

Defibrillator and/or Resynchronization Pacing

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Disclosure

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 - Fellowship grants
 - Research
 - Honorarium

ACC/AHA/ESC 2006

**Guidelines for Management of Patients
With Ventricular Arrhythmias and the
Prevention of Sudden Cardiac Death
(J Am Coll Cardiol 2006;48:1064-1108)**

ACC/AHA 2005

Guideline Update

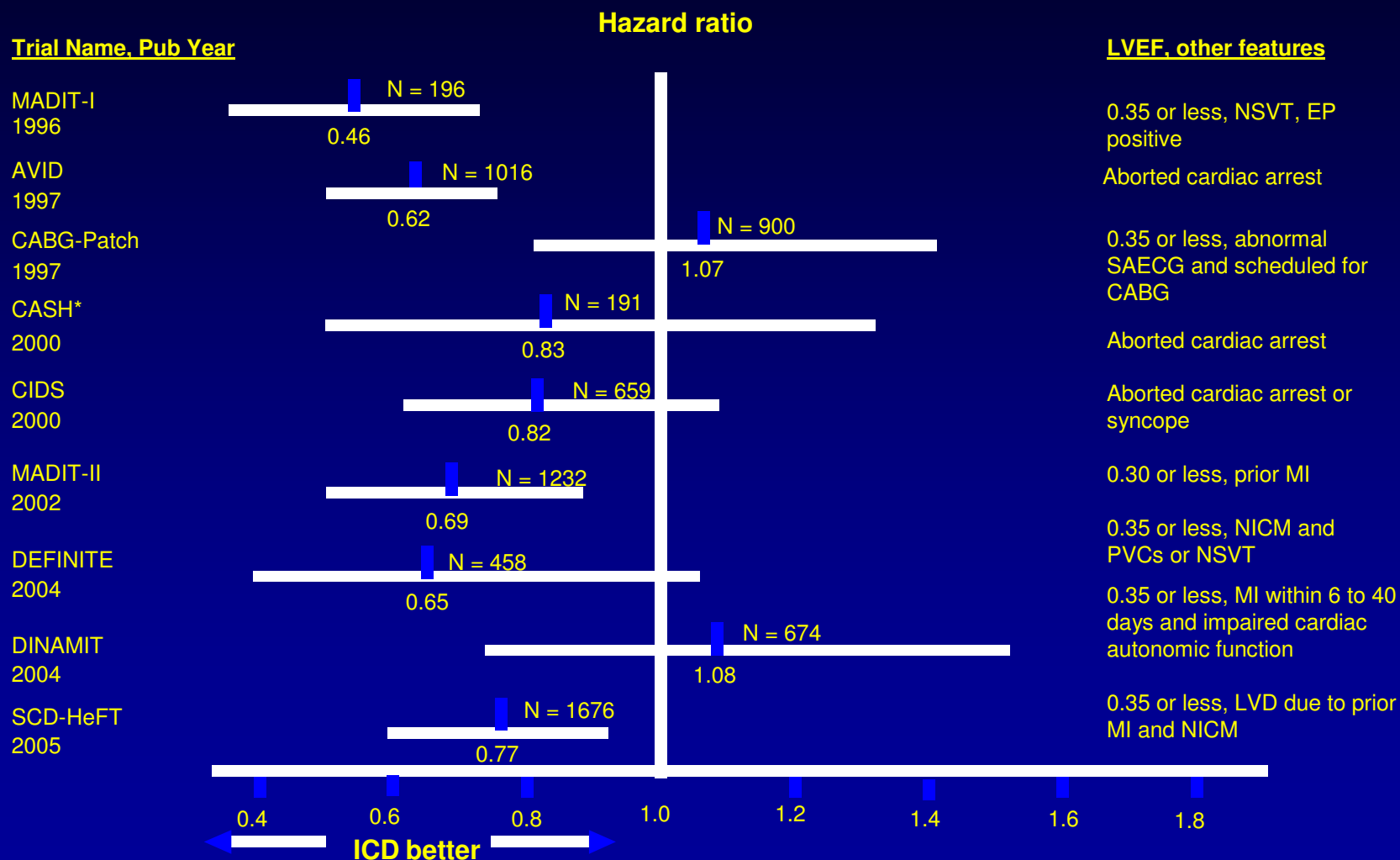
**for the Diagnosis and Management of
Chronic Heart Failure in the Adult
(J Am Coll Cardiol 2005; 46:1116-43)**

Heart Failure is a Major and Growing Public Health Problem in the U.S.

