More Evidence of Comprehensive Cardiac Rehabilitation Benefits, Even for All-Cause Mortality: Need to Increase Use Worldwide

Carl J. Lavie, MD,a Cemal Ozemek, PhD,b and Sherry L. Grace, PhDc

a The John Ochsner Heart and Vascular Institute, Ochsner Clinical School, The University of Queensland School of Medicine, New Orleans, Louisiana, USA
b Department of Physical Therapy, College of Applied Health Sciences, University of Illinois at Chicago, Chicago, Illinois, USA
c School of Kinesiology and Health Sciences, York University and KITE-Toronto Rehabilitation Institute, University of Health Network, University of Toronto, Toronto, Ontario, Canada

See article by Huang et al., pages 162–171 of this issue.

Considerable evidence indicates a very high prevalence of sedentary behaviour and lack of physical activity (PA) and exercise training (ET) in Canada, the United States, and much of the world.1–5 Clearly, many people move too little with too few steps, do not engage in PA/ET programs, and engage in prolonged sitting time and screen time throughout the day. The promotion of PA/ET, which improves levels of cardiorespiratory fitness throughout society and the health care system, is key for the primary and secondary prevention of cardiovascular disease (CVD).1–5 Certainly, in the secondary prevention of CVD, cardiac rehabilitation (CR) and ET programs that are comprehensive and comprise assessment, education, structured ET, psychosocial counselling, and risk-factor management have been the standard of care for many decades for patients with coronary heart disease (CHD), and this therapy has been supported recently for patients with heart failure (HF) with reduced ejection fraction.1–3,6,7,10 Nevertheless, despite these efforts, CR programs have been extremely underused, even in high-income countries, and this underuse is even more marked in low-income countries.1,6,7,11 In addition, although major Cochrane reviews and meta-analyses have supported benefits, recently, the impact on all-cause mortality has been questioned.12,13

In this issue of Canadian Journal of Cardiology, Huang and colleagues14 present a Bayesian network meta-analysis (NMA) with patients in CR with chronic CHD. Strengths of NMA include consideration of active comparison arms, which is often the case with CR trials. This is actually the fourth NMA in this CR field, with others assessing health-related quality of life (HRQOL):15 One considered the CR setting (centre based vs noncenter based),16 and the other considered the 5 core components of CR individually and combined.17 Briefly, the first assessed 49 reports of 41 randomized controlled trials (RCTs) in 11,747 subjects and demonstrated that HRQOL improved with ET and non-ET psychological-based interventions.15 The second assessed 60 RCTs of 19,411 patients and demonstrated that centre-based CR reduced all-cause mortality by 24%, but significant mortality benefits were not noted in noncentre-based CR.16 The third assessed 148 RCTs of 50,965 participants and demonstrated that psychological management and ET in particular were associated with reduced morbidity and mortality, and all CR components combined synergistically to reduce revascularization.17

Huang and colleagues14 extended these analyses, including 134 RCTs in 62,322 participants with CHD after myocardial infarction (MI), coronary artery bypass grafting (CABG), percutaneous intervention (PCI), or angiography alone and compared comprehensive CR (assessment, education, structural ET psychological counselling, and risk-factor management) with ET-only CR (ET without the other components), and non-ET CR (with the other components as described here but no ET). The main effects are seen in the Table. In summary, and as shown in the Table, they demonstrated that only comprehensive CR was associated with significant reductions in overall mortality. Non-ET CR and ET-only CR was effective in reducing CVD mortality compared with standard care but was not superior to comprehensive CR. Both comprehensive CR and ET-only CR reduced major adverse CVD events compared with standard care but were not statistically superior to each other or non-ET CR. For nonfatal MI, ET-only CR and non-ET CR both reduced subsequent MI but were statistically similar to comprehensive CR. For nonfatal stroke and transient ischemic attack, ET-only CR was superior to comprehensive CR and non-ET CR, but the evidence quality was low. Only comprehensive CR was associated with significant reductions in
reducing all-cause mortality when comprehensive.1-3,6

prevention, as has recently been promoted.1-3,6

comprehensive CR; for the majority of patients, the ideal

literature, in our opinion, the best overall effect is with

Considering the results of this NMA, as well as the broader

non-ET CR when comprehensive CR is not available.

did the other, which gives some support to ET-only CR or

particular modality had overall better statistical results than

with standard care, and there were some outcomes in which a

which they emphasize, and even with non-ET CR compared

HF, and only CR without ET was associated with reductions

cause and CVD hospitalizations. No therapy reduced risks of

All-cause and CVD

Revascularizations Bene

Nonfatal stroke/TIA No Superior No

hospitalizations Stat similar Benefits Stat similar for all-cause

Heart failure No No No

Depression Stat similar No No

benefit compared with control. Stat similar is not statistically

to control but statistically similar to the group that was benefi
c. No is no statistical benefit compared with control.

CCR, comprehensive cardiac rehabilitation; CVD, cardiovascular disease;

ET, exercise training; MACE, major adverse CVD events; MI, myocardial

infarction; Stat, statistically; TIA, transient ischemic attack.

revascularizations, either PCI or CABG, whereas only

ET-based CR was associated with significant reductions in all-

cause and CVD hospitalizations. No therapy reduced risks of

HF, and only CR without ET was associated with reductions in

depression but was statistically similar to the other 2 groups.

