Time to scale up access to cost-effective home-based/digitally supported models of rehabilitation delivery.

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There is compelling evidence that participation in exercise-based rehabilitation (ExCR) improves the health-related of quality of life and reduces the risk of clinical events, including hospitalisation, of people with coronary heart disease (CHD) - post-MI, revascularisation, and angina - and heart failure (HF). ExCR is a class I grade A recommendation of national and international clinical guidelines for CHD and HF management.[1] Nevertheless, despite these clear benefits and strong guidance, ExCR referral and participation rates remain stubbornly low across the globe.[2] Whether in a low-, middle- or high-income setting, the reasons for this poor access are complex and multilevel. However, two key drivers of future global ExCR access are economics i.e., the provision of affordable and cost-effective ExCR programmes, and 'modernisation' of ExCR service delivery i.e., the provision of alternatives to the traditional centre-based model of ExCR provision, which include home-based, digital technology supported, and hybrid (combing centre and remote) programmes.[3]

This comprehensive and high-quality systematic review of the cost-effectiveness of home-based cardiac rehabilitation by Shields and colleagues provides a timely summary of the evidence addressing these two key drivers of future ExCR access.[4] The review authors identified nine studies that address the cost and health outcomes of home-/digitally supported modes of rehabilitation: two studies in HF, five studies in CHD, and two studies in both. Heterogeneity in study contexts, research questions and the methods used to answer these questions mean that synthesis of cost-effectiveness evidence is challenging. This review is no exception - while all included studies were based on randomised trials allocating patients to a home-based/digitally supported programme, the wide range of study comparators complicates the interpretation of this evidence base.

Building on the categorisation by Shields et al., there were broadly three clinical/policy questions addressed by the different studies included in this review: (1) is home-based/digitally supported ExCR a cost-effective alternative to traditional centre-based ExCR? (2) is digitally supported ExCR cost effective when compared to usual care? and (3) is adding a period of digitally supported ExCR, following a centre-based programme, cost effective compared to a centre-based programme alone? The results of each study and the review are presented in accordance with the UK National Institute for Health and Care Excellence (NICE) reference approach for assessing the cost-effectiveness of health technologies, i.e., the incremental difference between ExCR delivery alternatives in terms of patient's health outcomes as assessed by quality adjusted life years (QALYs) relative to the net difference in costs of these alternatives. That seven of the nine assessed costs from a healthcare perspective, meant that the majority studies may have missed potentially important cost differences especially relevant to remote models of delivery including indirect medical costs borne by patients (e.g., travel costs to a hospital or community centre to undergo their rehabilitation) and productivity losses (i.e., patients not able to attend work due to rehabilitation attendance).

Two other important limitations highlighted by the review authors were the relatively small sample sizes of the studies and their short time horizon of up to 12-months to assess costs and QALYs. Only one study was formally powered on a non-inferiority hypothesis and was therefore formally designed with a sample size large enough to be able to reject the absence of important clinical difference between ExCR delivery alternatives. These limitations are well-recognised in the literature as being common amongst economic evaluations conducted alongside clinical trials (EEACTs).[5] The proposed mitigation of these limitations usually involves modelling. Decision analytic

models enable health economists to incorporate evidence synthesis to increase the generalisability of results and to extrapolate cost and health impacts beyond the trial time horizon. Further, the role of conceptual modelling in EEACTs is increasingly being advocated to address limitations of power to detect changes in health-related of quality of life.[6] However, only one study eligible for inclusion in this review used decision analytic modelling to perform an analysis over the patient lifetime, thereby capturing all relevant costs and health impacts of the ExCR delivery alternatives in the analysis. This review serves as a reminder of the importance of developing models alongside within-trial cost-effectiveness analyses, to ensure EEACTs are robust to answer the vital question of whether the intervention under study provides sufficient value.

So, accepting these individual study caveats, what are the clinical practice and policy learnings that we can take from Shield's review? The study reveals that most of the published research on relative cost-effectiveness of home-/digitally supported ExCR to date has focused on comparison to centre-based ExCR. Whilst some studies found the overall healthcare costs of home-/digitally supported programmes to be lower than centre-based, overall, there was no consistent pattern of cost difference between the two. Furthermore, there was no distinct pattern of difference in QALYs between the modes of delivery. While this lack of consistent pattern makes it difficult to make definitive conclusions about cost-effectiveness of home-based/digitally supported ExCR compared to centre-based, we can reasonably conclude that there is no evidence of loss of efficiency when moving from centre-based service delivery to a home-based platform.

It should be noted that the majority of these studies focused on low/moderate risk patients, and we therefore need to be cautious in overly extrapolating this evidence.

Higher risk CHD and HF patients need to be carefully selected for their suitability for referral to a home-/digitally supported programme. The evidence base identified in this review is too limited to confidently draw conclusions on the cost-effectiveness of either home-based/digitally supported ExCR versus usual care or adding a period of home-based/digitally supported rehabilitation following a centre-based programme versus centre-based programme alone.

Some 20 years ago, Taylor and Kirby published an editorial in Heart, one of the first commentaries on the cost-effectiveness of cardiac rehabilitation.[7] The authors concluded that "investment in cardiac rehabilitation services in the UK appears justified in terms of mortality (cost per life year gained) and quality of life (cost per QALY)". At that time the authors identified only one published randomised controlled trial and two non-randomised trials that had formally addressed the costs and cost-effectiveness of ExCR, all in patients with CHD. The evidence base supporting the clinical effectiveness and cost-effectiveness of ExCR has much evolved over the last two decades.[1] A recent review by Oldridge and Taylor identified nine published economic evaluations of ExCR versus no ExCR for patients with CHD and HF.[8] All studies found ExCR to be cost-effective with findings ranging from dominance (i.e. ExCR more effective and cost saving compared to usual care) to an incremental cost-effectiveness of up to ~£40,000/QALY, which generally compares favourably with NICE's (unofficial) willingness to pay threshold of £30,000/QALY.

This latest systematic review by Shields et al. shows that home-/digitally supported delivery models of ExCR have similar costs and health outcomes to centre-based programmes. Armed with this latest evidence, surely, it's time to ensure consistent access to 'modern' rehabilitation services for our CHD and HF patients. Growth in the development of digital technologies, as well as the upsurge of remote delivery of

healthcare services during the COVID-19 pandemic, means ever-increasing scope for the scale-up and global provision of remote, accessible, clinically efficacious, and cost-effective delivery models.

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