- **Approximately 5 million patients in this country have HF**
- **Over 550,000 patients are diagnosed with HF for the first time each year**
- **Primary reason for 12 to 15 million office visits and 6.5 million hospital days each year**
- **In 2001, nearly 53,000 patients died of HF as a primary cause**

Therapies for Ventricular Arrhythmias

ICDs: Results from Primary and Secondary Prevention Trials



Comparing Heart Failure and EP Guidelines

Heart Failure

- ICM EF < 30%, class I IIa
- ICM EF < 30%, class II-III 1a

- NICM, EF < 30%, class I IIb
- NICM, EF < 30%, class II-III 1b

- Any etiology, EF <30-35% IIa

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EP

- ICM EF < 30-35% class I IIa
- ICM EF < 30-40% class II-III 1a

- NICM EF < 30-35% class I IIb
- NICM EF < 30-35% class II-III 1b

Based on the ACC/AHA/ESC 2006
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Comparing EP and Heart Failure Guidelines

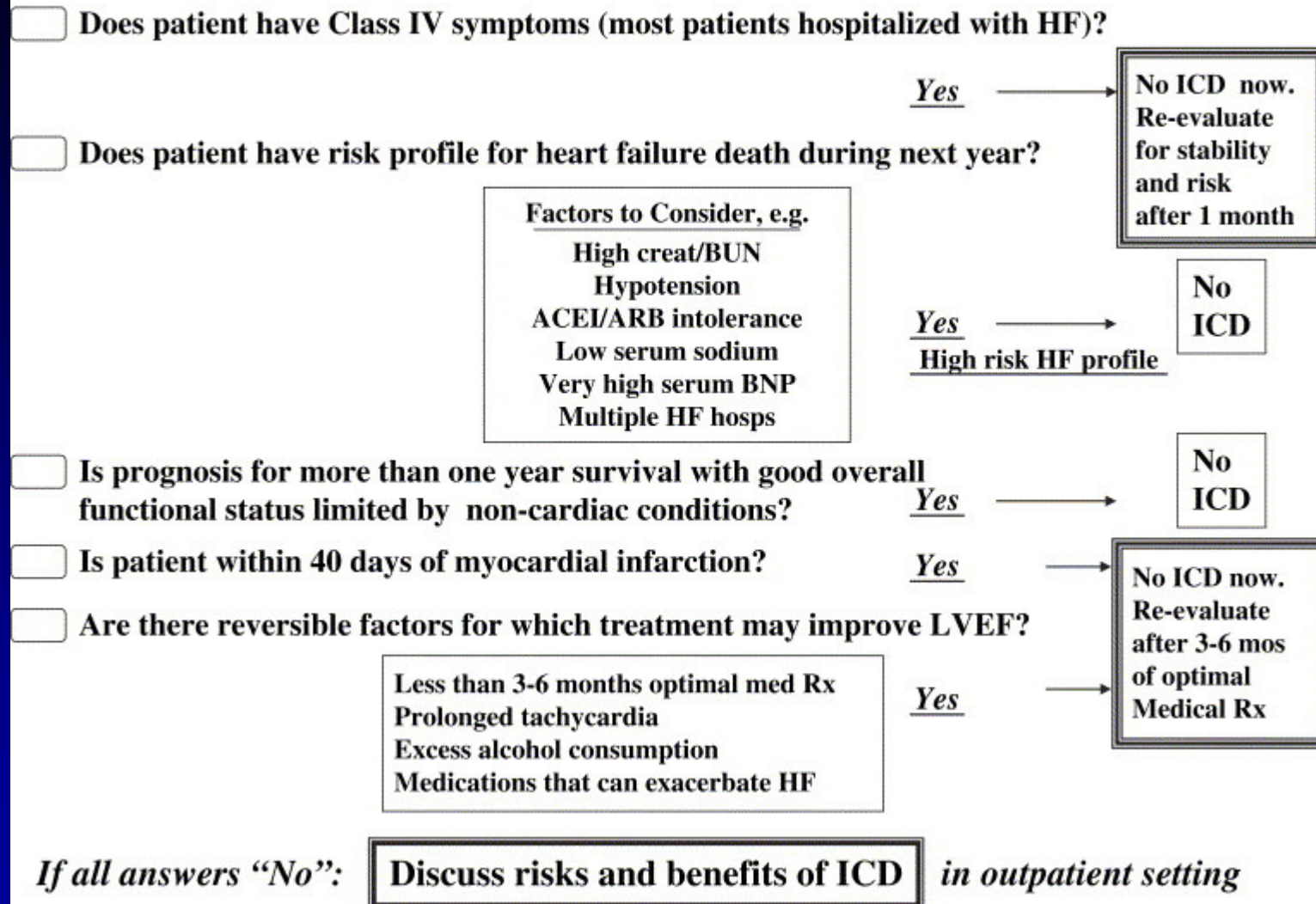
- Both sets of guidelines are written with the caveat that patients have a ***“Reasonable expectation of survival with a good functional status for more than 1 year.”***

