

*Vancouver Acute Department of Anesthesiology (VADA) recommendations for perioperative TEE reporting*

**Introduction**:

The perioperative Transesophageal (TEE) report is an extremely important document, which serves as a permanent record allowing future studies to follow the progression of a patient’s disease or the effect of therapy. In some cases, patients will present for surgery without a prior Transthoracic (TTE) study therefore this document is used as the reference point for the baseline echocardiographic assessment. With this in mind a thorough assessment and detailed report should be performed in all cases. Both the American Society of Echocardiography (ASE) and European Association of Cardiovascular Imaging (EACVI) have produced guidelines on the recommended perioperative TEE assessment. The following are recommendations based on the best available evidence.

**Parameters required for a comprehensive written report:**

* Patient Demographics.
* Name, Age & Hospital MRN.
* Date /Time & Indication for Study.
* Patients Height/Weight & Body Surface Area
* Echocardiographer & Location of Study.
* TEE machine used to Perform Study.
* Study Quality.
* Complications (if present) with Probe Insertion/Manipulation.

**Cardiac Dimensions**:

ASE/EACI 2015 chamber quantification guidelines recommend that the same range of normal values for left and right ventricular chamber dimensions and volumes apply for both TEE and TTE1.

**Atria:**

Left atrial (LA) cardiac dimensions should be measured, and the view used to obtain it should be stated. The linear measurement of the left atrium that correlates best with transthoracic echocardiographic anteroposterior measurements is taken from the Mid-esophageal (ME) AV Short Axis (SAX) view or the ME Long Axis (LAX) view, measuring from the apex of the sector to the posterior aortic root2. Presence or absence of thrombus in the LA appendage should be documented. Right atrial size should be documented. Anatomy of the inter-atrial septum and any abnormality of the septum should be documented.

Colour Doppler should be used to assess for flow across the septum and direction of shunt if present.

Flow in Right and Left pulmonary veins should be documented.

**Left Ventricle :**

Left Ventricular (LV) chamber size should be documented and the view obtained when reporting. ASE guidelines recommend Trans-gastric (TG) mid SAX, its orthogonal view or TG LAX view for direct correlation with TTE3.

Global LV systolic function should be documented. Any Regional Wall Motion Abnormality (RWMA) should be reported along with the location and severity. Global longitudinal strain rate (GLS), should be reported when measured. LV thickness should be documented along with severity and presence of aneurysm or thrombus.

LV Diastolic function:

As stated in the ASE guidelines for the assessment of LV diastolic dysfunction, perioperative diastolic assessment has not been standardized due to physiological changes under surgery & anesthesia5. However, several algorithms for diastolic assessment have been published, and demonstrate correlation to post-operative outcomes, including survival6. Whether or not a diastolic assessment was performed must be noted. It should also be reported if the diastolic assessment was indeterminant (eg. Arrhythmia, prosthetic MV, poor image quality, etc.). A diastolic assessment should follow the algorithm reported by Swaminathan et al. and include the following at minimum: lateral e’, transmitral E, and E/lat e’ ratio. A suggested grade of diastolic dysfunction should be included according to this algorithm. Additional variables may be reported, when pertinent, including: Mitral Annular e’ (medial and lateral), LA maximum volume index, peak Tricuspid Regurgitation velocity and pulmonary venous flow variables (S, D and a wave relationships). As LA volume is difficult to measure on TEE, preoperative LA measurements have been used successfully4.

**Right Ventricle:**

RV chamber size and view obtained should be documented. A comprehensive assessment of overall RV function should be documented along with any particular wall motion abnormalities if present. Quantitative variables (TAPSE and s’) may be noted as well.

**Valves:**

Patient’s scheduled for valvular surgery should already have a full comprehensive TTE assessment performed outlining their pathology. Perioperative TEE should serve to confirm or refine these findings to aid surgical management. General Anesthesia induces hemodynamic changes that can affect valvular pathology. It is therefore recommended that blood pressure should be documented at time of valvular assessment before & after the surgical repair/replacement7. This is especially pertinent in mitral valve pathology.

**Mitral Valve:**

Mitral valve leaflet morphology, motion, annular dimension and presence of any calcification should be documented. Grading of stenosis or regurgitation must be clarified with the exact methods and calculations used.

If planning mitral valve repair, three dimensional (3D) valve assessment has been shown to optimize patient outcomes and should be performed8.

**Aortic Valve:**

Aortic valve leaflet morphology, motion and presence of calcification should be documented. Left ventricular outflow tract, aortic annulus and root dimensions should be documented along with any abnormalities. Two-dimensional echocardiography remains the gold standard for morphologic assessment of the AV3. 3D imaging however, may improve assessment of annular sizing where it closely approximates measurements achieved by computed tomography9.

**Tricuspid Valve:**

Tricuspid Valve leaflet morphology and motion should be recorded. Annular size should be reported if abnormal and when mitral valve surgery is performed10.

Grading of stenosis or regurgitation if present must be clarified with the exact methods and calculations used. Right Ventricular Systolic Pressure should be reported where possible.

**Pulmonary Valve:**

Pulmonary Valve leaflet morphology and motion should be recorded. Grading of stenosis or regurgitation if present must be clarified with the exact methods and calculations used.

**Great Vessels:**

Assessment of Ascending Aorta, Aortic Arch & Descending Aorta should be documented. Irregularities of the aortic wall and presence of atheroma,

atheroma thickness, as well presence of mobile atherosclerotic elements should be noted. Abnormal dimensions should be recorded if present.