Overall, this fourth NMA from Huang and colleagues14

provides support for the marked benefits of CR programs in

patients with CHD and speaks to sustained and clinically
effective benefits of CR in the current era, including in

reducing all-cause mortality when comprehensive.1,6

Certainly, this NMA suggests some benefits of ET-only CR,

which they emphasize, and even with non-ET CR compared

with standard care, and there were some outcomes in which a

particular modality had overall better statistical results than
did the other, which gives some support to ET-only CR or

non-ET CR when comprehensive CR is not available.

Considering the results of this NMA, as well as the broader

literature, in our opinion, the best overall effect is with

comprehensive CR; for the majority of patients, the ideal

results would be this multimodality component of secondary

prevention, as has recently been promoted.1,5

The strengths of this NMA include (1) consideration of

setting and dose, (2) the characterization of CR interventions in

accordance with Template for Intervention Description and

Replication (TIDieR) reporting guidelines, (3) it included

non-English trials, (4) they considered depression as an

outcome, and (5) they characterized the proportion of males;

the latter is important given the paucity of women included in

CR trials with hard outcomes.18,19

The totality of evidence reminds us that great efforts are

needed to increase CR efforts worldwide.1-3,6 Even in rela-
tively high-income countries, such as Canada and the United

States, the barriers to CR may differ. In Canada, for example, CR

is covered by the government without copays. Nevertheless,

only 30% of eligible Canadians are referred to and

enrolled in CR services.18,26 Automating CR referrals and

encouraging health care providers to strongly advise patients
to enroll at the hospital bedside are effective strategies.

As we have discussed in the past, many members of the

health care team (eg, nurses, dietitians, pharmacists, physical

and occupational therapists, exercise specialists, as well as
general and CVD clinicians) should be involved with

vigourously encouraging patients to enroll, attend, and

complete CR.1,6

In the United States, although there are numerous barriers
to CR,1,6 Farah and colleagues25 recently demonstrated a

negative dose-response relationship between cost sharing and

CR sessions attended, and greater patient cost sharing was

associated with fewer CR sessions attended.26,27 Certainly,

reducing shared costs of CR could increase the chance of

successful CR attendance and completion in the United

States,25-27 and, indeed, providing financial incentives on an

escalating schedule has recently been advocated to facilitate
this.27,28

In addition, the current CR model of centre-based CR is

limited by long commutes, transportation, and employment

issues; poor infrastructure and capacity; and other obsta-
cles.1,6,29 Certainly, the "one size fits all" standard CR model

has substantial limitations and is outdated, and this model is

not effective enough at present to reach the entire population

of eligible patients and will likely be even less so in the
future.1,6,29 Home-based CR, which relies on remote

coaching and includes exercise supervision outside of the

traditional CR program at the medical centre, has tremendous
potential,30 as do programs that include modern technol-

ogy—such as smart-phone apps, Internet, and

community-based programs—that act as alternatives to stan-
dard CR care and are certainly needed in the modern era.1,6,29

In low-income countries, the obstacles are even greater,
especially when CR programs are either unavailable or

economically not feasible. Low-cost alternatives, including

ET-only, non-ET CR and other alternatives (eg, yoga and

meditation to improve psychological risk factors and other

CVD risk factors) may also be useful.31 Clearly, an intensive,
comprehensive multifactorial approach is needed for the

worldwide prevention and treatment of CVD, especially in

prevention of secondary CHD.

Funding Sources

The authors report no relevant funding sources

Disclosures

The authors have no conflicts of interest to disclose.

References


Table. Summary of the Huang et al. meta-analysis14

<table>
<thead>
<tr>
<th></th>
<th>CCR</th>
<th>ET-Only CR</th>
<th>Non-ET CR</th>
</tr>
</thead>
<tbody>
<tr>
<td>All-cause Mortality</td>
<td>Benefits</td>
<td>Stat similar</td>
<td>Stat similar</td>
</tr>
<tr>
<td>CVD mortality</td>
<td>Stat similar</td>
<td>Benefits</td>
<td>Benefits</td>
</tr>
<tr>
<td>MACE</td>
<td>Benefits</td>
<td>Benefits</td>
<td>Stat similar</td>
</tr>
<tr>
<td>Nonfatal MI</td>
<td>Stat similar</td>
<td>Benefits</td>
<td>Benefits</td>
</tr>
<tr>
<td>Nonfatal stroke/TIA</td>
<td>No</td>
<td>Superior</td>
<td>No</td>
</tr>
<tr>
<td>Revascularizations</td>
<td>Benefits</td>
<td>Stat similar</td>
<td>Stat similar</td>
</tr>
<tr>
<td>All-cause and CVD</td>
<td>Stat similar</td>
<td>Benefits</td>
<td>Stat similar for all-cause</td>
</tr>
</tbody>
</table>

Superior: statistically superior to control and the other groups. Benefits: statistically beneficial compared with control. Stat similar is not statistically superior to control but statistically similar to the group that was benefial. No is no statistical benefit compared with control.


