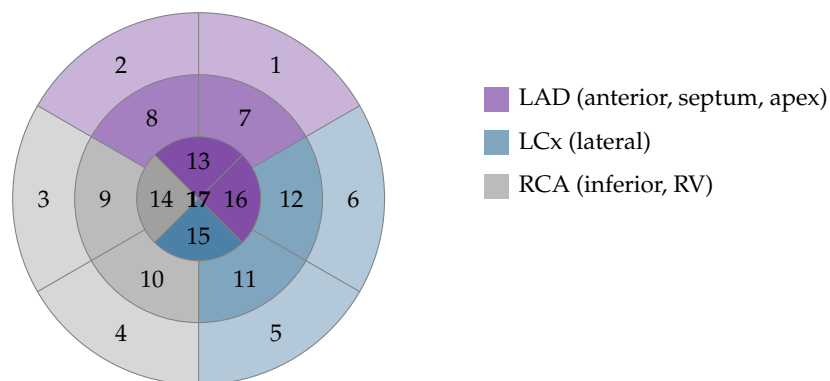
Memory hook: RAP from the IVC reads as **3, 8, 15**: small and collapsing IVC = 3 mmHg, the in-between state = 8 mmHg, dilated and non-collapsing = 15 mmHg (ASE 2015 point estimates). PASP > 35 to 40 mmHg by echo remains the practical screening flag even though mean PAP > 20 mmHg now defines the disease.

Pericardial pathology. Effusion size: small > 1 cm, moderate > 2 cm, large > 3 cm. ★ Tamponade signs: RA systolic collapse (high specificity) and RV diastolic collapse lasting > 100 ms (high sensitivity). Constraint physiology: mitral inflow respiratory variation $> 25\%$, tricuspid $> 40\%$, pericardial thickness > 3 mm, and a septal bounce.

Constriction sign	Normal	Constriction
Pericardial thickness (CT/MRI)	< 3 mm	> 3 mm
Septal bounce	absent	present

Coronary Territory to Wall Segment Map (Foundational for RWMA)

Image-based registry items lean hard on the 17-segment model. If you can color a bullseye by coronary territory, you can read regional wall motion in any view and back it into the culprit artery.



ASE 17-segment bullseye. Apex (segment 17) is usually LAD but can be RCA depending on dominance. Segment numbering and territory assignment follow the ASE standard.

Territory	Artery	Segments
Anterior wall, septum, apex	LAD	1, 2, 7, 8, 13, 14, 17
Lateral wall	LCx	5, 6, 11, 12
Inferior wall, RV	RCA (or LCx)	3, 4, 9, 10, 15, 16

Memory hook: LAD = front and middle (anterior wall, septum, apex), LCx = the side (lateral), RCA = the bottom and the right (inferior wall, RV). Match an RWMA territory to its artery and the image-based culprit-lesion question answers itself.

Common Trap

A still labeled "PSAX at the chordal level" shows the LV in short axis. The question asks which segments you are looking at and offers "mid" and "basal" as choices. The chords sit below the leaflet tips, so a student picks mid. **What is the error?**

Per the ASE 17-segment model, the basal/mid boundary is at the tips of the open mitral leaflets. The chordal level sits at or just below the tips, which places it in the **lower basal** zone, so the segments seen are basal, not mid. Only half of a prior cohort answered this correctly; it is a recurring trap.

Wall motion grading. 1 = normal (thickening and inward motion); 2 = hypokinetic (reduced); 3 = akinetic (absent thickening); 4 = dyskinetic (paradoxical outward bulge); 5 = aneurysmal. **Memory hook:** Count up with severity: **normal, hypo, a (no), dys (wrong way), aneurysm.**

