

Cardiac Rehabilitation: Under-utilized globally

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Abstract

Purpose of review:

Cardiac rehabilitation (CR) is grossly under-utilized. This review summarizes current knowledge about degree of CR utilization, reasons for under-utilization, and strategies to increase use.

Recent findings:

ICCPR's global CR audit quantified for the first time the number of additional CR spots needed per year to treat indicated patients, so there are programs they may use. The first randomized trial of automatic/systematic CR referral has shown it results in significantly greater patient completion. Moreover, the recent update of the Cochrane review on interventions to increase use has provided unequivocal evidence on the significant impact of clinician CR encouragement at the bedside; a course is now available to train clinicians.

Summary:

The United States is leading the way in implementing automatic referral with inpatient-clinician CR discussions. Suggestions to triage patients based on risk to less resource-intensive, unsupervised program models could simultaneously expand capacity and support patient adherence.

Keywords: cardiac rehabilitation, referral, access to health care, health care utilization, secondary disease prevention, cardiovascular diseases

Introduction

Cardiovascular diseases (CVD) are among the leading causes of mortality and morbidity globally, with rising incidence in low and middle-income countries (LMICs)(1). With advances in screening and associated risk factor control as well as acute treatments, most cardiac patients survive upon initial diagnosis, but then live with CVD chronically at an increased risk of mortality and further morbidity(2).

Cardiac rehabilitation (CR) is a standardized outpatient model of care for secondary prevention, delivering risk factor control strategies, psychosocial counseling, patient education, and supporting lifestyle behavior changes including exercise(3)(4). Robust evidence has established that CR participation results in approximately 25% lower mortality and morbidity(5)(6)(7), with benefits also seen in LMICs(8), and that CR is cost-effective(9). Therefore, referral to CR is highly recommended in cardiac clinical practice guidelines globally(10)(11)(12).

Rates of CR Under-Utilization

Unfortunately, CR is under-utilized around the world(13). CR utilization involves physician *referral*, subsequent patient *enrolment* (i.e., attending at least an initial appointment), their *adherence* to prescribed sessions (on average 2 sessions a week over 5 months)(14), and ultimately program *completion*, involving a discharge re-assessment(15). Many CR societies recognize these utilization parameters as quality indicators(16), with 7/7 associations with such indicators assessing referral, and 3-4 assessing each of the others(17).

Rates of CR utilization are uniformly low worldwide. Arguably the best (i.e., population-level) data we have stems from the United States (US). Based on Get With the Guidelines data,

referral rates at 156 hospitals were 53% after acute MI, 58% after percutaneous coronary intervention (PCI), and 74% after coronary bypass graft surgery between 2000 and 2007(18). Data from the US' Catheterization/PCI Registry from 1310 hospitals between 2009-2012 show 59.2% of patients were referred to CR(19). Based on data from the Chest Pain / Myocardial Infarction (MI) registry, CR referral rates increased from 73 to 81% between 2007 and 2012(20). With regard to enrolment, the US most recently reports 24% (up from 16-19% in 1997(21) and 2011(22)) in indicated Medicare beneficiaries ≥ 65 years (administrative data)(23); After enrollment, 57% of these patients adhered to ≥ 25 CR sessions, and 27% completed the full 36 prescribed sessions (i.e., completion)(23).

In Australia, 2012/13 data from the Coronary Angiogram Database of South Australia revealed 53% of PCI patients were referred to CR(24). In Europe, self-reported CR utilization at up to most recently 131 hospitals in 27 countries revealed 46% referral, with 69% of those reporting they attended at least half of prescribed sessions; 32% of all patients(25). We performed meta-analyses of published literature (not population-based) reporting CR utilization rates, and found overall referral rates at 43%(26), enrolment at 42%(27), and adherence at 70% of prescribed sessions(28).

When compared to implementation of other cardiac guideline recommendations, US registries demonstrate CR referral is much less well implemented than any other secondary prevention recommendation, be it in inpatients (e.g., 77% for CR referral vs 98% for aspirin and smoking cessation counselling for example)(29) or outpatients (e.g., 12% for CR referral vs 97% for blood pressure assessment and 81% for lipid-lowering)(30). We also know there is major geographic variation within jurisdictions, with many areas considered CR "deserts" where patients could not access CR as there is none available (31).

