

A Patient-Centered Approach to ECG Telemetry Monitoring in Cardiac Rehabilitation

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Objectives

- Attendee will appreciate the scientific and safety concerns associated with ECG telemetry monitoring in cardiac rehabilitation
- Attendee will understand the clinical fundamentals and processes associated with a patient-centered approach to ECG telemetry monitoring among patients in cardiac rehabilitation



Outline

- **Background and rationale**
- Current messaging
- Evidence
- Practical stuff
- Other processes (time and energy-level permitting)...
 - ECG telemetry and PAD??
 - Blood pressure monitoring ???



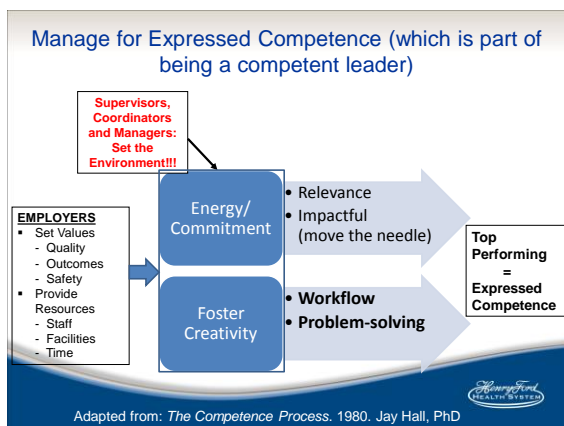
CMS/CDC/AHA/ACC/AACVPR ... Cardiac Rehabilitation Collaborative (CRC): Increasing enrollment from ~30% to 70% by 2022*

- Hitting the 70% target is going to require:
 - more programs
 - bigger programs**
 - more efficiently operated programs**
- A 70% participation rate is estimated to save 25,000 lives and prevent 180,000 hospitalizations, annually.



*Ades et al., Mayo Clin Proc 2016

To help get there ...Two “Big Picture” Program and Staff Management Issues



Deming Circle: Do what the words imply ...



And why should we do this....

- Value based care---
 - matches service to clinical need (patient-centered)
 - Improves efficiency to free-up time to:
 - Advance/complete those never ending ITP's
 - So very importantprogress training METs



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1

Let's digress for 5 minutes ... What is a MET (metabolic equivalent of task)

- Oxygen uptake during seated rest (seated, resting metabolic rate)
- 1 MET = approximately 3.5 mL/kg/min
 - perhaps closer to 2.6 mL/kg/min for patients with CHD (Savage et al, JCRP 2007)
- We can express intensity of effort/work performed as multiples of resting MET level



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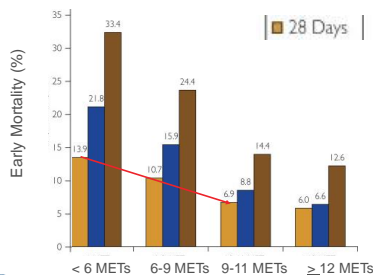
Is monitoring, increasing or progressing METs during CR important?

- METs used as an outcome measure for program certification
 - Magnitude of increase to be used as a performance or quality measure
- Peak exercise capacity in METs related to clinical outcomes
 - Each 1 MET higher exercise capacity ~ a 9% decrease in risk for mortality
- Training intensity or workloads during CR related to:
 - Magnitude of improvement in fitness
 - Role for moderate and higher intensity interval training
 - Implications for number of visits
 - Level of reduction in risk for mortality
- METs in CR can help guide recommendations for return to daily and leisure activities and return to work



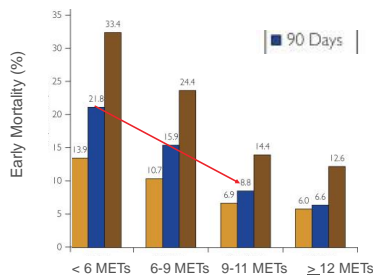
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Higher peak exercise METs before an MI associated with lower mortality at 28 d after an MI



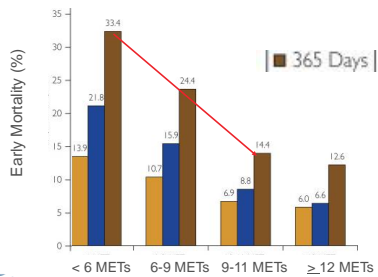
Shaya et al, Mayo Clin Proc 2016;91:129-39

