Cardiac Rehabilitation in Chronic Heart Failure: how well does it work in routine clinical practice?

Denmark, Sept 2016

Professor Patrick Doherty
Director of the National Audit of Cardiac Rehabilitation
University of York, UK
The NACR aims to:

• Support cardiovascular rehabilitation (CR) teams and commissioners in delivering high-quality and effective services, to evidence-based standards, for the benefit of all eligible patients
• Map the extent of provision and highlight inequalities and insufficiencies in delivery against key service indicators at local, regional and national levels
• Evaluate the effectiveness of routinely delivered CR services on patient outcomes
• Use audit and research data generated through the NACR to inform:
  • NICE clinical guidance and service specification development
  • Clinical practice standards from national associations
  • NHS healthcare commissioning processes and decision making
  • The public and cardiac patient groups about how their local services are performing.
Patient involvement

- Coronary Care partnership UK (CCP-UK) is our patient organisation and includes patients and carers from all cardiac conditions and interventions.
- The CCP-UK patient members sit on our Steering Group and help us develop indicators and support us in using the most appropriate methods (online) to communicate with patients.

Cardiac Rehabilitation in your area

Patient Information

Cardiac Rehabilitation: Uptake Project

The National Audit of Cardiac Rehab (NACR) team is working to develop innovative solutions to help rehab programmes to better engage with patients about accessing cardiac rehab and making the most of their rehab experience. For this to work it should be informed by the experiences and needs of people who have been a patient, or carer of a patient, after a cardiac event. If you are interested in helping us we would ask you to complete a short online survey which is available at

https://www.surveymonkey.co.uk/r/75Z7SC9

Find your nearest cardiac rehabilitation programme by typing in your town or postcode.

Postcode  
Radius  50 mi  
FIND LOCATIONS
NACR and the Cardiac Rehab Pathway

Patient Cardiac Rehabilitation Pathway – DH Commissioning Pack

1. Identify and Refer Patient
   - Reason for referral recorded in Initiating Event. Source of referral, and referral date recorded.

2. Manage referral and recruit patient
   - Referral dates and start dates for all early and core rehab.
   - Risk Assessment
   - Previous events and comorbidities

3. Assess Patient
   - Assessment 1: baseline before core rehab delivery:
     - From patient self-assessment questionnaire, and clinical appointment
     - Measures physical/activity/anxiety/depression/drugs
     - Tailored rehab based on assessment

4. Deliver comprehensive CR Programme
   - Duration and number of sessions measured;
   - Type of rehab delivered recorded. Core components listed.

5. Conduct final CR Assessment
   - Assessment 2 at end of rehab. Repeat of measurements at Ass 1, for outcomes
   - Onward referral recorded
   - Availability of Ass 3 for 12 month follow up

National Audit of Cardiac Rehabilitation
Modern rehabilitation services are:

• Structured around core components and commence early
• Informed by baseline assessment, patient goals and re-assessment
• Delivered by a multidisciplinary team over a predefined period of time and at an intensity known to yield benefits
• Evidence based and support an intervention that includes:
  – Prescribed exercise
  – Risk factor management
  – Symptom management
  – Education
  – Psychosocial support
  – A long term management plan with GP and social services
Modern Cardiac rehabilitation (CR) pathway delivered by a multidisciplinary Team (MDT)

CARDIAC REHABILITATION PATHWAY

Patient presentation → Identify and refer patient → Manage referral and recruit patient → Assess patient

- Develop patient care plan

Deliver comprehensive CR programme → Conduct final CR assessment

- Discharge and transition to long-term management

Patient discharged

Sharing cardiac rehabilitation information (education) and long term management strategy with the patient
The Seven Core Components for Cardiovascular Disease Prevention and Rehabilitation

Long-Term Management
- Lifestyle Risk Factor Management
- Psychosocial Health
- Medical Risk Factor Management
- Cardioprotective Therapies

Health Behaviour Change and Education

Audit and Evaluation

The British Association for Cardiovascular Prevention and Rehabilitation
Promoting excellence in cardiovascular disease prevention and rehabilitation
Exercise-based cardiac rehabilitation for coronary heart disease (2016 updated review)

• 63 studies with 14,486 participants with median follow-up of 12 months after exercise-based CR

• CR reduced cardiovascular mortality (relative risk: 0.74; 95% confidence interval: 0.64 to 0.86) and the risk of hospital admissions (relative risk: 0.82; 95% confidence interval: 0.70 to 0.96)

• There was no significant effect on total mortality, myocardial infarction, or revascularization

• Higher levels of health related quality of life after CR.