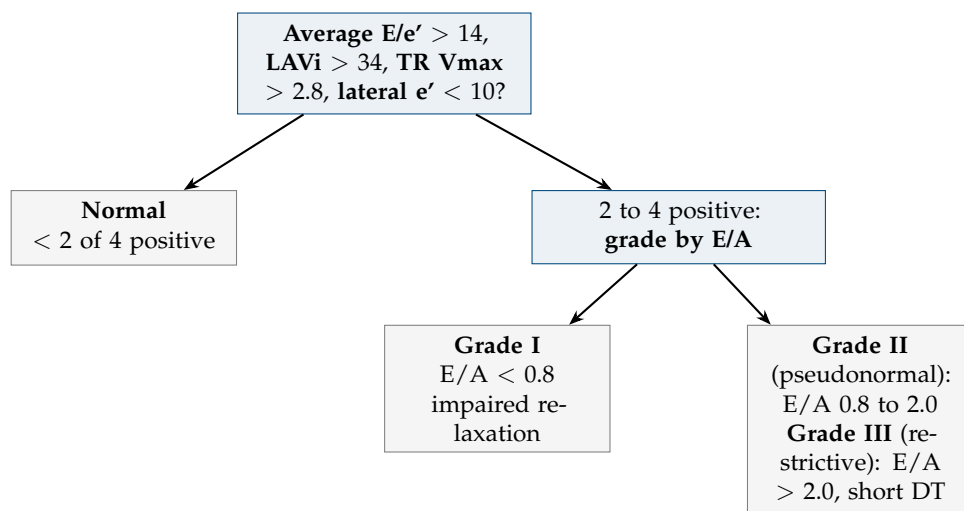
Echocardiographic View Anatomy Summary (W1 through W9)

Half of registry image items are answered the moment you name the view. Memorize probe position and the headline anatomy for each window.

View	Probe position	Key anatomy	Registry focus
PLAX	4th ICS, left of sternum	RV, LV, LA, aortic root, MV, LVOT	LVOT diameter, aortic root, LV function
PSAX base	rotate 90 degrees from PLAX	AV (3 cusps), RVOT, PV, TV	AV planimetry, RVOT, pulmonic valve
PSAX papillary	further toward apex	papillary muscles, mid LV	mid-LV wall motion, dimensions
A4C	5th ICS, mid-clavicular	all four chambers, IVS, MV, TV	chamber size, function, strain, shunts
A2C / A3C	rotate from A4C	inferior/anterior walls; LVOT and AV (A3C)	wall motion, MV inflow, LVOT VTI
Subcostal	below xiphoid	IVC, RA, RV, liver	IVC size and collapse (RAP), pericardium
Suprasternal	suprasternal notch	ascending aorta, arch, descending aorta	aortic root, dissection, coarctation

TEE windows (W2). Transgastric (best for RV, descending aorta); mid-esophageal (best for all four valves, ASD/PFO with bubble study, LAA thrombus); upper esophageal (aortic arch, descending thoracic aorta). ★ TEE is the registry's go-to answer for LAA thrombus, prosthetic valve dysfunction, and small vegetations.

Diastolic Function Flowchart (ASE/EACVI 2016 algorithm, registry standard)



ASE/EACVI 2016 algorithm (registry standard): start with the four pillars (average E/e' > 14, $LAVi$ > 34, $TR Vmax$ > 2.8, lateral e' < 10); if fewer than two are positive, filling pressure is normal; if two to four are positive, grade by the E/A ratio. The 2025 update lowers the e' cutoffs (lateral ≤ 7 , septal ≤ 6 , average ≤ 6.5 cm/s) and adds LA reservoir strain $\leq 18\%$; see the labeled 2025 box above.

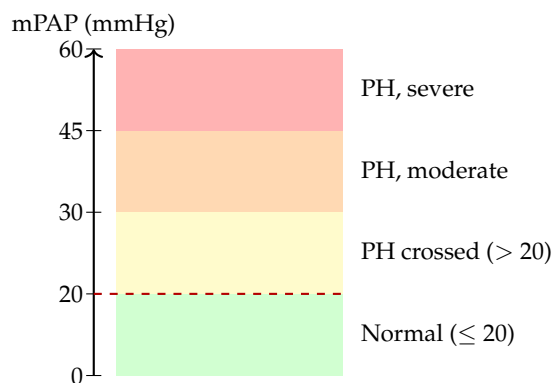
Figure pending: mitral inflow PW Doppler (E and A waves).

Common Trap

A young, healthy 25-year-old has an E/A ratio of 1.8. A practice item flags this as Grade III restrictive filling because the E wave towers over the A wave. **What is the error?**

Normal E/A is 0.8 to 2.0, so 1.8 is normal, not restrictive. Restrictive (Grade III) requires $E/A > 2.0$ plus a short DT (< 160 ms), elevated E/e' (> 14), and dilated $LAVi$ (> 34). A high E/A alone, with normal e' and E/e' , is the expected pattern in a young, compliant ventricle. Do not grade from one number.

PA Pressure Ladder and Right Heart



The 2025 definition lowered the disease threshold to mean PAP > 20 mmHg (was > 25). PASP > 35 to 40 mmHg by echo remains the practical screening cutoff.