Higher peak exercise METs before an MI associated with lower mortality at 90 d after an MI



Shaya et al, Mayo Clin Proc 2016;91:129-39

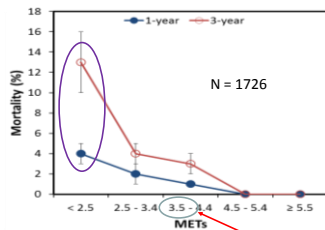
Higher peak exercise METs before an MI associated with lower mortality at 365 d after an MI



Shaya et al, Mayo Clin Proc 2016;91:129-39

The MET level upon d/c from CR is related to 1 yr and 3 yr survival in patients with CHD...

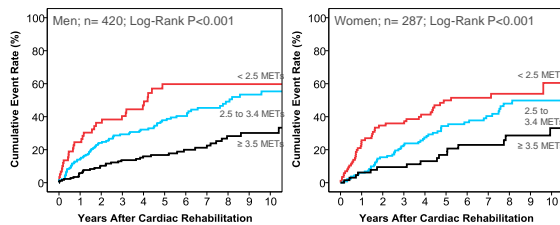
Target goal = 3.5 METs or higher



Brawner, et al. Am J Cardiol 2016;117:1236-1241; average MET level while treadmill walking from last two visits in CR

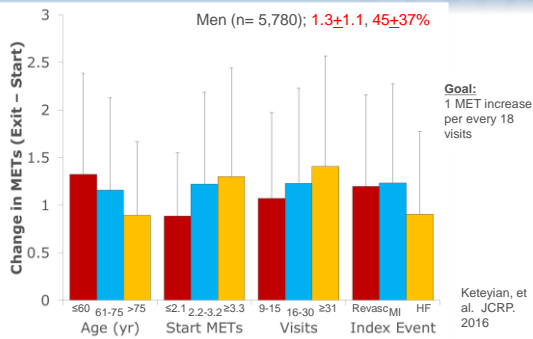
Figure 2.

The MET level upon d/c from CR is related to re-hospitalization in patients with heart failure...

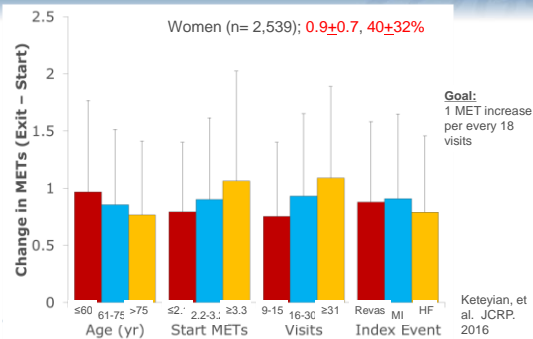


Keteyian, et al. Am Heart Journal 2018. Under review. Average MET level while treadmill walking from last two visits in CR

How much of an increase in MET level might one we expect from CR?



How much of an increase in MET level might one we expect from CR?



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AACVPR Website:

Turnkey Enrollment and Adherence Strategies

Admin

- 12-Month Cardiovascular Condition Episode (Bundle)
- Connecting with Psychosocial Providers
- CR Referral Performance Measures in a Quality Improvement System
- Establish a Philanthropic Fund
- Group Screening
- Inpatient Liaison for Outpatient CR (*Inpatient tracking form*)
- Reduce the Delay from Discharge to Enrollment

Behavior

- Diabetes Education
- Establish Standard of Care for Anxiety and Depression
- Medication Adherence
- Motivational Interviewing
- Self-Management
- Use of Text Messaging and Mobile Apps
- Use of Video

Exercise

- Accelerated Use of CR (*sample schedule*)
- ECG Monitoring Based on Clinical Need
- Open Gym (*sample schedule*)
- Safe Start Self-Pay

Nutrition

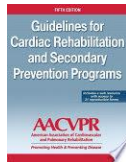
- Incorporating RDNs into CR
- Nutrition Assessment in CR

Matching Capacity to Demand:
ECG Monitoring Based on Clinical Need



ROADMAP TO REFORM
AACVPR
<http://www.aacvpr.org/R2R>

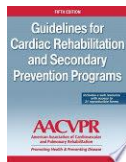
From:



- What is ECG telemetry monitoring intended for:
 - Detect dysrhythmias or other significant ECG changes that are amenable to treatment before complications arise
 - Monitor compliance with exercise prescription
 - Increase patient's self-confidence for independent activity

2013: Page 85-86

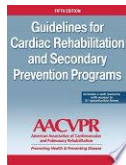
From:



- ECG tele-monitoring
 - Does not ensure efficacy or safety
 - Is not a valid measure of the clinical value of exercise
 - Is one method to monitor patients
- [A few (much less today) health insurers tie reimbursement to ECG tele monitoring]

2013: Page 85

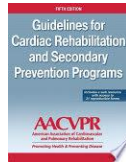
From:



- Cites “recommendations for intensity of supervision and monitoring is related to risk of exercise participation” (Williams, MA. 2001)
 - Lowest risk = begin with (6 visits) continuous ECG monitoring and decrease as appropriate to intermittent or no ECG monitoring
 - Moderate risk = begin with (12 visits) continuous ECG monitoring and decrease as appropriate to intermittent or no ECG monitoring
 - Higher risk = begin with (18 visits) continuous ECG monitoring and decrease as appropriate to intermittent ECG monitoring

2013: Page 85-86

From:



- “ ... Given the variable occurrence of dysrhythmias ... and given that the safety of exercise regimens has been determined only by means of aggregate data, the use of continuous versus intermittent (i.e., change in clinical status) ECG monitoring remains a matter of clinical judgement”
- “ECG monitoring ...inversely linked to risk, but no firm predictors exist ... to identify for whom it may not be necessary” (Verrill, et al., 1996)

2013: Page 85-86

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Over-all CR is safe



- Cardiovascular
 - Major event rate for CR = 1 per 120,000 up to 400,000 patient-hours of exercise

Leon, et al., Circ. 2005;111:369-376; Pavy, et al., Arch Int Med. 2006;166:2329-2334; Saito, et al., Circulation J. 2014;78:646-653.

Safety: HF-ACTION Trial (A controlled trial investigating outcomes of exercise training)



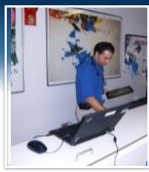
- 2331 patients with **stable, chronic HF and NYHA class II to IV symptoms** were randomized to exercise or usual care control ... at 82 sites
- Exercise group prescribed 36 center-based sessions followed by 9 or more months of home-based sessions; many sites did not ECG monitor during center-based and none-ECG monitored during home-based.
- *During or within 3 hours after exercise, no significant difference* was reported between the exercise and usual care groups for the overall rate of:
 - Hospitalization = 1.9% vs 3.2%; Death = 0.4% vs 0.4%

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 - Hospitalization = 1.9% vs 3.2%; Death = 0.4% vs 0.4%
- In a secondary analysis, **1,053 of the 2331 patients that were randomized to exercise or control ... already had an ICD at baseline**
- Among these 1,053 patients, 546 went exercise and 507 to control:
 - Exercise = 20% experienced a shock during any of the follow-up period
 - Control = 22% experienced a shock during any of the follow-up period

Electrocardiographic Monitoring During Cardiac Rehabilitation*



- 289 patient, 3,979 exercise sessions
- 27% experienced a minor event
 - Angina or equivalent, ST changes, abnormal BP response, non-sustained arrhythmia not requiring hospitalization, syncope or near syncope
 - How many were new onset versus known?
 - How many were symptomatic versus asymptomatic?
- 0% experienced a major event
 - sudden death, myocardial infarction, and sustained arrhythmia requiring hospitalization or electrical/ chemical cardioversion.



*Keteyian SJ, et al., Chest 1995;107:1242-46

Conclusions

- Rate of occurrence for **new-onset, asymptomatic events** (that ECG helped identify) was rare: 11 patients or 3.8%
 - However, only 2 of these 11 patients or 0.7% over-all had a change in care as a result
 - Beta blocker added for SVT (session #4)
 - Target HR range lowered for ST segment depression (session #3)



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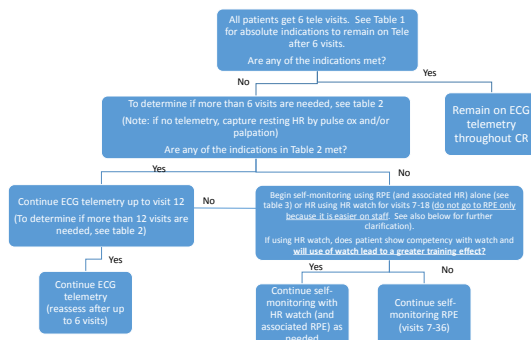
ECG Telemetry Monitoring (ECG-TM): Henry Ford Hospital Model