Reasons for CR Under-Utilization

These disconcertingly low rates of CR use are caused by factors at the patient, referring physician / acute care, program and health system levels(32)(33). With regard to the former, certain patient groups are less well-represented in programs than others(34)(35). Our CR Barriers Scale (CRBS; <https://sgrace.info.yorku.ca/cr-barriers-scale/crbs-instructions-and-languages-translations/>), now available in 14 languages, establishes patient's top barriers as distance from CR sites, transportation barriers, time conflicts, and in many jurisdictions, cost(36). Among non-enrollees, leading barriers include lack of perceived need, which is likely related to another common barrier of lack of awareness, which is itself likely due to lack of clinician encouragement, as well as preference to manage their condition independently(37). Most common reasons for enrollees failing to adhere to prescribed sessions include fatigue or pain due to exercise, preference to exercise at home independently, work conflicts and comorbidities(37).

Hospital-level factors also impact CR utilization, resulting in substantial geographic variation(38). Moreover, it has long been established by Ades et al. that encouragement by physicians in these hospitals is key to patient use of CR, and this finding remains apropos today(39)(40). Yet, unfortunately most discussions between patients and clinicians at the bedside, if they occur at all, do not result in informed patients supported to fully engage in CR(41)(41*). Reviews of barriers clinicians experience in referring and encouraging patients to enrol in CR reveal lack of knowledge of CR, its' benefits, as well as locations and how to refer; attitudes towards CR(43); referral norms among colleagues and perceptions it is the role of another clinician to make the referral; safety concerns; time constraints and competing priorities; perception patient lacks motivation or is unable to attend; as well as clinician's personal lifestyle and health beliefs play a role(44)(45).

At the CR program level, factors such as limited hours, parking costs, language of delivery, and lack of tailoring of programs to meet patient needs (e.g., exercise prescriptions, education, setting, time)(46) play a role in limiting patient engagement(47)(48). At the health system level, lack of reimbursement of CR services (which is particularly disconcerting as other guideline-recommended cardiac care is reimbursed)(49), leading to insufficient capacity(50); lack of integration with acute cardiac care such as through electronic referral for continuity of care(51); and failure to consider location and distribution of programs in relation to where patients reside, all impede CR use(52). With regard to the former, the problem of lack of reimbursement leading to insufficient capacity should not be under-estimated; the International Council of Cardiovascular Prevention and Rehabilitation (ICCP) has calculated through their recent global audit that countries such as the US, United Kingdom, Canada, Australia and Switzerland have among the best CR densities globally (i.e., spots per incident CVD patient/year)(50), and also determined that such countries have policies for government and/or private healthcare insurance coverage of CR services(53).

Patient-Level Factors

As outlined above, while overall CR utilization is sub-optimal, certain patients are even less well-represented in CR, particularly women(26)(27)(28). Despite the fact that they are in greater need for CR due to their poorer outcomes(54), and that they may realize even greater benefits than men from full participation(55), women experience different barriers to utilization(56). They are less often referred(26) and encouraged by their clinicians(39), and hence are less aware of the existence of CR and its benefits(37). They more often suffer from comorbidities, such as diabetes, arthritis, and osteoporosis, which they perceive hinder their participation in CR; in actuality, these comorbidities are ameliorated by CR in most cases, or can

be mitigated with individual program tailoring and thoughtful exercise prescription(57).

Relatedly, women more often report pain or fatigue from exercise(58). They also frequently have transportation barriers, which may be related to their often lower socioeconomic status due to the gender pay gap, and being widowed for example(59). And finally, as women are more often informal caregivers than men, and marry older partners who are hence more prone to chronic illness, women often have family responsibilities they put before their own health care such as participating in CR.

Moreover, older patients, those living outside of urban areas, speaking a first language or being from a culture other than the main one where they live, those with mental health or psychosocial issues, who are unemployed, uncoupled, of lower socioeconomic status as well as those with comorbidities are even less likely to access CR(34). Again, these are patient groups who often have poorer health outcomes than their counterparts, hence would likely benefit from CR to an even greater degree, so these are the patients we should be reaching.

On a final note, patients in LMICs are even less likely to access CR than those in high-income countries (where we have the most data on utilization unfortunately), yet this is where the epidemic of CVD is at its' worst and growing(60). As outlined above, capacity is the leading barrier, with only 1 CR “spot” per 66 incident ischemic heart disease patients per year in LMICs (vs per 3 in high-income countries)(61). While clinician barriers to referral are generally consistent with higher-income countries (e.g., time, awareness of programs)(62)(63)(64), more patients have to pay out-of-pocket in these settings which is clearly a limiting factor(53).

