### Comprehensive Echocardiographic Examination

**Measure Description:** This metric will assess the average completeness score, as measured by the *Comprehensiveness Exam Assessment* worksheet (Appendix 1), of initial transthoracic echocardiograms designated as complete studies (either inpatient or outpatient) for patients with hearts interpreted as structurally normal.

| **Numerator** | The sum of the *Comprehensiveness Exam Assessment* worksheet (Appendix 1) scores for all transthoracic echocardiograms included in the denominator. |
| **Denominator** | The number of initial transthoracic echocardiograms designated as complete studies during the measurement period for patients with structurally normal hearts. |
| **Denominator Exclusions** | None |
| **Denominator Exceptions** | None |
| **Definitions/Notes** | 1. **Complete Studies** - Studies that are identified as being focused, limited, or incomplete due to either patient instability or patient agitation will not be included. |
| **Measurement Period** | Quarterly |
| **Sources of Data** | Prospective flowsheet, retrospective review of stored echocardiographic images |
| **Attribution** | This metric will be reported by each echocardiography laboratory performing transthoracic echocardiography. The recommended optimal approach is for data to be assessed quarterly by the laboratory director or their designate and reviewed with the laboratory staff involved in the performance and interpretation of echocardiograms. |
| **Care Setting** | Inpatient or outpatient |

**Rationale**

Adequate image acquisition in echocardiography relies on a variety of components. The integration of two-dimensional imaging, color Doppler, and spectral Doppler is required for a comprehensive echocardiographic examination. A complete transthoracic echocardiogram is one that images all cardiac chambers, valves, and great vessels from a series of multiple orthogonal views and performs Doppler assessment of antegrade and retrograde flow across all cardiac valves, as well as the atrial and ventricular septa. Important echocardiographic components, or elements, that are not identified on echocardiograms in a specific echocardiography laboratory may result from limitations in image quality for a particular patient, incomplete delineation of the echo protocol to ensure assessment of these elements, or incomplete training of those tasked with obtaining the images. Assessment of the number of required elements identified as outlined in this quality improvement activity provides a method to evaluate compliance with imaging standards and may suggest to the echo lab particular processes that need revision.

**Clinical Recommendation(s)**
“The standard integration of two-dimensional, color, and spectral Doppler modalities is required to provide a comprehensive evaluation by TTE and TEE imaging. Assessment of the number of complete studies with all components (two-dimensional, color, and Doppler) reported provides a method to estimate compliance with current imaging standards. This should be measured for each sonographer annually.
A complete TTE or TEE study is one that images all cardiac chambers, valves, and great vessels from a series of multiple views and performs Doppler assessment of antegrade and retrograde flow across all cardiac valves, as well as the atrial and ventricular septa.”


“1.6.1.1B Complete Examination: Includes standard views from multiple planes including views of all cardiac structures and selected extracardiac structures.”


Challenges to Implementation

Time required identifying, selecting and reviewing echocardiograms.

Authors

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Appendix 1.

Comprehensive Exam Assessment WORKSHEET

Each worksheet is for ONE echo evaluation

Patient Name: __________________________________
Date of Birth: _________________________________________
Sonographer: __________________________________
Date of Study: ________________________________________
Interpreter: ________________________________
Location of Study: _____________________________________
Echo Machine: _________________________________
Reviewer: _____________________________________
Date of Review: _______________________________________
Time Spent for Review: ___________________

Indicate if each item listed is evaluated. Score as 1 for "Yes" response, 0 for "No".

SITUS, VEINS, ATRIA

YES NO

☐ ☐ Liver and stomach shown (transverse plane)
☐ ☐ Cardiac position
☐ ☐ IVC and aorta demonstrated in relation to spine (transverse plane)
☐ ☐ IVC, and SVC evaluated, imaging and color (in at least one view)(+/- azygous connection to SVC)
☐ ☐ IVC connection to atrium documented in at least one view
☐ ☐ Two left and two right pulmonary veins evaluated by color Doppler
☐ ☐ Coronary sinus visualized
☐ ☐ Atrial septum evaluated by imaging and color Doppler (in at least one view)

VENTRICLES

YES NO

☐ ☐ Ventricular septum is evaluated by color Doppler (in at least two views)
☐ ☐ Imaging for qualitative RV function assessment (in at least two views)
☐ ☐ Imaging of LV function (in at least two views)
☐ ☐ Evaluation adequate for measurement of LV end diastolic internal dimension or volume
Evaluation adequate for measurement of LV end systolic internal dimension or volume
Evaluation adequate for measurement of LV end diastolic septal and ventricular end diastolic wall thickness or LV mass
LV Outflow evaluated by color Doppler/spectral Doppler (in at least one view)
RV Outflow evaluated by color/spectral Doppler (in at least one view)

AV VALVES, SEMILUNAR VALVES

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
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<tbody>
<tr>
<td>TV imaging (adequate for measurement)/color/spectral Doppler (in at least one view)</td>
<td></td>
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<tr>
<td>TR jet evaluation by Doppler (in two views, if available)</td>
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<tr>
<td>MV imaging (adequate for measurement)/color/spectral Doppler (in at least one view)</td>
<td></td>
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<tr>
<td>MV in short axis (with and without color Doppler)</td>
<td></td>
</tr>
<tr>
<td>PV evaluated by imaging (adequate for measurement)/color Doppler/spectral Doppler (in at least two views)</td>
<td></td>
</tr>
<tr>
<td>AoV evaluated by imaging/color Doppler/spectral Doppler (in at least one view)</td>
<td></td>
</tr>
<tr>
<td>Coronary arteries evaluated by imaging/color Doppler in parasternal short-axis</td>
<td></td>
</tr>
</tbody>
</table>

VESSELS

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation adequate for measurement of AoV/Ao root/Ao sinotubular junction diameters in parasternal long-axis</td>
<td></td>
</tr>
<tr>
<td>Branch PA's evaluated by imaging/color Doppler/spectral Doppler (in at least one view)</td>
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<tr>
<td>Patent ductus arteriosus excluded in at least one view</td>
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<tr>
<td>Ascending Ao evaluated by imaging/color Doppler/spectral Doppler in at least one view</td>
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<tr>
<td>Ao Arch sidedness and branching evaluated by imaging/color Doppler</td>
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<tr>
<td>Ao Arch evaluated by imaging/color Doppler/spectral Doppler in suprasternal long-axis</td>
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<tr>
<td>Abdominal aorta evaluated by color Doppler/PW spectral Doppler in subxiphoid short axis/sagittal plane</td>
<td></td>
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</tbody>
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TOTAL SCORE (Maximum = 30):