Factors Hindering CR Availability and Utilization that are Unique to, or More Problematic in LMICs

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| **Level** | **Supervised Programs** | **Home-Based/ Hybrid Models\*** |
| Society/System | Less universal health care, so more patients pay out-of-pocket for CR. Also leads to patient prioritization of acute vs secondary preventive care.  Less CR reimbursement, such that CR is not financially sustainable or resourced.  Less publicly and more privately-funded CR, hence need for policies supporting healthcare insurance reimbursement, and means for non-employed cardiac patients to access CR. | Home-based models must be universally reimbursed publicly, so patients do pay out-of-pocket.  Internet connections poorer, and amount of data per month limited due to cost.  Implications for CR delivery include inability to stream a/synchronous education, exercise or other components (e.g., yoga for stress management). |
| Referring Clinicians | Fewer primary care and specialist physicians to refer to CR.  Clinicians less aware of CR and have less exposure to it, so are less likely to refer and encourage their patients.  Cannot implement systematic referral as there are insufficient programs and capacity within programs to meet need, and patients cannot attend if they cannot afford to pay. | Not aware of the existence of home-based models to which they could refer patients with distance, transportation and/or time barriers. |
| CR Programs | Fewer centers, resulting in lack of capacity, or where it is exists in metropolitan areas generally only, longer travel times.  Few trained healthcare professionals across the disciplines for comprehensive secondary prevention, nor skilled for CR delivery. Also, fewer specialty physicians, and those that exist have very high caseloads, so are not available to support CR programs.  Reduced ability for staff and patients to travel to CR due to more common: civil unrest, conflict, crime, poor road/traffic conditions, natural disasters (due to greater impact of climate change in low resource settings, compounded by poor infrastructure).  Insufficient funds to maintain CR equipment.  Concerns about safety, due to complexity of patients, lack of follow-up | Penetrance of mobile phones is high, but of larger-screen devices lower. Implications include difficulty viewing patients for home functional capacity tests, to teach them aerobic and resistance exercise, to monitor their symptoms visually (e.g., signs of fatigue, pain); small screen to log exercise activity etc. online.  CR center access to secure, private connection with patients, including needed software, training and IT support for the software, and associated hardware.  Poorer access to emergency medical services, in case of adverse event during home exercise in higher-risk patients.  Home-based programs have too few sessions to be impactful. Sufficient staffing is needed to regularly contact patients.  Technology-mediated care not widely incorporated in clinical curricula or continuing education. |
| Patients | Inequities are greater in terms of socioeconomic status and gender, such that many patients have even poorer access to CR care; we must also consider the many displaced persons and refugees.  Most patients do not have coverage for medications, leading to less use, and consequently poorer outcomes.  Lower literacy and numeracy, including health literacy, thwarting patient education efforts.  Lipid tests paid for out-of-pocket.  Necessity to work to cover basic needs of family, and lack of disability benefits, such that patients cannot take time off to attend CR sessions.  CR barriers more fundamental: cost, distance, necessity to work, severe weather.  Higher rates of mental illness, comorbidity, disability, complicating CR management. | Less opportunity to exercise outside of CR center in home due to: smaller space, more people, lack of equipment.  Patients would not have devices at home to support monitoring, including for blood pressure or glucose. Pharmacies charge to assess blood pressure in the community.  Validated outcome measures not translated to applicable language of patients and scale cost a barrier.  Patients unwilling to travel back to CR center for reassessment due to distance, cost, work conflicts, lack of perceived value of preventive healthcare.  Patients share phone with other family members.  Patients changing mobile phone numbers, losing phones. Inability to charge phones.  Less opportunity to exercise in community due to: road safety (e.g., lack of sidewalks), lack of green space, high levels of air pollution, extreme weather (e.g., too hot), higher crime leading to lower safety, few community exercise facilities and those that do exist are not affordable. |

Abbreviations: CR, cardiac rehabilitation; IT, information technology; LMIC, low- and middle-income countries

\* +/- technology.

Note that many intersect multiple levels and that some relevant to supervised models are also relevant to unsupervised delivery