HOW TO SET UP THE ECHO LAB?

Luigi P. Badano*, MD, FESC

*No relevant conflict of interests
*No off-label use of devices
SETTING UP AN ECHO-LAB

What is an echo-lab?

The simplest

The most complex
SETTING UP AN ECHO-LAB

Not necessarily a complex lab makes people unhappy!
SETTING UP AN ECHO-LAB
Planning
SETTING UP AN ECHO-LAB

Planning

• Mission
  – Clinical
  – Research
  – Teaching

• Setting
  – Academic/Clinical
  – Primary/Tertiary Center
  – Cardiac surgery
  – Interventional cardiology

• Logistics
  • Location/Size
  • Machines

• Organization
  – Basic/Advanced
  – Digital/Analogic
  – Sonographers?
  – In-/Out-patients

• Quality control
  – Appropriateness
  – Accuracy
  – Education
SETTING UP AN ECHO-LAB

Get Informed

EAE laboratory

P. Nihoyannopoulos*, on behalf of the Labc

Hammersmith Hospital, NHLI,
Available online 26 December 2009

EAE RECOMMENDATIONS

European Association of Echocardiography recommendations for training, competence, and quality improvement in echocardiography

Bogdan A. Popescu (Chair)*, Maria J. Andrade (Co-Chair)†, Luigi P. Badano‡, Kevin F. Fox§, Frank A. Flachskampf‖, Patrizio Lancellotti*, Albert Varga†, Rosa Sicari‡, Arturo Evangelista§, Petros Nihoyannopoulos*, and Jose L. Zamorano†† on behalf of the European Association of Echocardiography

Document Reviewers: Genevieve Derumeaux*, Jaroslaw D. Kasprzak†, and Jos R.T.C. Roelandt‡
“Digital storage and review is now the state of art in echocardiography and practitioners are urged to move quickly to an all digital solution in their laboratories”

J Am Soc Echocardiogr 2005
SETTING UP AN ECHO-LAB

What is a digital echo-lab?

- Digital image recording and storage
- Digital record keeping and reporting
- Digital laboratory management
SETTING UP AN ECHO LAB

Expected Benefits From Digital Organization

- More accurate storage and retrieval of information with greater speed
- Echo information management (study comparison, post-processing, …)
- Higher quality and reproducibility of image information
- Decrease in time and money spent with an increase in accuracy and quality
SETTING UP AN ECHO-LAB
Why digital? “A picture is worth thousands of words”
SETTING UP AN ECHO-LAB

Why digital? “A picture is worth thousands of words”
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Why digital? Quality
SETTING UP AN ECHO LAB

Why digital? Quality
SETTING UP AN ECHO-LAB

Why digital? Multimodality
## Setting Up an Echo Lab

**Why digital? Media Cost Savings**

<table>
<thead>
<tr>
<th>Year</th>
<th>Media Costs (€)</th>
<th>Cost Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>10,132</td>
<td>-83%</td>
</tr>
<tr>
<td>2005</td>
<td>1,716</td>
<td></td>
</tr>
</tbody>
</table>

No more pollution linked to image media use!
SETTING UP A DIGITAL ECHO-LAB

The 10 basic questions that should be answered before

1. What do I want to store (N.o of loops, heartbeats or views)?
2. What and who will be included in the network (echo lab only, hospital wide, or off-sites)?
3. Who does the work (data entry, acquisition, report generating, etc)?
4. Who maintains the network?
5. How accessible do the images need to be?
6. What is the current workflow model and how will it change?
7. Who will want to access the data and for what purpose?
8. What will be the archival storage medium?
9. How will the images be transferred from the echo machine?
10. How will the images and data be combined?
SETTING UP A DIGITAL ECHO-LAB

Standards: Image Format
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Standards: Data Format
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Database and Reporting
SETTING UP AN ECHO-LAB

Standards: Report

It contains a proposal for quantitative and semiquantitative parameters to be used to report size and function of heart structures in a structured computerized echo reporting system.