Anderson et al 2015 Cochrane Syst Rev. JACC, VOL. 67 NO. 1
Cochrane Review: Taylor et al 2014: Exercise Based Rehabilitation for Heart Failure

• 33 trials with 4,740 heart failure patients
• NYHA class I to IV  LVEF < 40%, age from  51 to 81 years
• Mostly male (>60%) but more females included in recent trials
• 8 trials reported follow up in excess of 12-months
• Exercise: 15 to 120 mins, 2 to 7 sessions/week, at an intensity of 40% of maximal heart rate to 85% of maximal oxygen uptake . Duration of 24 to 52 wks
• RESULTS: A trend towards a reduction in mortality with longer follow-up (>12 months) RR 0.88
  • Heart failure specific admissions significantly reduced (RR 0.61) and improvement in HRQL (MLWHF)
  • The cost-effectiveness ratio for long-term exercise in patients was 18.82 years and $1,773 (£1,152) /life-year saved.
• CR exercise training programmes are safe

Mechanisms responsible for the positive effect of CR based exercise training

• Reduction of major cardiovascular risk factors
• Improvement of endothelial function
• Improved inflammatory status
• Improvement of diastolic function
• Reversal of left ventricular remodelling after AMI
• Improved electrical stability of the diseased heart

Making the case for cardiac rehabilitation: modelling potential impact on readmissions

March 2013

CR can reduce health care utilisation!

“Achieving an uptake rate for cardiac rehabilitation of 65% in England among all eligible patients could release over £30 million per year in savings which could be reinvested in rehabilitation and re-ablement.”

CR delivery: where and what type

• Key considerations:
  – Hospital, local community or home based
  – Supervised or non-supervised
  – Group based, individual or supported self-management

• Location and type is informed by:
  – Assessment by a MDT
  – Risk assessment (low, mod and high)
  – Baseline assessment of fitness (<5 METs)
  – Monitoring requirements and supervision availability
  – Patient choice (supporting patient preference of evidence based interventions improves outcomes)
CR delivery: where and what type cont..

• Home-based versus centre-based CR:
• No difference in the healthcare costs and outcome based on 12 studies with 1,938 lower risk patient following an acute (MI) and revascularisation
• Supervised is more superior to non-supervised CR so to is supported-facilitated self-management (e.g Heart manual)

References:
Mode of Delivery in Modern UK CR

• Alternative mode of delivery of CR is seen as a solution to poor uptake and high levels of adherence (Dalal et al 2016)
• The dominate mode of delivery in the UK is group based with home based remaining at 10% share which is consistent over the last three years
• More should be done to support these options as part of the menu of approaches offered by programmes which can only help improve uptake and adherence to CR

<table>
<thead>
<tr>
<th>Mode of Delivery</th>
<th>Conventional Cardiac</th>
<th>HF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% of Patients attending</td>
<td></td>
</tr>
<tr>
<td>Group Based programme</td>
<td>82</td>
<td>73</td>
</tr>
<tr>
<td>Home Based</td>
<td>10</td>
<td>7</td>
</tr>
<tr>
<td>Web Based</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>19</td>
</tr>
</tbody>
</table>
Trends in multidisciplinary HF team follow up post discharge: NICOR Heart Failure Audit 2016 (2014-2015 data)
Kaplan Meier plot of all-cause mortality following hospital discharge by referral to cardiac rehab (2014/15)
NICOR 2016
Why do we need to quality assure CR?

- The health landscape is continually changing and financial austerity has reached peak levels
- We are still using an old evidence-base from the pre statins and pre acute revascularisation era
- Huge innovations in acute cardiology
- Most recent RCTs of CR showed little effect
- Greater expectations from patients in respect of the mode of CR delivery (patient choice agenda)
- Greater accountability from health funders and commissioners in terms of quality service delivery and measurable patient outcomes.
National Audit of Cardiac Rehabilitation (NACR)

We use NACR service level data to monitor and assess CR quality in the UK against BACPR minimum standards.
BACPR MS1: Equitable uptake age and gender 2013-2014

Proportion of male and female patients by age across programmes

Mean 66
Age alone is insufficient basis for not promoting or offering CR exercise!

