The Ohio State University
Heart and Vascular Center

Updated Cardiac Resynchronization Therapy Guidelines

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A Decade of Cardiac Resynchronization Therapy

- 2001 – FDA approves first CRT device for use in NYHA Class III-IV patients on the basis of the MIRACLE trial
- 2002 – FDA approves first two CRT-ICD devices for use in NYHA Class III-IV patients on the basis of the CONTACK-CD and MIRACLE-ICD trials
- 2005 – ACC/AHA heart failure guideline update gives CRT a Class 1 recommendation for use in NYHA Class III-IV patients with QRS ≥ 120 msec
  - A “should receive” recommendation

A Decade of Cardiac Resynchronization Therapy

- 2008 – EchoCRT Trial begun (ongoing in 2013)
  - QRS < 130 msec with echocardiographic dysynchrony
- 2010 – FDA expands indication for CRT to NYHA Class I (ischemic) and II patients on the basis of the MADIT-CRT trial
- 2010 – ESC heart failure guideline update gives CRT a Class 1 recommendation for use in NYHA Class II patients with QRS ≥ 150 msec
  - An “is recommended” recommendation

A Decade of Cardiac Resynchronization Therapy

- 2012 – FDA reaffirms expansion of CRT to NYHA Class II patients on the basis of the REVERSE and RAFT trials
- 2010-2012 – Questions are raised about efficacy of CRT based on QRS duration and morphology
- 2012 – HFSA CRT guideline update softens the recommendations for CRT in QRS 120-149 msec
- 2012 – ACCF/AHA/HRS device guideline update softens the recommendations for CRT similar to HFSA guideline

CRT in NYHA Class III-IV Heart Failure: Weight of Evidence

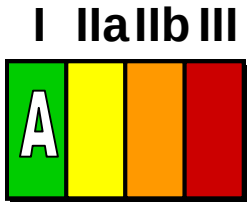
- >4,000 patients evaluated in randomized controlled trials
- Consistent improvement in quality of life, functional status, and exercise capacity
- Strong evidence for reverse remodeling
  - ↓ LV volumes and dimensions
  - ↑ LVEF
  - ↓ Mitral regurgitation
- Reduction in heart failure and all-cause morbidity and mortality

Abraham WT, 2005

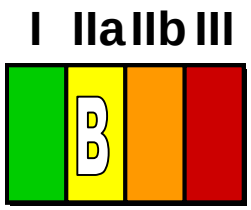
Cardiac Resynchronization Therapy Saves Lives in NYHA Class III-IV Heart Failure

- Comparison of Medical Therapy, Pacing, and Defibrillation in Heart Failure (COMPANION) – 24% to 36% ↓
- Cardiac Resynchronization in Heart Failure Trial (CARE-HF) – 36% ↓

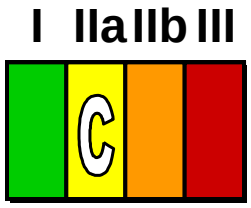
2008 U.S. Guideline Recommendations for CRT in NYHA Class III-IV Heart Failure



For patients who have left ventricular ejection fraction (LVEF) less than or equal to 35%, a QRS duration greater than or equal to 0.12 seconds, and sinus rhythm, cardiac resynchronization therapy (CRT) with or without an ICD is indicated for the treatment of New York Heart Association (NYHA) functional Class III or ambulatory Class IV heart failure symptoms on optimal recommended medical therapy.



For patients who have LVEF less than or equal to 35%, a QRS duration greater than or equal to 0.12 seconds, and atrial fibrillation, CRT with or without an ICD is reasonable for the treatment of NYHA functional Class III or ambulatory Class IV heart failure symptoms on optimal recommended medical therapy.



For patients with LVEF less than or equal to 35% with NYHA functional Class III or ambulatory Class IV symptoms who are receiving optimal recommended medical therapy and who have frequent dependence on ventricular pacing, CRT is reasonable.

ACC/AHA/HRS 2008 Guidelines for Device-Based Therapy of Cardiac Rhythm Abnormalities

CRT in NYHA Class I-II Heart Failure: Weight of Evidence

- > 4,500 patients evaluated in randomized controlled trials
- Consistent evidence for reverse remodeling
  - ↓ LV volumes and dimensions
  - ↑ LV ejection fraction
  - ↓ Mitral regurgitation
- Improvement in functional status and outcomes
  - clinical composite endpoint
  - combined endpoint of heart failure morbidity and all-cause mortality
  - all-cause mortality alone