- All patients receive 6 ECG-tele visits
 - Any observed meaningful abnormalities, add 3 to 6 ECG-TM visits
 - Maintain ECG-TM throughout for highest risk (VAD, dialysis, inotrope infusion)
- Visits 7-36
 - Begin self monitoring using HR watch (titrating with RPE)
 - **Note: Use of HR to guide intensity is associated with achieving a higher MET levels¹**
 - Begin self-monitoring using RPE alone (no HR watch) for patients unable or not interested in performing moderate-vigorous exercise or not interested in using a HR-based approach
- Resume ECG-TM, as clinically indicated

1. Schley, et al. J Cardiopulmonary Rehabil. 2016;36:296 (abstract S210)

ECG Telemetry Monitoring: Henry Ford Hospital Model



#3. ECG Telemetry Monitoring: Henry Ford Hospital Model

Table 1: Indications for CR patients to remain on ECG telemetry

1. Higher Risk Patients
 - a) Patients with CHF on positive inotropes (e.g. milrinone)
 - b) Patients with a left ventricular assist device
 - c) Patients who are currently undergoing dialysis
2. Patients who have insurance providers that do not reimburse non-monitored cardiac rehabilitation (Aetna only requires tele for high risk and only for 3 wk)
3. Request from physician to remain on monitor throughout

Table 2: Indications to continue, or resume, ECG telemetry for an additional 3-6 sessions

1. Observed or documented arrhythmias of the following
 - a) Sustained ventricular tachycardia (8 or more beats)
 - b) Supraventricular tachycardia (relative based on 3x and frequency/duration of SVT)
 - c) Heart block or bradyarrhythmias
 - d) Non-sustained VT up to 7 beat runs (relative based on 3x and extent of non-sustained VT)
 - e) Medically managed MI??
2. ST or QRS changes, such as ST depression >1.0 mm during exercise (or additional ST depression of 1.5 mm if baseline abnormality present)
3. Addition of an anti-arrhythmic drug (e.g. amiodarone)
4. New or worsening angina?
5. Patient with recent cardiac-related IPD stay who returns to CR

#3. ECG Telemetry Monitoring: Henry Ford Hospital Model

Table 3: Indications for CR patients to move to RPE-only

1. Due to claudication, orthopedic, or non-cardiovascular conditions or very poor motivation, patient unable to perform moderate-vigorous exercise
2. Patients who are stable and demonstrate an exercise heart rate response <15 beats above rest
3. Patients who, after given sufficient education and training, are unable to demonstrate an understanding regarding the utilization of the heart rate monitor
4. Patients who are stable and do not wish to use or will not benefit from the heart rate monitor

Patient-Process Interface

- None to very, very few patients are ever concerned “about not being monitored” or “not getting their monies worth”
- Patients view d/c monitoring as a level of progression; a confidence builder
- Clinical judgement ... re-start telemetry as needed

It's all in the delivery --- during orientation we explain that stopping ECG tele is part of the process ... “after so many visits... we will likely d/c...”



Was a stress test ordered and completed... or not

Stress test ordered and completed

No exercise stress test

- This information can help guide the need for initial (or continued use) of ECG tele-monitoring.
- Helps evaluate an ECG telemetry identified issue
- Allows for intensity to be optimized; prescribed using a HR- or RPE-based approach



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Stress test ordered and completed

- This information can help guide the need for initial use or continued use (or not) of ECG tele-monitoring.
- Helps evaluate an ECG telemetry identified issue
- Allows for intensity to be optimized; prescribed using a HR- or RPE-based approach

No exercise stress test

- More likely the approach used today in practice
- Guide intensity using RPE (supported by HR)
- Clinical judgment; adjust number of ECG tele-monitoring visits based on patient history and initial observations and responses to CR

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Implications for patients PAD



- PAD and CAD very-often co-exist
- Due to claudication, patients with PAD often do not exert themselves to a level of exertion during ADL's that is sufficient to reveal myocardial ischemia
- Exercise training with telemetry monitoring could be used as a "soft screen" for covert myocardial ischemia



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Implications for patients PAD (continued)

- Not required, but in select patients consider at least three visits of ECG tele-monitoring to screen for myocardial ischemia
- Higher heart rates are achieved with stationary biking versus treadmill walking, because occurrence of claudication is delayed (or absent) due to the work being performed independent of body weight



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Decrease/stratify frequency of blood pressure measurement – Henry Ford

Goal: The frequency of blood pressure assessment during and after CR is driven-by patient safety; it should be discontinued if it provides no additional clinically meaningful information (and might detract from other important tasks being completed in CR).