Combatting CR Under-Utilization

There are established interventions to mitigate under-use that work(65)(66). An excellent review of multi-level CR utilization barriers and corresponding potential mitigation strategies is available in the literature(60). First however, as outlined above, health system capacity must be augmented so there are CR spots to which patients can be referred. How do we achieve this? CR must be covered so the needed resources are there to treat indicated patients in accordance with guideline recommendations(10)(12). A scale to assess healthcare administrator attitudes towards CR and supporting it is available(67). ICCPR has developed an advocacy toolkit to support reimbursement policy development and enactment (<https://globalcardiacrehab.com/Advocacy>)(49). They have also developed a high-quality(68) consensus statement, used as the basis of recommendations by the World Health Organization's Package of Rehabilitation Interventions for ischemic heart disease(68), on how CR can feasibly be delivered in low-resource settings, so capacity can be maximized using available resources(3)(4). Moreover, they have developed a corresponding online certification program for would-be CR clinicians from the many disciplines involved in CR(69), to augment CR human resources for delivery (<https://globalcardiacrehab.com/Certification>).

With regard to the role of programming in maximizing capacity, the nature of CR services themselves must be optimized to treat as many patients as possible, while maintaining adherence to guidelines, comprehensiveness, safety and patient-centredness. While validation is needed, a useful triage algorithm has been proposed, where patients would be allocated to one of 3 CR models, each requiring a different level of resources and hence cost, on the basis primarily of risk(70) (Figure 2). Programs would develop the following models/ levels of service: (1) comprehensive care supervised by a physician, delivered in clinical centres by a multidisciplinary team for only the highest-risk patients, (2) community-based care exploiting

technology for self-management for those at moderate risk, and (3) home-based care via technology and leveraging peer support, with the minimum needed care provided by the CR team, for the majority of patients who are at low risk(71)(72).

Automatic / Systematic CR Referral

After increasing capacity, the most influential way to augment CR utilization will be to automate referral(73)(74). Given the evidence(5)(6), with corresponding guideline recommendations to refer(10)(12), and given that patients in most countries cannot access CR without a physician referral(75), it is incumbent on those treating indicated patients to refer. A large, seminal multi-centre observational study by our group established that systematic referral results in significantly greater patient enrolment(76). A subsequent review confirmed this effect across different settings(77), and formed the basis for a policy statement on systematic CR referral(78). The evidence continues to mount, particularly given the spread of electronic health records that can be readily leveraged for this purpose(79)(74)(80). Most recently, a randomized, population-based trial of automated CR referral (ISLAND) has established its' efficacy in increasing CR *completion*(77**)(82). In this intervention, all cardiac catheterization patients with obstructive disease randomized to the intervention arms were mailed a pre-filled (using the angiogram information) CR referral form for provision to their primary care provider, along with information on CR benefits and available sites, so the clinician could make the referral(83)(84).

Clinician Encouragement / CR Discussions

Recently, the Cochrane review on interventions to increase CR enrolment, adherence and completion was updated, and a meta-analysis could be performed for the first time(81**).

Twenty-six trials were included, with evidence supporting significant intervention effects in

increasing all 3 utilization indicators. Meta-regression analyses supported the long-reported observation(40) that clinician encouragement face-to-face significantly improves CR enrolment, bolstering the imperative to empower cardiac care providers to promote CR to their patients at the bedside (while much work has pointed to “liaisons” from CR programs speaking to patients on acute care wards which is ideal given their CR knowledge, in few institutions are the resources available to support this, and so realistically acute cardiac care providers need to be supported to enact this). Results were translated to clinically-actionable recommendations in a rigorously-developed position statement by the ICCPR which was endorsed by 23 CR-related societies(86), and an online course was developed to support implementation(83*). The evidence-based, free, 20-minute course, which is available in 5 languages (<https://globalcardiacrehab.com/CR-Utilization>), is approved for continuing education credits by several bodies(88). The course, directed towards all disciplines involved in acute care of CR-indicated patients, describes the nature and benefits of CR, how to recognize eligible patients who should be referred, and what key information to impart to patients with encouragement. A point-of-care tool is embedded to support the latter, although it has yet to be validated; more needs to be known about the content and characteristics of patient-clinician discussions and how they can optimally promote patient CR utilization, particularly given the previous research reviewed above demonstrating how infrequently these discussions occur and their insufficiency when they do occur, primarily due to lack of clinician knowledge and time(41)(42)(83*).