Abraham WT, 2010

Wexner Medical Center

Cardiac Resynchronization Therapy Saves Lives in NYHA Class II Heart Failure

- Resynchronization/Defibrillation for Ambulatory Heart Failure Trial (RAFT) – 25% ↓

ESC Heart Failure Guideline: CRT in Mildly Symptomatic Heart Failure

- Class I Indication: CRT preferentially by CRT-D is recommended to reduce morbidity or to prevent disease progression. Patient population – NYHA function class II, LVEF ≤35%, QRS ≥ 150 msec, sinus rhythm, optimal medical therapy

  Level of Evidence: A

Dickstein et al., EHJ 2010

MADIT-CRT FDA Indication

- High-risk NYHA Class I (ischemic) and II (ischemic and non-ischemic) patients with left bundle branch block morphology and sinus rhythm
- High-risk is defined as QRS width ≥ 130 msec and LV ejection fraction ≤ 30%

http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm226123.htm, Sept. 16, 2010

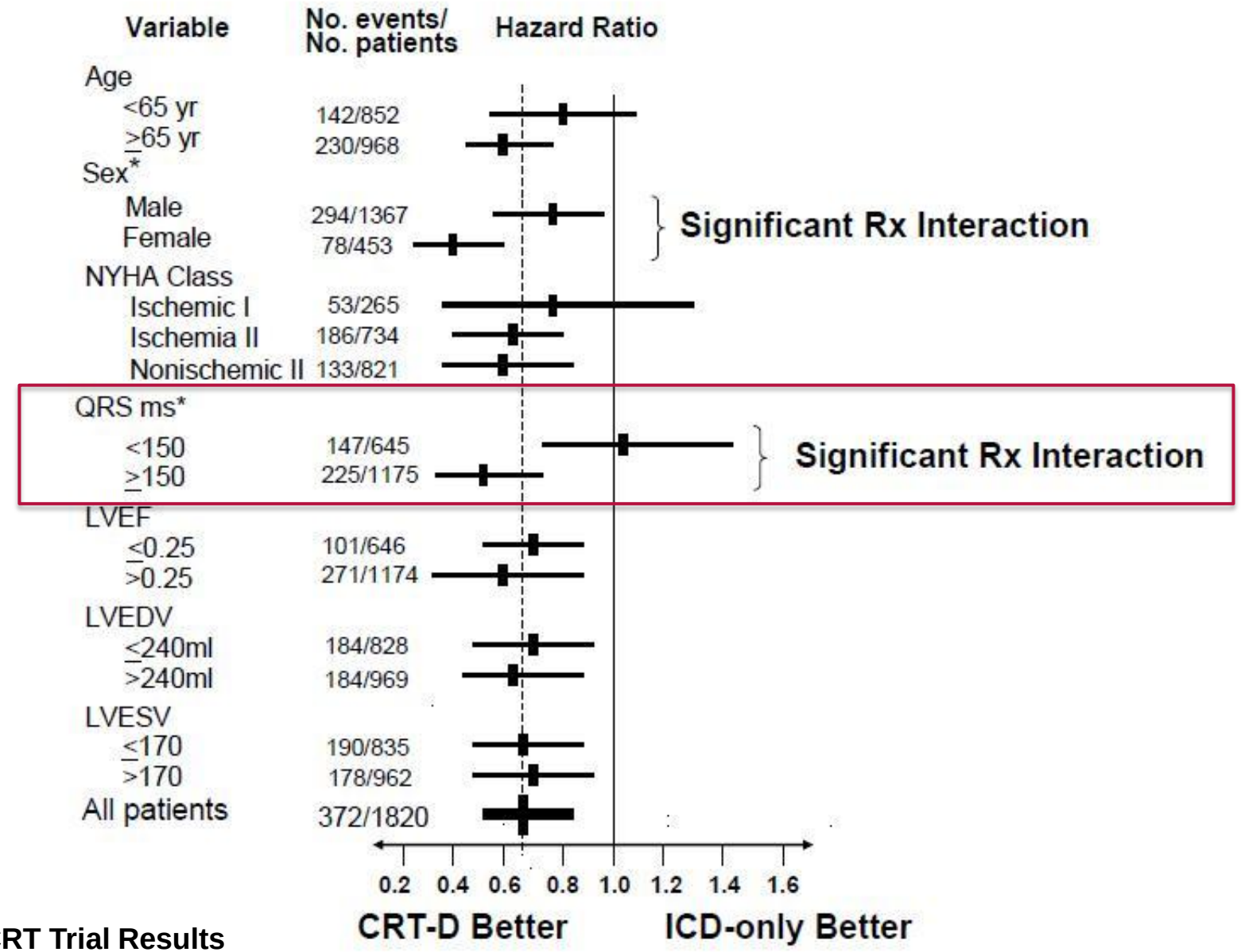
REVERSE / RAFT FDA Indication

- NYHA Class II heart failure patients with an LVEF ≤ 30%, left bundle branch block, and QRS duration ≥ 130 msec

http://wwwp.medtronic.com/Newsroom/NewsReleaseDetails.do?itemId=1334060694116&lang=en_US, April 12, 2012