Tamponade versus constriction (a perennial 0-percent-correct item).

Feature	Tamponade	Constriction
Underlying problem	fluid compressing the heart	stiff, thickened pericardium
Chamber collapse	RA systolic, RV diastolic collapse	none
Septal bounce	absent	present
Pericardial thickness	normal	> 3 mm

Feature	Tamponade	Constriction
Heart sounds	muffled (Beck triad)	pericardial knock
Respiratory variation	exaggerated inflow variation	exaggerated inflow variation

Common Trap

A patient with sharp pleuritic chest pain has a scratchy, to-and-fro sound on auscultation. The chart says "muffled heart sounds." A student equates the two and calls a large tamponade. **What is the error?**

A friction rub (scratchy, to-and-fro) is the sound of inflamed pericardial surfaces rubbing in *pericarditis* and it disappears as fluid accumulates. Muffled heart sounds (part of Beck triad: hypotension, jugular venous distension, muffled sounds) indicate a large effusion or tamponade. A pericardial knock points to constriction, not effusion. These three sounds map to three different diagnoses.

Image Recognition Workflow for the Mock Board

Run the same six steps on every image item. **Memory hook: V-L-D-F-P-M:** View, Landmarks, Dimensions, Function, Pathology, Match to diagnosis.

1. **View:** which projection and probe position? (PLAX, PSAX, A4C, subcostal, suprasternal, TEE)
2. **Landmarks:** find the chambers, valves, aorta, or relevant structure.
3. **Dimensions:** is a chamber enlarged, normal, or small?
4. **Function:** normal, hypokinetic, akinetic, or dyskinetic wall motion? EF preserved?
5. **Pathology:** vegetation, effusion, thrombus, flap, jet, mass, gradient?
6. **Match:** integrate with the clinical stem (for example, anterior RWMA in the LAD territory plus chest pain = anterior STEMI).

High-yield image targets. ★ Mitral stenosis (hockey-stick doming, small PSAX area); aortic stenosis (thick calcified AV, dense high-velocity mid-peaking CW); MR (PISA, dense CW, pulmonary vein systolic reversal); AR (holodiastolic flow reversal in descending aorta); aortic dissection (intimal flap, true/false lumen on TEE); pericardial effusion with RA/RV collapse; ASD/VSD (positive bubble study); LA myxoma (stalked mass prolapsing through MV); amyloidosis (apical-sparing strain "cherry on top," granular myocardium, biatrial dilation); HCM (SAM, LVOT gradient, "ace of spades" apex); LAA thrombus on TEE.

Figure pending: rheumatic mitral stenosis, hockey-stick doming.

Figure pending: cardiac amyloidosis, thick granular myocardium.

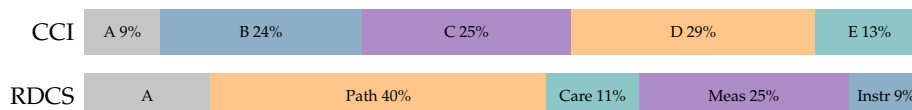
Memory hook: Carcinoid is right-side only (TV + PV) because vasoactive metabolites are cleared by the lungs; left-side carcinoid lesions imply a right-to-left shunt or pulmonary metastases. **Memory hook: AFib thrombus lives in the LAA** (about 90% of cases in nonvalvular AF), not the interatrial septum; TEE is the gold standard for detection.

Test-Taking Strategy and Weak-Topic Self-Assessment

Exam mechanics. ★

Exam	Questions	Time	Passing	Item formats
CCI RCS (post-2023)	170 (150 scored + 20 pilot)	3 hours	650 (scaled 0 to 900)	MC, multiple-response, hot-spot, drag-and-place
ARDMS RDCS V24.2	150	3 hours	scaled pass/fail	MC, hot-spot image-based

Timing. CCI: 170 questions in 180 minutes is about 64 seconds each; aim to clear 85 to 90 questions by the 90-minute mark, flag hard items, and return. RDCS: 150 in 180 minutes is about 72 seconds each, with a little more room for image items. **Memory hook: Pace, flag, return:** never burn five minutes on one question on the first pass.



Exam blueprint weights. CCI Domain D (29%) and RDCS Pathology (40%) are the largest single buckets; budget your final review proportionally.