What is Being Tried

Through the Cochrane review, when compared to enrolment, fewer trials for improving the outcomes of adherence and completion were identified, and hence fewer meta-regression analyses to identify what works were possible(81**). For completion, no tangible approaches

were discerned, but the ISLAND trial outlined above has since been published, providing some further direction(77*). For adherence, results suggested offering some CR remotely results in greater adherence. This should be considered preliminary however, because in the included trials adherence was not assessed in a comparative manner in the supervised and remote arms; thus, it is likely adherence was artificially inflated in the remote arms. For example, in our included CR4HER trial, we were hesitant to count answering a call (or logging in to a website in the case of other included trials) as a comparable indicator of attending a session / adherence as taking the time to travel to a CR center, and indeed we did find somewhat lower functional capacity in the home-based arm despite comparable “adherence”(89). Future trials using, for instance, activity monitors over the course of a week as a comparable indicator of adherence regardless of CR setting could resolve this question. Clearly more research is needed in this area to determine what can optimize program adherence, and hence completion. ICCPR has posted the CRBS online for self-report, which could help patients identify their key barriers and share them with programs for mitigation; indeed suggested strategies are provided for each barrier (see: <https://globalcardiacrehab.com/For-Patients>).

Many CR societies are also actively working to augment CR utilization(90). For instance, to our knowledge, there are currently 8 active CR registries globally(91), of which most assess multiple utilization indicators; what is measured can be reported and improved. This should include focus on measuring use in under-served groups in need, to alleviate inequities. Indeed, the US “Get with the Guidelines” initiative has successfully demonstrated auditing adherence to guideline recommendations including CR referral and supporting institutions in quality improvement results in significantly greater CR utilization(92).

Moreover, the US has embarked on its' "Million Hearts" initiative(93)(31)(94), which recognizes that one of the top ways to reduce CVD deaths would be through implementation of CR(95). With the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR), they have developed a "Change Package" replete with resources for implementing new processes supporting CR utilization (<https://millionhearts.hhs.gov/tools-protocols/action-guides/cardiac-change-package/index.html>). Finally, they are working with the Agency for Healthcare Research and Quality who funded an initiative called "TAKEheart", where they are implementing automatic referral with care coordination (e.g., bedside CR discussions) at participating hospitals across the country (<https://takeheart.ahrq.gov/>; [Figure 1](#)).

Conclusions

CR is highly effective in reducing mortality and morbidity, but it is poorly implemented, particularly when compared to other cardiac guideline recommendations. Most patients are not accessing this life-saving intervention, due to factors from the system level (chiefly lack of capacity), through to physician referral failure ascribable commonly to lack of time, and insufficiently-resourced programs that hence cannot innovate to meet patient need(s). Yet, we now know of proven strategies to overcome patient utilization barriers, which could be implemented if we could achieve reimbursement in more countries, and hence augmented capacity. Over the next few years we will all be watching the US -- a country with among the best CR densities in the world, due likely to their successful advocacy for reimbursement(96)(97)-- as they implementing these proven strategies to increase use at a population level.

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Compliance with Ethical Standards

Conflict of Interest: All authors declare they have no conflict of interest.

Human and Animal Rights: All reported studies/experiments with human or animal subjects performed by the authors have been previously published and complied with all applicable ethical standards (including the Helsinki declaration and its amendments, institutional/national research committee standards, and international/national/institutional guidelines).