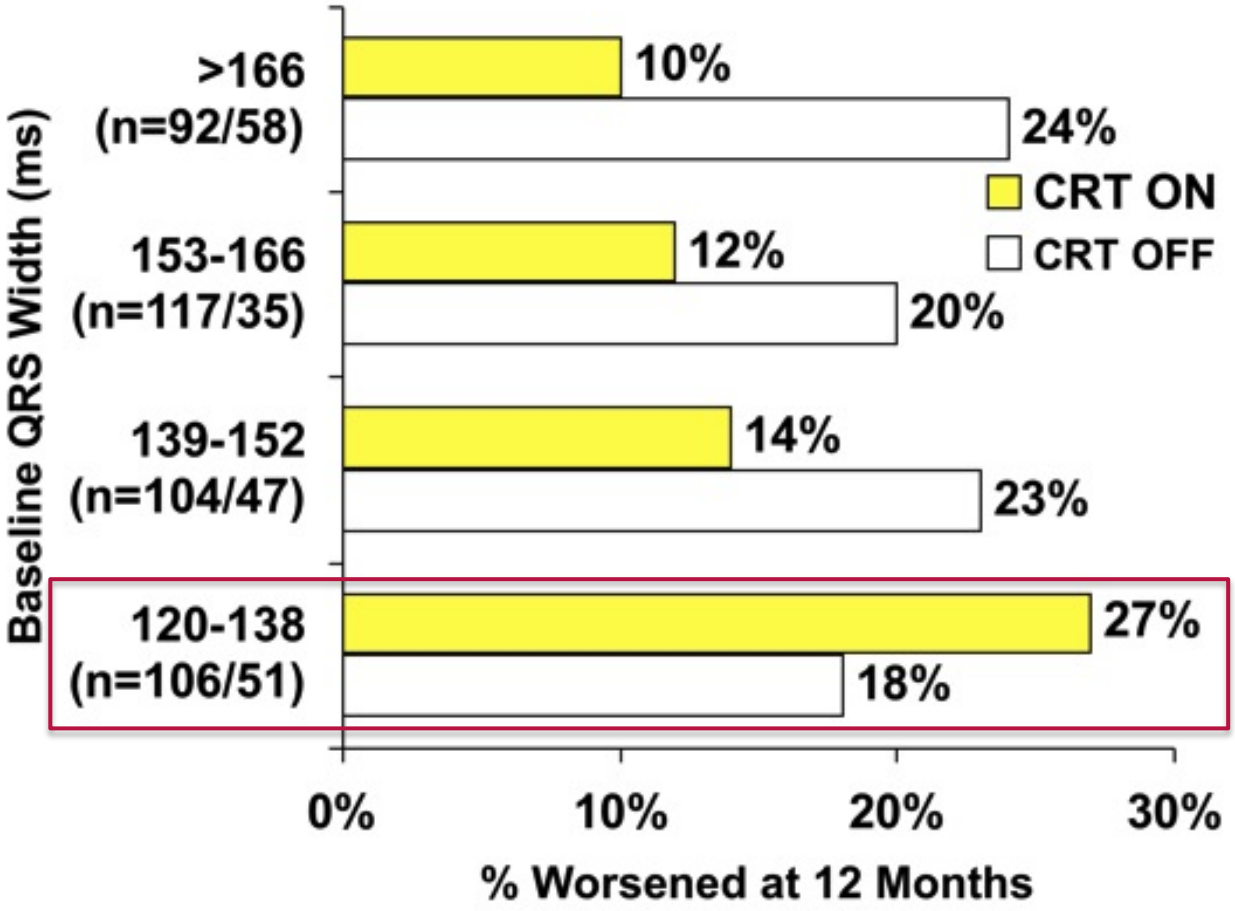
Should CRT indications be limited by QRS duration?