Objective: Identify early on during CR those patients who will require blood pressure measurement for more than 3 sessions (or throughout) versus those that do not require such extensive monitoring.

Assumptions/Givens:

1. Some patients demonstrate abnormal BP measures before, during and/or after a CR session. These patients may require blood pressure measurements during and after exercise and throughout CR; especially those patients experiencing symptoms.
2. Many (the majority?) of patients participating in CR are free of abnormal BP measures before, during and/or after a CR session; therefore, not all patients require having their blood pressure measured during and/or after exercise.
3. No contemporary/definitive guidelines that pertain to the measurement of blood pressure during or following CR.

Decrease/stratify frequency of blood pressure measurement



Approach/Method:

- Measure blood pressure before, during and after a patient's first 3 CR sessions.
- If values measured during and after exercise represent normal physiologic responses for the patient's medical history (and the patient is asymptomatic), then future blood pressure measurements could be discontinued. Good clinical judgment should be used to determine what are normal responses.

For example, a patient with chronic, stable heart failure on beta blockers and afterload reducing agents may have a pre-exercise blood pressures of ~ 90/70 mmHg ... which regularly increases to ~ 118/70 mmHg with exercise, and returns to near baseline values after exercise.

If the patient is asymptomatic, this likely represents an ideal candidate to cease blood pressure measurement on during (and likely after exercise).
- And remember, it is normal for blood pressure, especially systolic, to be slightly lower after exercise than before. This should not be a concern if patient is asymptomatic.

Decrease/stratify frequency of blood pressure measurement

- **Example:** A 49 year old STEMI patient that routinely has a pre-exercise blood pressures of ~138/88 mmHg and that exceeds 210/90 mmHg with moderate-vigorous exercise (or exhibits a markedly exaggerated response to low level exercise) ... this patient likely requires some additional measurements during CR and/or notification of the referring physician.
- Again, clinical judgment by the CR professional should dictate the decision making about the continued measurement of blood pressure.
- Program staff are encouraged to confer with their physician leadership to establish program-specific guidelines that identify normal and abnormal blood pressure responses at rest, during exercise and in recovery.
- Such guidelines can then be used by staff to help identify which patients might require continued measurement of blood pressure during and/or after CR (versus those which do not).

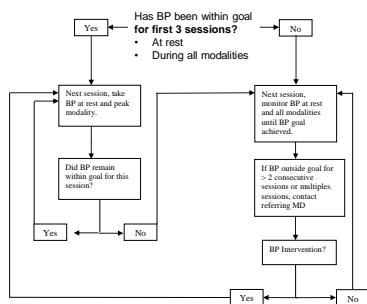
Decrease/stratify frequency of blood pressure measurement

In summary:

- Use a patient's first three sessions to screen for an abnormality in blood pressure response during (once or twice) or after exercise.
- If responses are clinically normal, then discontinue, with the knowledge that measuring blood pressure can be re-started at any time based on symptoms or a change in clinical status.
- For the lesser number of patients that demonstrate abnormal BP at rest, during exercise, and/or in recovery, continued blood pressure measurement during exercise and in recovery for all CR sessions may be warranted.

("Borrowed from") NYU Langone Health System
Rusk Cardiac Rehabilitation Blood Pressure Session Goal

- Resting BP goal of <140/90 or > 80/40
- **Peak exertional BP < 180/100 or without drop of systolic or diastolic of 10 mmHg**



In summary:

Be part of the fix ...

- ... Past practice ≠ best practice
- ... Identify best practice ... and pull-together a work-group
- ... Plan (a project at your site); involve physician champion?
- ... Do (conduct the project and collect the data)
- ... Study (assess/analyze the data)
- ... Act (implement or revise and re-study)
- ... **and use/trust your clinical decision making skills**



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