Where students slip (by CCI domain). **A (9%, non-imaging):** grew from 5% in 2023; CVSG2280 underteaches it, so over-review patient prep, probe disinfection (Tristel/Trophon), report writing, and when to interrupt the physician for critical findings. **B (24%, imaging):** 3D and strain were added in 2023; know image-quality optimization and agitated saline. **C (25%, valvular):** memorize the cutoff tables and the primary-versus-secondary MR difference. **D (29%, anatomy/physiology/hemodynamics):** the 2016 diastolic grading algorithm (the registry standard, with the labeled 2025 cutoff update) and amyloid apical sparing are heavily tested. **E (13%, physics):** Nyquist, PRF, aliasing, and artifacts are often the weakest area; review Edelman or Reynolds.

Weak-topic self-map. Use Canvas gradebook data to find modules where you scored below 75%, then target W7 (diastolic, strain, hemodynamics), W8 (aorta, pericardium, PA pressure), W9 (congenital, masses, ethics), and W4 (valves). Two to three focused hours per weak module beats a broad re-read.

Final checklist before you sit.

- ☐ Place all 17 LV segments by location and territory.
- ☐ Name three findings that separate constriction from restriction.
- ☐ Define annuloaortic ectasia and why it matters.
- ☐ Calculate RVSP from TR velocity and estimate RAP from the IVC.
- ☐ Grade diastolic dysfunction with the 2016 ASE/EACVI algorithm (registry standard) from memory, and recall the labeled 2025 e' update.
- ☐ Tell a myxoma from a thrombus from a fibroelastoma on a still.
- ☐ State your scope of practice (what you do and do not do).
- ☐ Complete at least three full-length timed practice exams this week.

Common Trap

A timed practice exam stem describes annuloaortic ectasia and asks for the definition. A student picks "a discrete saccular aneurysm of the ascending aorta." **What is the error?**

Annuloaortic ectasia is *diffuse* dilation of the aortic annulus, sinuses of Valsalva, and ascending aorta as one continuous process (a tulip-bulb or pear shape), not a discrete saccular aneurysm. It is associated with Marfan, other connective-tissue disorders, bicuspid aortic valve, and hypertension; surgical threshold is ≥ 5.5 cm absolute, or > 2.75 cm/m² when indexed in Marfan/bicuspid patients. A prior cohort scored 0% on this item, so commit it to memory.

Essential Formulas

Simplified Bernoulli: $\Delta P = 4V^2$ converts a Doppler velocity into a pressure gradient (modified form $\Delta P = 4(V_2^2 - V_1^2)$ when $V_1 \geq 1.5$ m/s). *Plain English:* a faster jet means a bigger pressure drop. *Why it matters:* every gradient on both boards, from AS to TR, starts here.

Continuity (AVA): $AVA = \frac{CSA_{LVOT} \times VTI_{LVOT}}{VTI_{AV}}$ where $CSA_{LVOT} = \pi(d/2)^2$. *Plain English:* what flows into the LVOT must come out the valve. *Why it matters:* the backbone of aortic stenosis grading; severe AS is $AVA < 1.0$ cm².

Dimensionless index: $DI = \frac{VTI_{LVOT}}{VTI_{AV}}$ *Plain English:* a ratio that needs no diameter, so it sidesteps the biggest measurement error in AS. *Why it matters:* $DI < 0.25$ flags severe AS even when the LVOT diameter is uncertain.

Pressure half-time (MVA): $MVA = \frac{220}{PHT}$ *Plain English:* the slower the mitral inflow decays, the tighter the valve. *Why it matters:* grades mitral stenosis but is invalid on a prosthesis or with significant AR.

PISA (regurgitation): $EROA = \frac{2\pi r^2 \times V_{alias}}{V_{max}}$ and $RVol = EROA \times VTI_{regurg}$. *Plain English:* the size of the converging color hemisphere tells you the leak's true orifice. *Why it matters:* the most quantitative MR severity tool on the registry.

RVSP via TR: $RVSP = 4(V_{TR})^2 + RAP$ *Plain English:* the TR jet speed plus right atrial pressure gives RV systolic pressure. *Why it matters:* the single most tested right-heart calculation; subtract any pulmonic gradient before calling it PASP.

E/e' (filling pressure): $E/e' = \frac{\text{mitral } E}{e'}$ *Plain English:* inflow speed divided by how fast the annulus relaxes estimates LV filling pressure. *Why it matters:* average > 14 is the headline abnormal cutoff in the diastolic flowchart.