CRT-D:ICD Hazard Ratios for Prespecified Subgroups



MADIT-CRT Trial Results

Outcomes by QRS Duration Quartiles



REVERSE Trial Results

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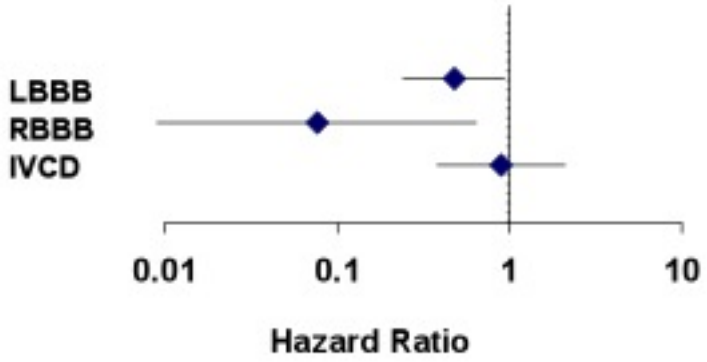
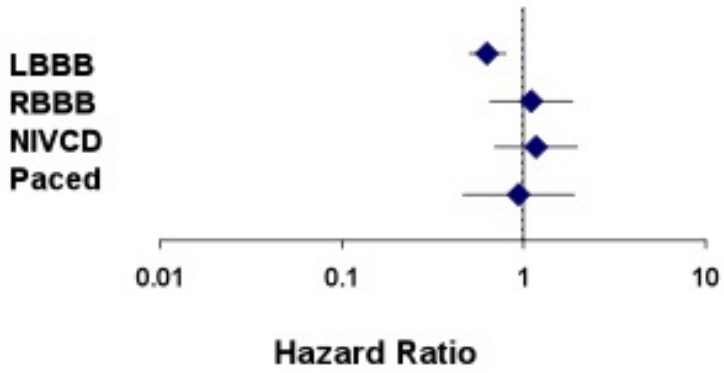
Should CRT indications be limited by QRS morphology?

REVERSE, RAFT and MADIT-CRT: HF Hospitalization/ Event or All-cause Death by QRS Morphology