**Pleura/Pericardium:**

Size of effusions should be documented if present.

**Post Procedure Study:**

The post procedure report must contain the following information

1. Timing of TEE assessment (ie. Post-CPB, chest open/closed, etc).
2. Operation performed and size & type of prosthesis if inserted.
3. Use of inotropic or vasopressor medication at time of assessment.
4. Global LV systolic function should be assessed and presence of any new RWMA’s should be documented.
5. Thorough assessment of new valvular morphology including presence of regurgitation/washing jets/gradients across valve if repaired or replaced. Blood pressure should again be recorded at time of assessment.
6. Evaluation of Aorta post Decannulation
7. Any abnormal findings should be discussed with surgical team and documented.

**Conclusion:**

The conclusion at the end of your report should summarize your perioperative findings. Pathological findings should be documented in order of significance and severity.

**References:**

1. Lang RM, Badano LP, Mor-Avi V, Afilalo J et al. Recommendations for Cardiac Chamber Quantification by Echocardiography in Adults: An Update from the American Society of Echocardiography and the European Association of Cardiovascular Imaging. J Am Soc Echocardiography 2015; 28: 1-39
2. Colombo PC, Municino A, Brofferio A, Kholdarova L et al. Cross-sectional Multiplane Transesophageal Echocardiographic Measurements: Comparison with Standard Transthoracic Values Obtained In The Same Setting. Echocardiography 2002; 19:383- 90
3. Hahn RT, Abraham T, Adams M et al. Guidelines for Performing A Comprehensive Transesophageal Echocardiographic Examination: Recommendations from the American Society of Echocardiography and the Society of Cardiovascular Anesthesiologists. J Am Soc Echocardiography 2013;26:921-64
4. Mahmood F, Jainandunsing J, Matyal R. A practical Approach To Echocardiographic Assessment of Perioperative Diastolic Dysfunction. Journal Cardiovascular Anesthesia 2012; 26: 1115-1123
5. Nagueh SF, Smiseth OA, Appleton CP, Byrd BF. Recommendations for the Evaluation of Left Ventricular Diastolic Dysfunction by Echocardiography: An Update from the American Society of Echocardiography and the European Association of Cardiovascular Imaging. J Am Soc Echocardiography 2016;29:277-314
6. Swaminathan M, Nicoara A, Barbara G et al. Utility of a Simple Algorithm to Grade Diastolic Dysfunction and Predict Outcome After Coronary Artery Bypass Graft Surgery. Ann Thorac Surg 2011; 91:1844-51.
7. Feneck R, Kneeshaw J, Fox K, Bettex D et al. Recommendations for reporting Transesophageal Echo Studies. European Journal of Echocardiography (2010) 11, 387–393.
8. David TE, Ivanov J, Armstrong S et al. A comparison of outcomes of mitral valve repair for degenerative disease with posterior, anterior, and bileaflet prolapse. Journal Thoracic Cardiovasc Surg 2005; 130:1242-9.
9. Messika-Zeitoun D, Serfaty JM, Brochet E et al. Multimodal assessment of the aortic annulus diameter: implications for transcatheter aortic valve implantation. Journal American College Cardiology 2010; 55: 186-94.
10. Antunes MJ, Rodrıguez-Palomares J, Prendergast B, De Bonis M et al. Management of tricuspid valve regurgitation. Eur J Cardiothorac Surg 2017; 52:1022–30.

**Algorithm for Perioperative LV diastolic function assessment6**



For the purposes of simplification, only lateral e’, transmitral E velocity, and E/lat e’ ratio are required at minimum.

ASE Chamber Reference Guide:

|  |
| --- |
| LV Size |
| MALE (mm) | Normal | Mild | Moderate | Severe |
| LVIDd (TG mid) | 42-58 | 59-63 | 64-68 | >68 |
| LVIDd index | 22-30 | 31-33 | 34-36 | >36 |
| FEMALE (mm) | Normal | Mild | Moderate | Severe |
| LVIDd | 38-52 | 53-56 | 57-61 | >61 |
| LVIDd index | 23-31 | 32-34 | 35-37 | >37 |

|  |
| --- |
| LVH |
| MALE (mm) | Normal | Mild | Moderate | Severe |
| IVSd | 6-10 | 11-13 | 14-16 | >16 |
| LVPWd | 6-10 | 11-13 | 14-16 | >16 |
| FEMALE (mm) | Normal | Mild | Moderate | Severe |
| IVSd | 6-9 | 10-12 | 13-15 | >15 |
| LVPWd | 6-9 | 10-12 | 13-15 | >15 |

|  |  |
| --- | --- |
| RV Size | |
| ME4Ch | | Normal | Mild | Moderate | Severe |
| RVd-mid (mm) | | 27-33 | 34-37 | 38-41 | >41 |
| RV Thickness |  | 1-5 | >5mm is RVH | | |

|  |
| --- |
| LA Size |
| MALE (mm) | Normal | Mild | Moderate | Severe |
| AP Diameter(ME-SAX/LAX) systole | 30-40 | 41-46 | 47-52 | >52 |
| LA index | 15-23 | 24-26 | 27-29 | >29 |
| FEMALE (mm) | Normal | Mild | Moderate | Severe |
| AP Diameter | 27-38 | 39-42 | 43-46 | >46 |
| LA index | 15-23 | 24-26 | 27-29 | >29 |

|  |  |
| --- | --- |
| RA Size | |
| ME4Ch systole | Normal | | Dilated |
| RA Minor axis index (width) | | 16-22 | >22 |