Who Should Not Undergo ICD Implantation? The Perspective of a Heart Failure Specialist

- Key question: Is the patient likely to survive **2 years** with a good functional quality of life?
 - Probably not if:
 - Frequent CHF hospitalization,
 - Systolic BP <90
 - Rising Bun/Creat
 - Circulatory-renal intolerance of ACE
 - Unable to walk 2 blocks

Stevenson et al. *Journal of Cardiac Failure*, August 2006.

Selecting Patients with Heart Failure for Discussion About ICD As Primary Prevention of Sudden Death



Stevenson et al. Journal of Cardiac Failure, August 2006.

ICD Information for Patients

If we put an ICD in 100 patients with heart disease like yours, over the next 5 years we would expect:

- 30 patients will die anyway
- 7-8 patients will be saved by the ICD
- 10-20 would have a shock they don't need
- 5-15 would have other complications
- The rest of patients will not experience their devices at all

**Some patients will request to have the device
Inactivated to allow natural death.**

What's Fair To Tell Your Patient?

- **This therapy is not mandatory, but recommended.**
- **Show them the device and where it will be implanted.**
- **All man-made devices can fail.**
- **Inappropriate shocks are possible.**
- **Implantation is not without risk.**
- **Discuss potential circumstances in which the device could be turned off, e.g. hospice.**

Guidelines: Are We Adhering to Them?

- **Approximately 30-40% of patients with a class I indication for implant actually receive one.**

Coumadin in Atrial Fibrillation:

Physician adherence to guidelines in practice

108 patients.

Chronic atrial fibrillation.

At least one risk factor for stroke.

No contraindication for warfarin.

ONLY 40% received a prescription for warfarin.