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Figure 1

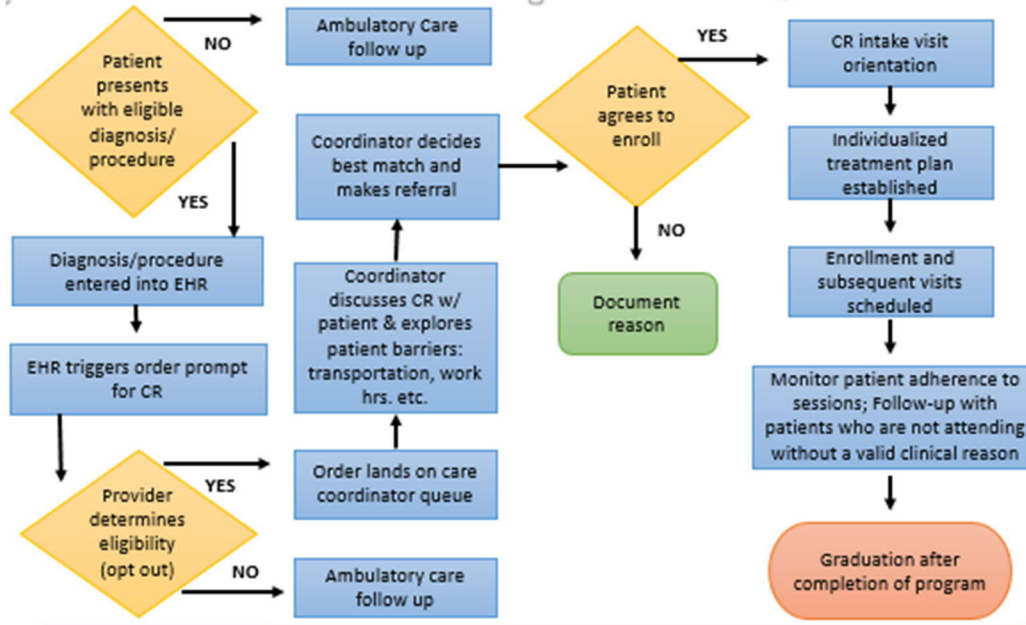
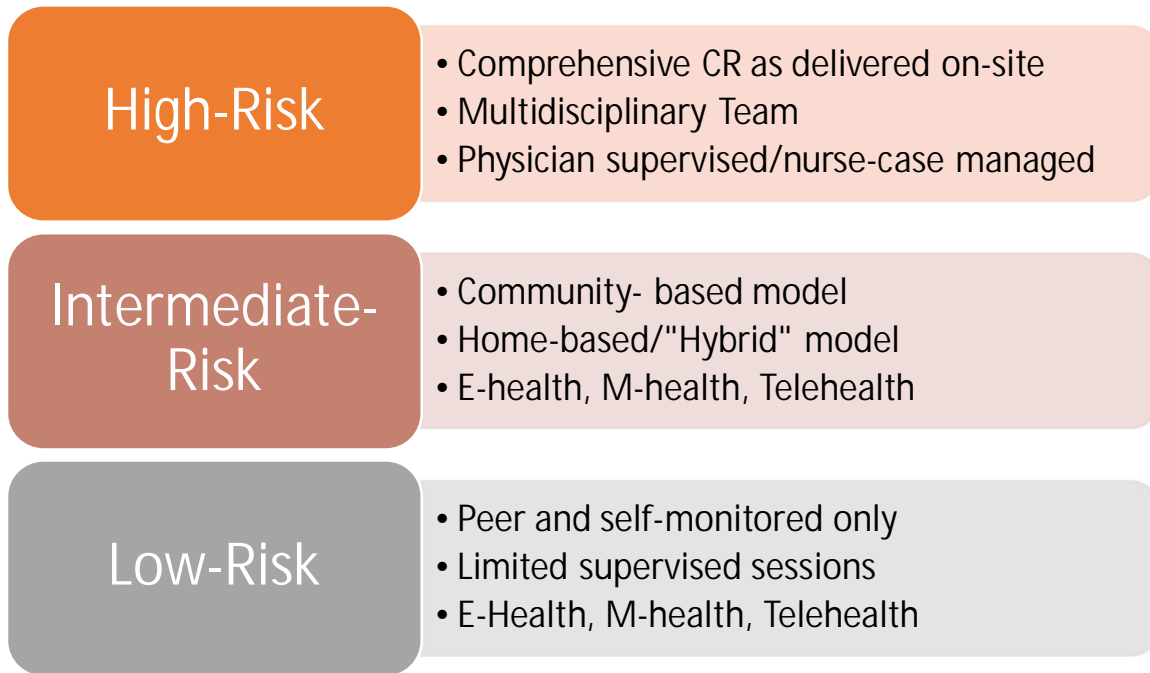


Figure 1: Process for Automatic Cardiac Rehabilitation Referral, with Care Coordination to Support Patient Enrolment, Adherence, and Completion. CR: cardiac rehabilitation; EHR:

electronic health record. (With permission from: The Agency for Healthcare Research and Quality. TAKEheart: AHRQ's Initiative to Increase Use of Cardiac Rehabilitation.

[https://takeheart.ahrq.gov/.](https://takeheart.ahrq.gov/))

Figure 2



Triaging Patients to Less Resource-Intensive Models as a Means to Increase CR Capacity

Proposed framework for CR models at three levels of resource intensity to which patients could be allocated based on their clinical risk. Cost efficiency of models of lesser intensity requires confirmation.

CR = Cardiac Rehabilitation

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