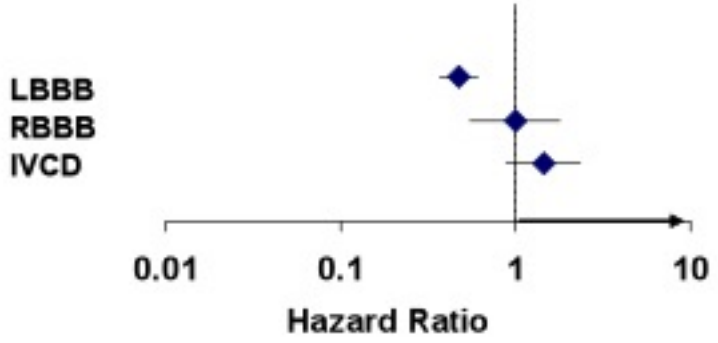
REVERSE – HF Hosp/Death



RAFT Class II – HF Hosp/Death

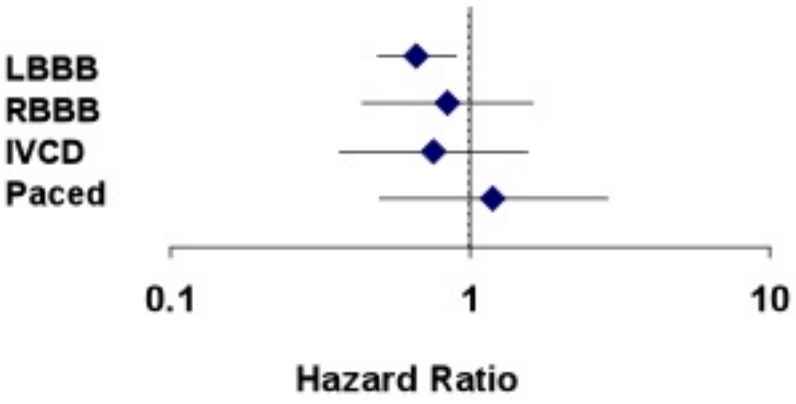


MADIT-CRT – HF Event/Death

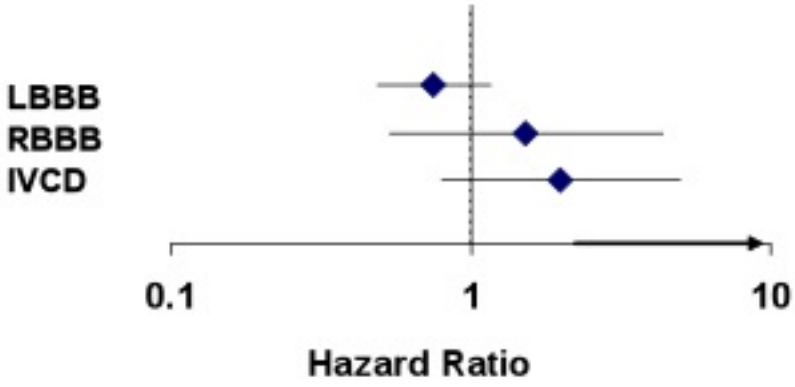


RAFT and MADIT-CRT: Mortality Results by QRS Morphology

RAFT Class II Mortality

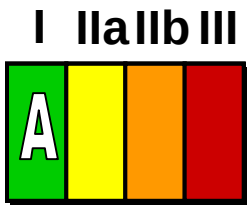


MADIT-CRT Mortality

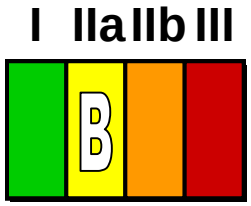


Note: Too few deaths in REVERSE to present subgroups.

2012 Guideline Recommendations for CRT



CRT is indicated for patients who have LVEF less than or equal to 35%, sinus rhythm, LBBB with a QRS duration greater than or equal to 150 ms, and NYHA class II, III, or ambulatory IV symptoms on guideline-directed medical therapy (GDMT).

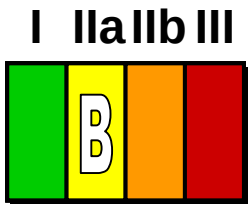


CRT can be useful for patients who have LVEF less than or equal to 35%, sinus rhythm, LBBB with a QRS duration 120 to 149 ms, and NYHA class II, III, or ambulatory IV symptoms on GDMT.

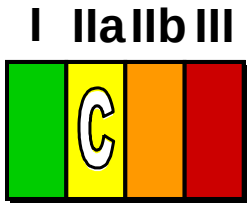
CRT can be useful for patients who have LVEF less than or equal to 35%, sinus rhythm, a non-LBBB pattern with a QRS duration greater than or equal to 150 ms, and NYHA class III/ambulatory class IV symptoms on GDMT.

Tracy C, et al., 2012 ACCF/AHA/HRS Focused Update of the 2008 Guidelines for Device-Based Therapy of Cardiac Rhythm Abnormalities. Circulation 2012; 126:1784-1800.

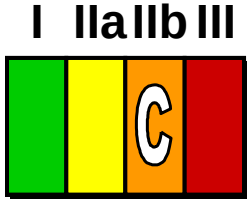
2012 Guideline Recommendations for CRT



CRT can be useful in patients with atrial fibrillation and LVEF less than or equal to 35% on GDMT if a) the patient requires ventricular pacing or otherwise meets CRT criteria and b) AV nodal ablation or pharmacologic rate control will allow near 100% ventricular pacing with CRT.



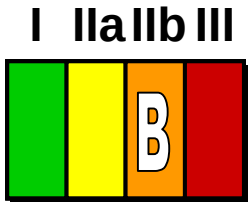
CRT can be useful for patients on GDMT who have LVEF less than or equal to 35% and are undergoing new or replacement device placement with anticipated requirement for significant (>40%) ventricular pacing.



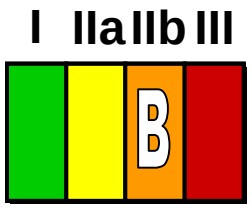
CRT may be considered for patients who have LVEF less than or equal to 30%, ischemic etiology of heart failure, sinus rhythm, LBBB with a QRS duration of greater than or equal to 150 ms, and NYHA class I symptoms on GDMT.

Tracy C, et al., 2012 ACCF/AHA/HRS Focused Update of the 2008 Guidelines for Device-Based Therapy of Cardiac Rhythm Abnormalities. Circulation 2012; 126:1784-1800.

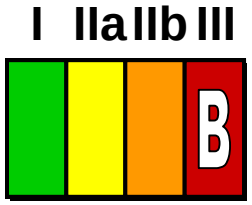
2012 Guideline Recommendations for CRT



CRT may be considered for patients who have LVEF less than or equal to 35%, sinus rhythm, a non-LBBB pattern with QRS duration 120 to 149 ms, and NYHA class III/ambulatory class IV on GDMT.



CRT may be considered for patients who have LVEF less than or equal to 35%, sinus rhythm, a non-LBBB pattern with a QRS duration greater than or equal to 150 ms, and NYHA class II symptoms on GDMT.



CRT is not recommended for patients with NYHA class I or II symptoms and non-LBBB pattern with QRS duration less than 150 ms.

Tracy C, et al., 2012 ACCF/AHA/HRS Focused Update of the 2008 Guidelines for Device-Based Therapy of Cardiac Rhythm Abnormalities. Circulation 2012; 126:1784-1800.