Conclusions on Defibrillators

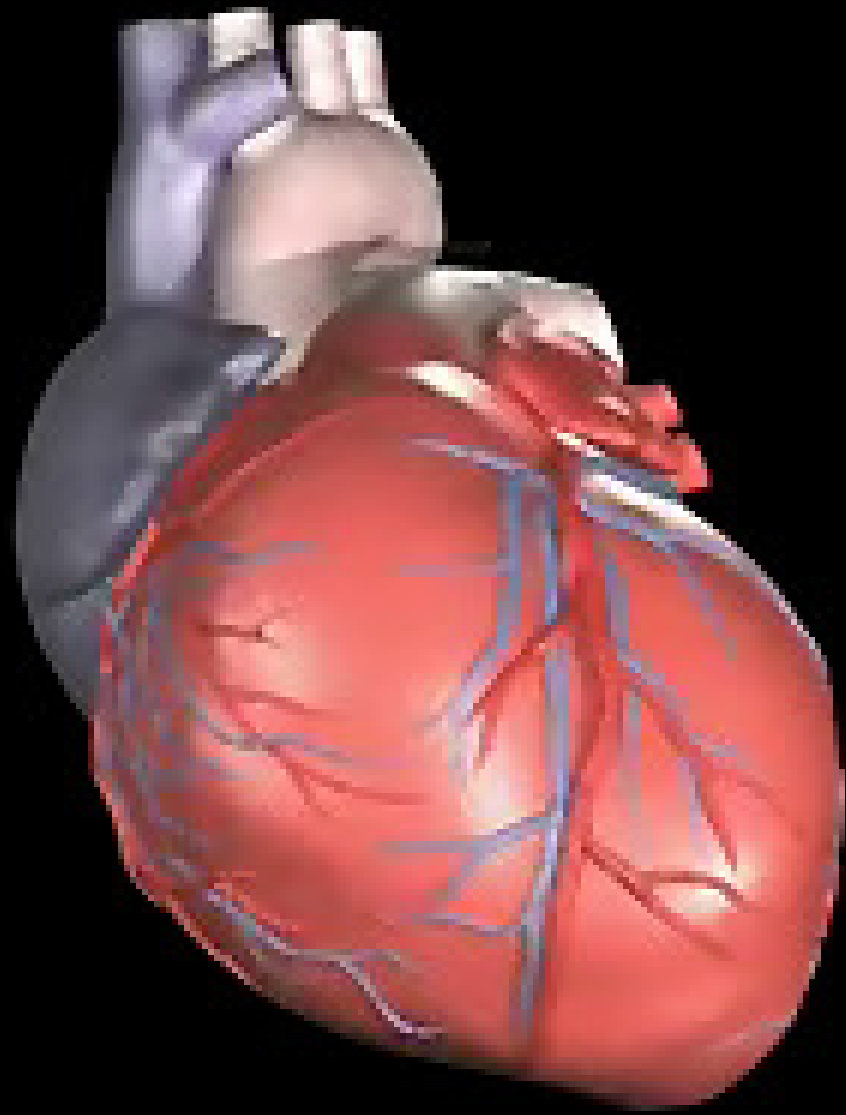
- **ICDs are effective in both ischemic and nonischemic patients to prevent sudden cardiac death.**
- **Therapy is currently not offered to all those eligible.**