UK CR mean
age = 66 (SD 8)

Dr. Leonard Schwartz in his 80s
We know what type of exercise works: Good exercise modes if done well! 60+ Tai Chi
A few examples of exercises that can do more harm than good as you get older!
Alternative modes of CR delivery
Self-managed home-based CR in heart failure

Project funded by
the NIHR

This presentation presents independent research funded by the National Institute for Health Research (NIHR) under the Programme Grants for Applied Research programme (RP-PG-1210-12004). The views expressed in this publication are those of the author(s) and not necessarily those of the NHS, the NIHR or the Department of Health.
Chair based exercise for heart failure patients

Designed to:

• avoid breathlessness during exercise
• delay or prevent muscle atrophy and weakness
• maintain aerobic fitness
• prevent muscle shortening
• reduce the likelihood of harm from exercise
• enable a greater volume of exercise for less effort
• improve the efficiency of arm exercise
• carryover into daily activity
How well is UK CR working in routine practice?

British (BACPR) minimum standards (MS) for CR

1. Equitable uptake from eligible population
2. Early CR
3. Prescribe CR based on assessment of core components
4. Multi-component CR over an evidence based duration (e.g. ≥ 8 weeks) delivered by a MDT
5. Evaluate the CR effect and long term management through re-assessment
BACPR MS2: Time from referral to start of CR by programme

Lines = guidelines for CABG ~42 days & MI-PCI ~28

- **MI/PCI**
- **CABG**

2013-2014 data

<table>
<thead>
<tr>
<th>England</th>
<th>NI</th>
<th>Wales</th>
</tr>
</thead>
</table>

BACPR MS3 & MS4: Pre & post CR assessment

Percentage of Assessment 1 with Assessment 2

2013-2014 data

Centre by Country

England  NI  Wales
BACPR S4: Duration of CR by programme

Lines represent 8 and 12 week guidelines for Core CR

Number of Weeks

2013-2014 data  England  NI  Wales
The BACPR-NACR certification programme uses 3 or more professions for MDT staff profile to tackle co-morbidity.

<table>
<thead>
<tr>
<th>Category</th>
<th>UK total N=261</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse</td>
<td>251 (96%)</td>
</tr>
<tr>
<td>Physiotherapist</td>
<td>170 (65%)</td>
</tr>
<tr>
<td>Dietitians</td>
<td>149 (57%)</td>
</tr>
<tr>
<td>Psychologist</td>
<td>48 (18%)</td>
</tr>
<tr>
<td>Social Worker</td>
<td>2 (1%)</td>
</tr>
<tr>
<td>Counsellor</td>
<td>16 (6%)</td>
</tr>
<tr>
<td>Doctor</td>
<td>25 (10%)</td>
</tr>
<tr>
<td>Health Care Assistant</td>
<td>45 (17%)</td>
</tr>
<tr>
<td>Secretary</td>
<td>197 (75%)</td>
</tr>
<tr>
<td>Administrator</td>
<td>26 (10%)</td>
</tr>
<tr>
<td>Exercise Specialist</td>
<td>132 (51%)</td>
</tr>
<tr>
<td>Occupational Therapist</td>
<td>77 (30%)</td>
</tr>
<tr>
<td>Pharmacist</td>
<td>118 (45%)</td>
</tr>
<tr>
<td>Physiotherapy Assistant</td>
<td>70 (27%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Comorbidity category</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angina</td>
<td>28</td>
</tr>
<tr>
<td>Arthritis (OA, RA)</td>
<td>25</td>
</tr>
<tr>
<td>Diabetes</td>
<td>23</td>
</tr>
<tr>
<td>Stroke</td>
<td>7</td>
</tr>
<tr>
<td>Claudication</td>
<td>5</td>
</tr>
<tr>
<td>Hypertension</td>
<td>50</td>
</tr>
<tr>
<td>COPD</td>
<td>16</td>
</tr>
<tr>
<td>Chronic back pain</td>
<td>11</td>
</tr>
<tr>
<td>Cancer</td>
<td>8</td>
</tr>
<tr>
<td>Other condition</td>
<td>32</td>
</tr>
</tbody>
</table>

50% of patients had two or more comorbidities.
### Number of Comorbidities

<table>
<thead>
<tr>
<th>Number of Comorbidities</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean) %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>61</td>
<td>22</td>
<td>66</td>
</tr>
<tr>
<td>One</td>
<td>65</td>
<td>34</td>
<td>69</td>
</tr>
<tr>
<td>Two</td>
<td>67</td>
<td>24</td>
<td>71</td>
</tr>
<tr>
<td>Three</td>
<td>69</td>
<td>13</td>
<td>72</td>
</tr>
<tr>
<td>Four</td>
<td>70</td>
<td>5</td>
<td>73</td>
</tr>
<tr>
<td>&gt; Five</td>
<td>70</td>
<td>3</td>
<td>72</td>
</tr>
</tbody>
</table>