Shunt ratio: $Qp:Qs = \frac{SV_{pulm}}{SV_{syst}}$ *Plain English:* pulmonary flow over systemic flow measures how big a shunt is. *Why it matters:* $Qp/Qs > 1.5$ marks a hemodynamically significant left-to-right shunt that may need closure.

One-Page Cutoff Cheat Sheet

Topic	Key threshold	Number
LV systolic	EF preserved	$\geq 50\%$
Aortic stenosis	severe AVA / mean gradient / DI	$< 1.0 \text{ cm}^2$ / $\geq 40 \text{ mmHg}$ / < 0.25
Mitral stenosis	severe MVA / PHT	$< 1.0 \text{ cm}^2$ / $> 220 \text{ ms}$
Mitral regurg (primary)	severe EROA / RVol	$\geq 0.40 \text{ cm}^2$ / $\geq 60 \text{ mL}$
Mitral regurg (secondary)	severe EROA / RVol	$\geq 0.20 \text{ cm}^2$ / $\geq 30 \text{ mL}$
Aortic regurg	severe RF / VC	$\geq 50\%$ / $> 0.6 \text{ cm}$
Diastolic	E / A normal; avg E/e' abnormal	0.8 to 2.0; > 14
Right heart	TR Vmax abnormal; TAPSE abnormal	$> 2.8 \text{ m/s}$; $< 1.7 \text{ cm}$
Pulmonary HTN	mean PAP defining	$> 20 \text{ mmHg}$
Aorta surgical	absolute; indexed (Marfan/bicuspid)	$\geq 5.5 \text{ cm}$; $> 2.75 \text{ cm/m}^2$
Shunt	significant Qp/Qs	> 1.5
Strain	GLS abnormal	worse than -16% (closer to 0, e.g. -12%)

Glossary

- **EF** — ejection fraction; preserved $\geq 50\%$
- **FS** — fractional shortening; linear M-mode systolic measure
- **SV / CO / CI** — stroke volume / cardiac output / cardiac index
- **VTI** — velocity-time integral (Doppler envelope area, cm)
- **LVOT** — left ventricular outflow tract
- **AVA / MVA** — aortic / mitral valve area (cm^2)
- **DI** — dimensionless index; severe AS < 0.25
- **PHT** — pressure half-time; invalid on prosthetic MV
- **EROA** — effective regurgitant orifice area (cm^2)
- **VC** — vena contracta; narrowest part of a regurgitant jet
- **RVol / RF** — regurgitant volume / fraction
- **E / A** — early passive / late atrial mitral inflow velocity
- **e'** — tissue-Doppler mitral annular relaxation velocity
- **E/e'** — surrogate for LV filling pressure
- **LAVi** — left atrial volume index (mL/m^2)

- **GLS** — global longitudinal strain
- **TAPSE** — tricuspid annular plane systolic excursion
- **RVSP / PASP** — RV / pulmonary artery systolic pressure
- **RAP** — right atrial pressure (IVC size + collapse: 3/8/15)
- **Qp/Qs** — pulmonary-to-systemic shunt ratio
- **RWMA** — regional wall motion abnormality
- **SAM** — systolic anterior motion (HCM, dynamic LVOT obstruction)
- **LAA** — left atrial appendage; usual AFib thrombus site
- **AAE** — annuloaortic ectasia; diffuse root + ascending dilation
- **Beck triad** — hypotension, JVD, muffled sounds (tamponade)
- **Nyquist** — max unambiguous velocity (PRF/2) before aliasing

Registry Connection

Where this week lands on the boards. W10 is the integrator: it feeds **all five ARDMS RDCS content areas** (Anatomy/Physiology, Pathology, Clinical Care/Safety, Measurement/Views, Instrumentation) and **all five CCI RCS domains (A through E)**, with the heaviest pull on **CCI Domain D (Anatomy/Physiology/Hemodynamics, 29%)** and **RDCS Pathology (40%)**. **Item formats to expect:** traditional multiple choice, multiple-response (select all that apply), hot-spot image clicks, and drag-and-place on CCI; multiple choice plus image-based hot-spot on ARDMS. Practice the V-L-D-F-P-M image workflow until it is automatic, and rehearse pacing (about 64 seconds per CCI question, 72 per RDCS).

Carry forward into your exam day: bring the one-page cutoff cheat sheet, the 17-segment map, and the diastolic flowchart into your final week of timed practice; if you can reproduce all three from memory, you are ready to sit.

Study smart. Scan with confidence.

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