- **Needless to say, common sense and communication with our patients is crucial.**

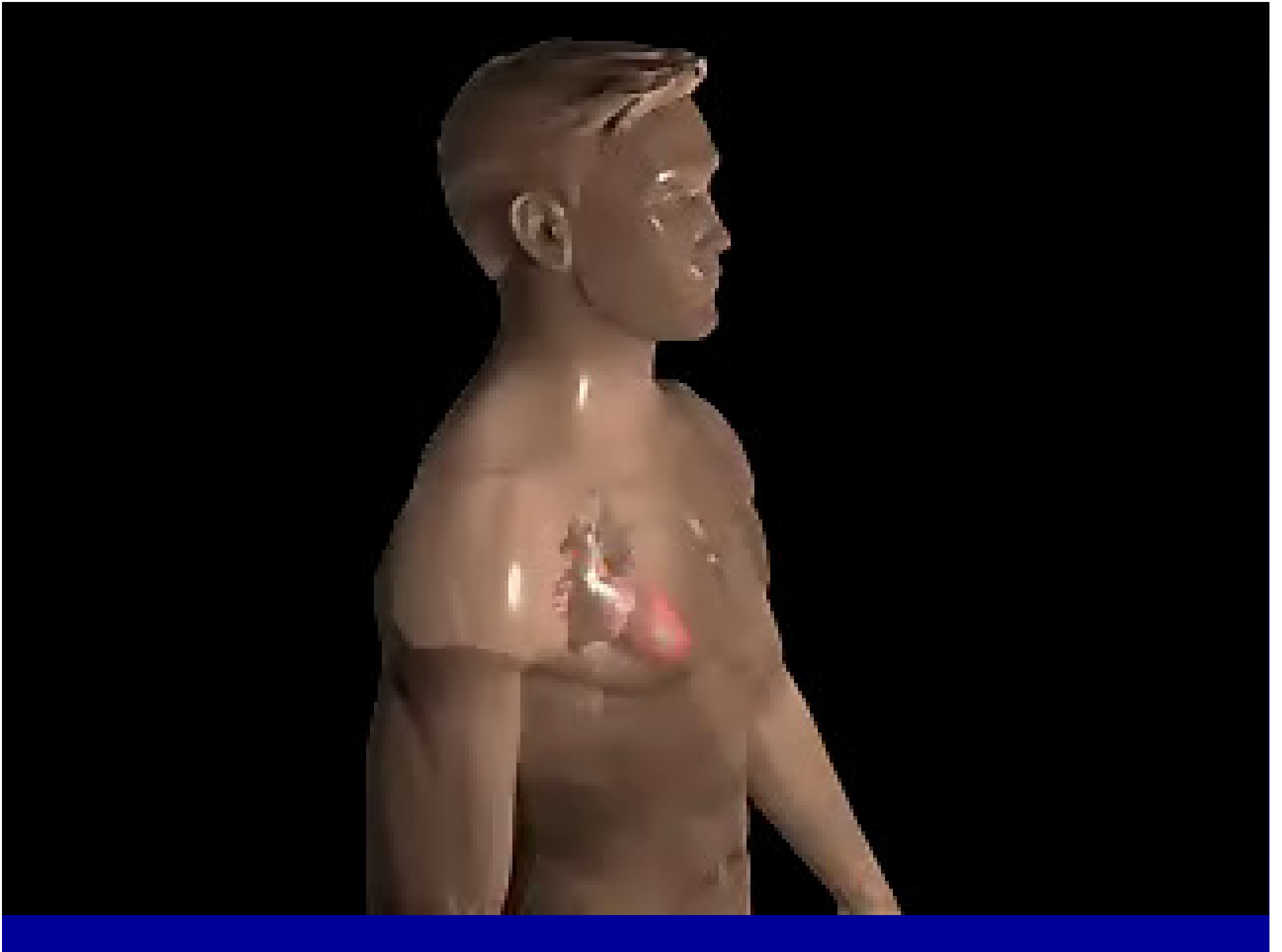
Introduction: Left Ventricular (LV) Dysynchrony