### Percentage of patients achieving 150 minutes exercise per week

<table>
<thead>
<tr>
<th>Number of co-morbidities</th>
<th>Before CR</th>
<th>After CR</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>33%</td>
<td>58%</td>
<td>25</td>
</tr>
<tr>
<td>One</td>
<td>33%</td>
<td>56%</td>
<td>23</td>
</tr>
<tr>
<td>Two</td>
<td>31%</td>
<td>54%</td>
<td>23</td>
</tr>
<tr>
<td>Three</td>
<td>28%</td>
<td>50%</td>
<td>22</td>
</tr>
<tr>
<td>Four</td>
<td>28%</td>
<td>47%</td>
<td>19</td>
</tr>
<tr>
<td>&gt; Five</td>
<td>22%</td>
<td>38%</td>
<td>16</td>
</tr>
</tbody>
</table>
Does the UK meet BACPR minimum standards?

- Yes it is equitable but too few women taking up CR
- Fewer older patients (>70 years) than expected based on acute cardiology eligibility
- At a local level:
  - Over half the patients are waiting too long
  - Baseline assessment is reasonable but less so for post CR assessment
  - 75% of programmes are delivering CR at or above guideline for duration (for 10% duration < 5 weeks)
  - The number with 3 or more staff in the MDT is 70%
Percentage improvement in CR after 8-12 weeks

NACR data: sample size of 400,000 patients (2008 to 2016)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anxiety</td>
<td>18</td>
</tr>
<tr>
<td>Depression</td>
<td>20</td>
</tr>
<tr>
<td>BMI</td>
<td>2</td>
</tr>
<tr>
<td>QoL</td>
<td>18</td>
</tr>
<tr>
<td>Exercise</td>
<td>30</td>
</tr>
<tr>
<td>Chol</td>
<td>16</td>
</tr>
<tr>
<td>BP</td>
<td>8</td>
</tr>
<tr>
<td>Waist</td>
<td>4</td>
</tr>
</tbody>
</table>

Nationally it looks good for UK CR but what about locally!
Percentage of non-smokers post CR by programme

2013-2014 data
Exercise of 150 mins/week post CR by programme

2013-2014 data
Percentage change post CR in anxiety status

2013-2014 data
Percentage change post CR in depression status
National Certification programme (NCP)

• The BACPR and the NACR have completed the first certification phase based on the national minimum standards
• The NCP uses BACPR registration paperwork and routinely generated data from the NACR to assess each application
• The aim is to ensure that all programmes achieve a basic minimum standard and to assist programmes to achieve high quality delivery and outcomes
• In the first six months 14 programmes have applied with 12 securing immediate certification and two others referred with minor changes requested in the next six months
• Over 50 additional CR programmes have now expressed an interest to apply for certification.
Is CR working for HF patients in clinical practice?

Yes and no!

- Mortality benefit seen in HF patients that receive CR in routine practice
- Too few patients are referred
- Low conversion rates from referral to starting CR
- The majority of patients are waiting too long
- For HF patients that received CR
  - 37% show benefits above the level of change reported nationally
  - 59% show some change but it is at or below national averages
Next steps for the UK

• Use key service indicators developed with the NHS and NICE to implement a best practice tariff (funding) for CR
• Implement an online map to help support patient choice
• Carry out further research to identify the programme characteristics that determine high performance
• Develop clinically meaningful outcome thresholds for CR
• In collaboration with the NHS support CR providers to achieve the best possible outcomes for patients
• Fully implement the BACPR-NACR certification programme
• Work closer with the Danish Clinical audit team to help drive innovation and carry out observational research
Recent NACR research papers

1. Does cardiac rehabilitation favour the young over the old? Open Heart 2016;3:e000450. doi:10.1136/openhrt-2016-000450


Thank you!

Questions most welcome!

BHF Research Group
patrick.doherty@york.ac.uk
References

- Al Quait A, Doherty P. Does cardiac rehabilitation favour the young over the old? Open Heart 2016;3:e000450. doi:10.1136/openhrt-2016-000450


- Danish Cardiac Rehabilitation Database (DCRC) 2013, [https://www.sundhed.dk/content/cms/93/59693_hjerterehab2014.pdf](https://www.sundhed.dk/content/cms/93/59693_hjerterehab2014.pdf)


Houchen-Wolloff L, Boyce S, Singh S. The minimum clinically important improvement in the incremental shuttle walk test following cardiac rehabilitation. European Journal of Preventative Cardiology 2015;22;8:972-78

National Heart Failure Audit (2016). NICOR (National Institute for Cardiovascular Outcomes Research). 

NICE 2013 MI-secondary prevention in primary and secondary care for patients following a myocardial infarction. NICE clinical guideline 172, guidance.nice.org.uk/cg172


