The RAMIT trial by West et al., published in 2011, is a randomized controlled trial (RCT) of cardiac rehabilitation (CR) in patients following acute myocardial infarction that was undertaken between 1997 and 2000, with follow-up of secondary outcomes to 2001 and for mortality to 2006. The trial compared cardiac rehabilitation as an intervention with that of usual care, and the authors conclude that they found ‘no effect on mortality at 1 year, 2 years or after 7-9 years and little evidence of any beneficial effect on morbidity, cardiac medication, risk factors, lifestyle or patients’ appreciation of total aftercare’. They concluded that “The value of cardiac rehabilitation as practised in the UK is open to question” (page 1).

At a time when NHS secondary prevention services are required to justify the efficacy of their interventions, unsurprisingly, the RAMIT study instigated much academic and professional discussion of cardiac rehabilitation both in the United Kingdom and around the world. In order to reduce the potential damaging effects that this study could have on CR services, the BACPR released an initial response to the study (click here to view the BACPR's initial response to its members) which offered members suggested responses to those questioning the worth of CR as an effective prevention treatment. The BACPR also submitted a letter to the Editor of Heart which was published (to read this letter click here).

What follows is a summary of the responses prompted by the publication of the RAMIT trial. We encourage members to consider these when evaluating the findings of this study. The main themes that emerged from the responses were:

**RAMIT findings in context of the 2011 Cochrane review.**

The RAMIT trial was submitted for publication before the release of the recent Cochrane Collaboration Systematic Review and meta-analysis2 of 47 RCTs and the authors therefore did not consider this in their discussion. However, when the RAMIT trial findings are pooled with those of the Cochrane review, additional analysis by Taylor3 concludes that with CR there still remains an average reduction in all-cause mortality of 11% compared to that of usual care. Additionally, Taylor3 suggests that the RAMIT trial provides further data that supports reduced hospitalisation following CR.

**Study design.**

The RAMIT study required an 8000 sample size (from power calculations) in order to illustrate their primary endpoint of 2 year all-cause mortality, but due to funding cuts were unable to recruit to this level. Several respondents (Rashid & Wood4, Redfern and Clark5, Wood6 and Berger et al7), point out that the final sample size of 1817 patients does not meet this criteria, thus meaning that the sample size was not strong enough to assess the primary endpoint. Rashid & Wood4 further state that the inclusion of ‘elective hospitals’ is ‘inappropriate’ as a method to increase the sample size, and Wood6 adds that this merely serves as a ‘distraction’. Redfern & Clark5 add that over 20% of the
intervention group dropped out, therefore not completing the rehabilitation programme and further add that ‘any contamination among controls is unclear’.

Doherty and Lewin\(^8\) reiterate the point made by BACPR\(^8\) that the RAMIT study did not report CONSORT data (quantifying recruitment and subsequent losses) although subsequently data is produced within a response from the authors of the RAMIT trial, West and Jones\(^10\).

**Heterogeneity of programmes.**

Following extensive audit of 348 cardiac rehabilitation programmes in England, Wales and Northern Ireland over the past 5 years, the National Audit of Cardiac Rehabilitation (NACR) has documented a substantial reduction in patients who were previously sedentary (49% pre CR, 29% at 12 months) and also an increase of 15% in those achieving the recommended guidelines for physical activity, again at 12 months\(^11\). As Wood\(^6\) points out, the NACR results are consistent with those of a European audit of 12 month outcomes from 22 countries in 2008\(^12\). The findings of the RAMIT study are not consistent with these results. – one possible explanation is that the RAMIT study was conducted a decade previous to the recent NACR audit and although the RAMIT trial was conducted well, ‘by comparison with the BACR standards of the time these programmes were not fit for purpose’ (Wood\(^6\)). One of the reasons that NACR was initiated was that it was recognised at the time that not all CR programmes were delivering effective interventions (lack of staffing, resources etc,) and that it was necessary to audit activity and to be able to provide a realistic picture of CR practice in the UK.

Williams and Austin\(^13\) make reference to the subject characteristics in the RAMIT trial – they averaged around 64 years of age (not old for this population) and there was no evidence of them being at risk or experiencing anxiety and depression. They also point out that the study provided no evidence of short-term analysis – no assessment immediately post intervention. Results from a study conducted by Williams *et al*\(^14\) with heart failure patients, show that at five years following CR, 71% were still exercising, compared with 51% of those who had no intervention – and the authors further highlight a recent review showing reduced hospital admissions and improved quality of life following hospital based CR\(^15\). Again these findings are not consistent with those of the RAMIT trial.

The quality and comprehensiveness of any intervention will determine the outcome of the study. The initial response from the BACPR\(^9\) points out that the RAMIT trial took place previous to the original BACR (2007) standards – and although RAMIT claims to evaluate ‘comprehensive cardiac rehabilitation’, encompassing the traditional CR remit of exercise, education and relaxation, the 2007 standards surpassed this, with the addition of cardio-protective therapies, smoking cessation, medical risk factor management amongst many others. The 2012 BACPR Standards and Core Components\(^16\) offer an advanced interventional model of comprehensive prevention and rehabilitation.

Wood\(^6\) offers the EUROACTION trial as an example of a comprehensive multidisciplinary programme that documented substantial positive lifestyle changes such as reduced consumption of saturated fat, increased intake of fruit and vegetables, decreased smoking relapse and more notably, a difference (34%) between physical activity uptake in those receiving the intervention compared to usual care\(^17\). The EUROACTION trial also saw significant improvement in blood pressure control between the intervention and usual care as a result of changing behaviour – something, as noted by Wood\(^6\) that was not reported on by the RAMIT authors, despite their focus on secondary prevention.
Exercise component.

Berger and colleagues\(^7\) point out that intervention subjects in the RAMIT trial received around ten hours of exercise training within six to eight weeks as compared with recommended guidelines of thirty minutes of moderate intensity training on at least five days of the week\(^18\). They suggest that the intensity of exercise will determine the success of the intervention, this may be why the RAMIT trial did not produce positive results. They further note that lack of detailed information on the exercise component in the RAMIT trial makes it impossible to generalise the findings of the study, a view already expressed by the BACPR\(^9\) and echoed by Conraads et al\(^19\) in their response to the RAMIT trial. Conraads and colleagues\(^19\) further comment that there is no evidence of pre and post exercise testing, something that could have enhanced our understanding of the results. Doherty and Lewin\(^8\) bring our attention to recent observational studies\(^20-23\) that suggest that any proven benefit is determined by the dose and mode of intervention and also highlight a review of trials and observational studies that provide evidence of effectiveness of CR\(^24\). Taylor\(^3\) points out that in the recent Cochrane review\(^2\), the CR interventions were heterogeneous in character, including the exercise component. The lack of detail on the intervention in the RAMIT trial makes it difficult to consider this study within the context of current practice.

Optimisation of medication (secondary prevention) in RAMIT trial.

Two respondents to the RAMIT trial point to the sub-optimisation of medication for secondary prevention\(^6,19\) that is apparent in the study, with only 65\% of both intervention and control patients taking a statin, 43\% an ACE inhibitor and 61\% a beta-blocker at 12 month follow-up. Berger and colleagues\(^7\) suggest that this sub-optimisation may explain to some extent the rather high mortality rate amongst RAMIT trial intervention group (6\%) and control group (5.2\%) when compared to other studies of 2.2\%\(^20\) and 2.6\%\(^25\).

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