- **Generally defined as the effect of intraventricular conduction defects or bundle branch block to produce nonsynchronous ventricular activation**
- **Places the already failing heart at a further mechanical disadvantage.**
- **Once a patient is referred for an ICD, he/she should be evaluated for possible benefit of an LV lead.**
- **Likewise, a patient referred for a biventricular pacemaker should be considered for an ICD; this includes a conversation with their heart failure physician.**

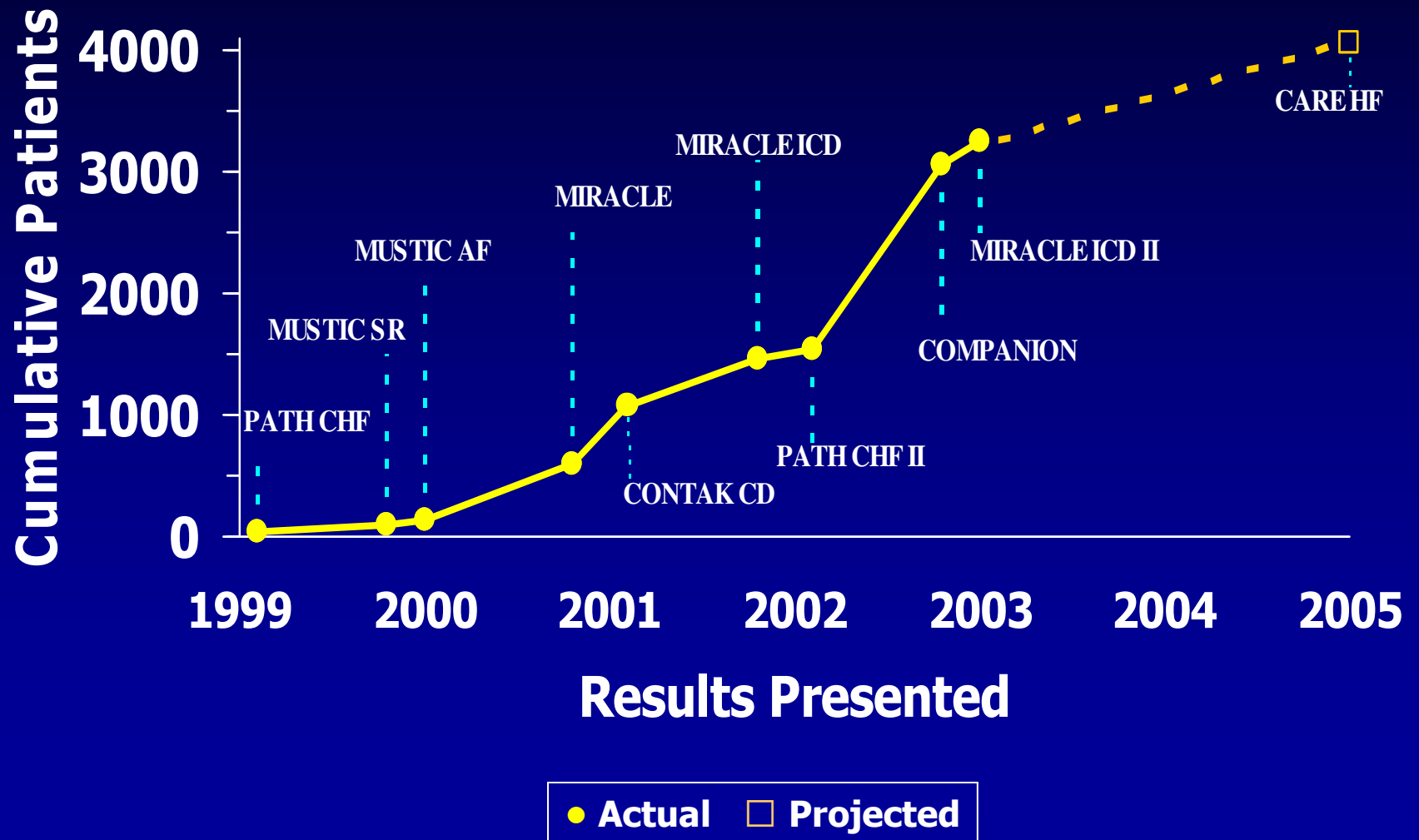
Introduction: Cardiac Resynchronization Therapy