1. GEOMETRY AND FUNCTION

1.1 LEFT VENTRICLE

End-diastolic diameter (cm)

<table>
<thead>
<tr>
<th>STRUCTURE</th>
<th>DESCRIPTION</th>
<th>FINDING</th>
<th>VALUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left Ventricle</td>
<td>Normal</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Abnormal</td>
<td>Dilatation</td>
<td>Absent</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mild</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Severe</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hypertrophy</td>
<td>Absent</td>
</tr>
<tr>
<td></td>
<td>Concentric</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eccentric</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Eccentric remodeling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ejection Fraction</td>
<td>Localized hypertrophy</td>
<td>Basal anterior septum</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anterior and inferior septum</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Interventricular septum and free wall</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anterior-lateral wall</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inferior septum</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Apical</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1.2 MITRAL VALVE

Annulus diameter (cm)

<table>
<thead>
<tr>
<th>STRUCTURE</th>
<th>DESCRIPTION</th>
<th>FINDING</th>
<th>VALUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitral Valve</td>
<td>Normal</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Midsystolic</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Systolic function</td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mildly decreased</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Moderately decreased</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Severely decreased</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Diastolic filling</td>
<td>Normal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inhibited relaxation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pseudonormal</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It contains a proposal for statements to be used to report morphological findings in a structured computerized echo reporting system. Items in “Description” column are mutually exclusive. Items in “Finding” and “Values” columns can have a multiple selection.
SETTING UP AN ECHO LAB

Database and Reporting
Setting up an echo lab

Quality Control: Scheduling

DA ESSEGUIRE IN EMEC (PRE E POST) RICOVERO

1. Valutazione specifica dalla funzione ventricolare sinistra
2. Sconfitto non determinato
3. Valutazione sviolo valvola automatica e prl determinati e calcolo
4. Conferma e modificazione di cardiocigistografia
5. Valutazione e tracciata
6. Rischio di ventricolo e determina
7. Rischio di ventricolo e determina
8. Rischio di ventricolo e determina
9. Rischio di ventricolo e determina
10. Rischio di ventricolo e determina

Testine: __________________________

Data della richiesta: __/__/20__

Medico richiedente: __________________________
SETTING UP AN ECHO LAB

Quality Control: Electronic Agenda
SETTING UP AN ECHO LAB

Quality Control: Electronic Agenda

<table>
<thead>
<tr>
<th>Paper Agenda</th>
<th>Electronic Agenda</th>
</tr>
</thead>
<tbody>
<tr>
<td>Looking for Lost Echo</td>
<td>70±60 s</td>
</tr>
<tr>
<td>Dates</td>
<td>3±1 s</td>
</tr>
<tr>
<td>Secretary Time</td>
<td>24 hrs/year</td>
</tr>
<tr>
<td>Savings</td>
<td></td>
</tr>
</tbody>
</table>
SETTING UP AN ECHO LAB

Quality Control: Electronic Agenda

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**Manual**

Demographic Data Input: 31±8 s

Sonographer’s Time Savings: 51 hrs/year

**Electronic Agenda**

Demographic Data Input: 7±3 s

Sonographer’s Time Savings: 51 hrs/year
SETTING UP AN ECHO LAB

Quality Control: The sonographers

*Echo competence certified by the Italian Society of Echocardiography

Rossana

Maria Luisa*

Lorenzo*

Cine-loops (1 cardiac cycle if SR- 3 cycles if arrhythmia)

- **Parasternal views**: aortic root + ascending aorta
  - Long-axis / color mitral & aortic valve
  - Basal short-axis / color pulmonary and tricuspid valve
  - Papillary muscle short-axis
  - Apical short axis

- **Apical views**: 4-chamber,
  - 2-chamber,
  - Long axis / color mitral and aortic valve

- **Subcostal 4-chamber view**

- **Inferior vena cava excursion**

- **Color Flow**: Mitral
  - Aortic
  - Valve regurgitant jets

- **Still frames**: Aorta and left ventricular M-mode tracings
  - Mitral & Tricuspid valve flow Doppler tracings
Physician review time: from $600 \pm 300$ sec to $440 \pm 300$ sec

Physicians’ time savings = 62 full work days/year
SETTING UP AN ECHO LAB

Conclusions

• Setting-up a modern echo lab is not an easy job;
• The time spent for careful planning is time invested;
• Organization is as important as to buy the most recent high-end echo machine;
• Planning a full digital organization will ensure cost/effectiveness, accuracy and adequate quality control.
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