- The clinical and mechanical manifestations of ventricular dyssynchrony can be treated by simultaneously pacing both the right and left ventricles usually in association with right atrial sensing, resulting in atrial-synchronized biventricular pacing or cardiac resynchronization therapy (CRT).**

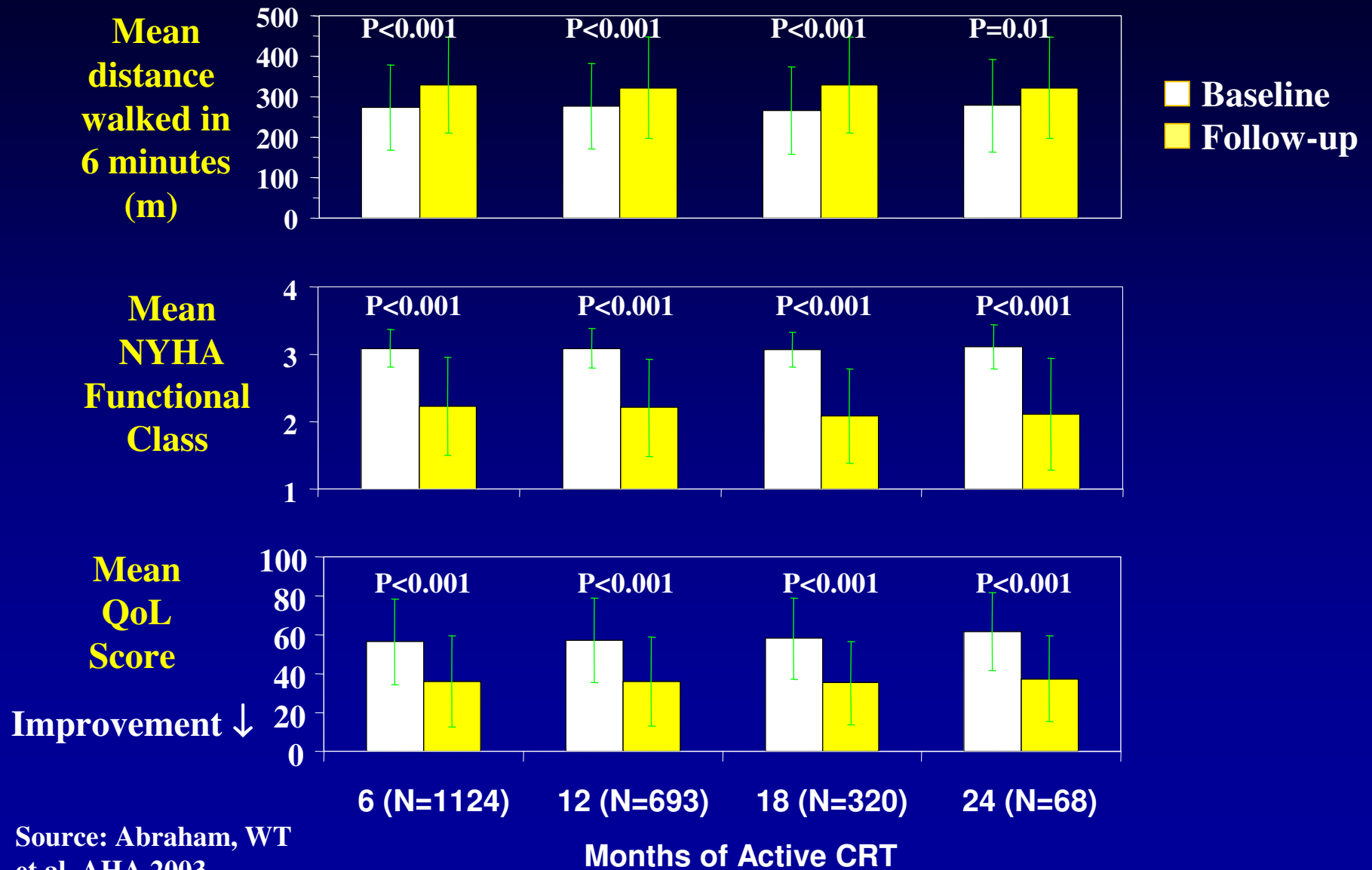




Cumulative Enrollment in Cardiac Resynchronization Randomized Trials



Benefits Sustained Through 2 Years



Source: Abraham, WT et al. AHA 2003

Resynchronization: Comparing Heart Failure and EP Guidelines

- CRT
- EF < 35% class III-IV QRS > 120 msec 1a

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- CRT alone
- EF < 35% class III-IV QRS > 160 msec IIa
- CRT + ICD
- EF < 35%, class III or IV QRS > 120 msec IIa

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CRT: Who Needs It?

- **Cardiac resynchronization accomplished with biventricular pacing is considered standard therapy for patients with left ventricular dysfunction and a wide QRS.**
- **90-95% have successful technical implantation in appropriate hands.**
- **The majority of patients who receive a biventricular device also get an ICD.**

Case

- **A 75 y.o. male presented with class IV CHF, an EF of 25% (marked LV dysfunction). He had multiple episodes of syncope, including one while on telemetry documenting sustained monomorphic ventricular tachycardia. Despite almost enucleating an eye during one episode, he refused defibrillator implantation, and left the hospital AMA several times. He was slow to respond and belligerent during our interactions.**

- **Finally, his wife refused to take him home, and he consented to the implantation of a biventricular ICD, a device with biventricular pacing and defibrillation capabilities.**
- **On his return to our clinic, we met a charming, completely compliant, educated man. He is now able to walk ½ mile three times/day, and enjoys playing with his grandchildren.**

Sir William Osler

“Medicine is learned by the bedside and not in the classroom. Let not your conceptions of disease come from words heard in the lecture room or read from the book. See, and then reason and compare and control. But see first.”

Heart failure and cognition

- **Left ventricular dysfunction in patients with CHF is associated with impaired cognitive function.**
 - **Left ventricular assist devices**
 - **Transplant**

Seeing this patient lead to our hypothesis that biventricular pacing, like the other therapies mentioned, might improve cognition.



Pilot study

To investigate changes in attention to and processing of information in patients before and after biventricular pacemaker implantation.

Examined QOL in patients before and after biventricular pacemaker implantation.



Measures

Cognitive Measures:

- **Processing speed and attention**
 - Symbol Digit Modalities Subtest of the Wechsler Adult Intelligence Test-III (WAIS-III)
- **Attention**
 - Digit Span Subtest of the WAIS-III
- **Memory**
 - Hopkins Verbal Learning Test (HVLT)

Measures



Psychosocial Measures:

- **CARDIAC QOL**
 - **Minnesota Living with Heart Failure Questionnaire (MLHFQ)**
 - **Left Ventricular Dysfunction-36 (LVD-36)**
- **DEPRESSION**
 - **Center for Epidemiological Studies Depression Scale: CES-D**

Tasks of Processing Speed and Attention

Digit Symbol Task

○	□	∞	⊥	▽	≡	∧	×	□
1	2	3	4	5	6	7	8	9

∧
3

Tasks of Attention

Digit Span Task

FORWARD

23

156

6183

SUBJECT RESPONSE

23

156

6183

BACKWARD

34

986

5683

SUBJECT RESPONSE

43

689

3865



Sample

N= 20

<u>Demographics</u>	<u>Mean (SD)/ %</u>
Age	54.80 <u>±</u> 11.94
Sex (% Male)	85%
Ethnicity (% Caucasian)	100%



Results

- We found significant improvement in **Processing Speed** 3 mo post CRT. Symbol Digit accuracy improved from a t score of 47 +/- 10 to 55 +/- 9 ($p < 0.001$) indicating an improvement in ability to match symbol to digit after biventricular pacing.
- We found significant improvement in **Attention** 3 mo post CRT. Digit Span accuracy improved from a t score of 56 +/- 9 to 62 +/- 10 ($p = 0.015$) indicating an improvement in ability to repeat additional numbers after biventricular pacing.
- There were no differences in **Verbal Memory** (HVLT) pre-post CRT.



Results

- **Quality of Life** improved from pre-post CRT:
 - LVD-36; 12 +/- 7 vs. 7 +/- 5, $p = .004$
 - MLHFQ; 55 +/- 18 vs. 36 +/- 18, $p = .015$.
- **Depression**
 - Depression did not change from pre-post.

Objective and Subjective Improvement in Cardiac Measures

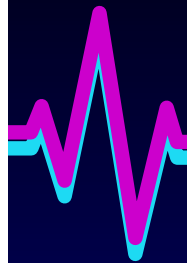
- EF improved from $17.5\% \pm 13\%$ to $30 \pm 10\%$ over baseline ($p < .001$).
- Pre CRT, 15% at NYHA Class II, 60% at Class III, and 25% at Class IV status. Post- CRT, NYHA status improved overall, with 15% at NYHA Class I, 70% at Class II, 10% at Class III, and 5% at Class IV.



Summary

- **Tasks which assess attention and processing speed appear to become easier (less errors) for patients post CRT.**
- **CRT improves both neurocognitive functioning and QOL when measured @ three months compared to pre-implantation. At the same time, EF and NYHA class improved in this patient cohort.**

Clinical Implications



- **Many CHF patients report memory complaints that may be better explained by attention limitations.**
- **Patient education efforts are dependent on attention. Therefore, it is important to include spouses/family in these efforts.**
- **Deficits in attention may be why patients don't remember what we tell them.**

Chronic Failure: Response

- **Nonresponse generally denotes lack of clinical improvement or objective evidence of remodeling.**
- **Thought to be secondary to poor patient selection and poor LV lead position**
- **THIS IS AN OVERSIMPLIFICATION.**

Troubleshooting Algorithm for CRT Nonresponders

Clinical Problem Solving

Evaluate volume status, presence of atrial fibrillation, or cardiac ischemia

Atrial fibrillation

Rate control or cardioversion

Pre-renal azotemia

Decrease diuretics

Euvolemic

No improvement

Volume overload

Increase diuretics

Cardiac ischemia

Coronary angiography

Revascularization

Device Interrogation

EKG, CXR, and interrogation of CRT device

Loss of LV capture

Reprogram or revise device

Adequate device function

Loss of RV capture

Reprogram or revise device

AV/AA/VV Evaluation

Optimize AV delay and VV delay

Improvement in symptoms

No improvement

Observe

Dyssynchrony Studies

Evidence of dyssynchrony

Echocardiographic ventricular dyssynchrony studies

No dyssynchrony

Evidence of moderate to severe MR

No

Nonresponder

Consider LVAD, Htx, or cardiac support devices

Yes

Consider mitral valve surgery

Reevaluate LV lead position (transvenous or epicardial)

Aranda JM Jr., et al. J Am Coll Cardiol 2005;46:2193-8.

Conclusions

- **Concordant proof that CRT improves quality of life, exercise capacity, functional capacity through 2 years.**
- **Other unproven benefits (cognitive function) currently being evaluated.**
- **Current guidelines are based upon a wide QRS, EF < 35 and class III-IV CHF.**
- **ICD or no ICD-must be a collaborative decision between patient, electrophysiologist and heart failure specialist.**