2

Setting Up a Cardiac Rehabilitation Program

FRAMEWORK FOR IMPLEMENTATION

Rationale

Cardiac rehabilitation (CR), an evidence-based secondary prevention strategy, significantly reduces mortality and morbidity, improves functional outcomes, and enhances quality of life. The implementation of a structured, scalable, and context-sensitive framework for CR is essential for expanding access, ensuring safety, enhancing adherence across diverse settings, and is needed to guide policymakers, clinicians, and institutions (Fig. 2.1).

Components of the Framework

- **Patient assessment and risk stratification:** Determine baseline physical, clinical, and psychological profiles to guide intervention planning using various assessment tools.
- **Individualized exercise prescription:** Improve cardiovascular endurance, muscular strength, and flexibility.
- **Education and risk factor modification:** Empower patients to make sustainable behavior changes focusing on areas like medication adherence, smoking and alcohol cessation, healthy dietary habits, and the importance of physical activity.
- **Nutrition counseling:** Advise to manage comorbidities such as obesity, diabetes, and hypertension.
- **Psychosocial support:** Address anxiety, depression, stress, and emotional adjustment postcardiac event.

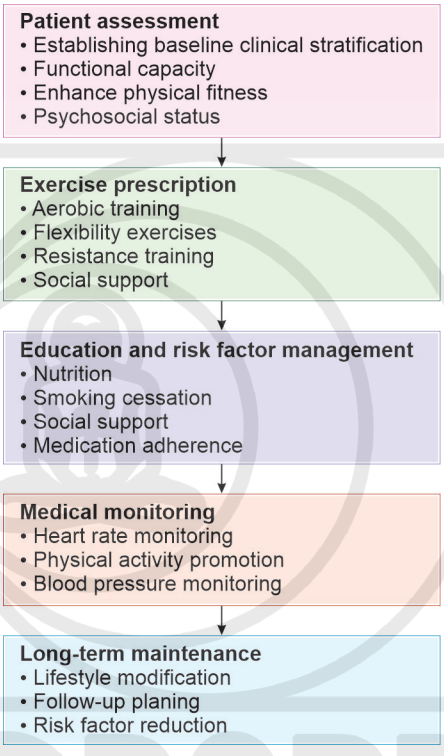

Figure 2.1: Framework for cardiac rehabilitation

- **Medical surveillance and safety monitoring:** Monitor patient response, detect complications, and adjust interventions.
- **Vocational counseling and social reintegration:** Help patients return to work, perform daily roles, and meaningful activities.
- **Long-term adherence and maintenance:** To sustain lifestyle changes postdischarge from CR.

Best Practice Recommendations

- Initiate CR referral at discharge.
- Customize CR based on risk profile and social support.
- Integrate digital tools for home-based models.
- Train nonphysician providers to scale services.

- Align programs with guidelines from international bodies [ICCPR, American College of Sports Medicine (ACSM), AHA] and adapt using clinical reasoning to local contexts.
- Ensure patient-centric care, emphasizing individual risk stratification, tailored exercise prescriptions, and clinical judgement.
- Prioritize safety protocols and clinical reasoning in emergency response preparedness.
- Implement systematic documentation and reflective clinical reasoning practices for tracking patient progress and outcomes.

Cultural and Contextual Adaptations

- In resource-limited settings, utilize low-cost alternatives (e.g., manual BP cuffs, resistance bands).
- Partner with community centers for overflow services to reduce capital expenses.
- Translate digital interfaces and training materials into regional languages.
- Adapt scheduling to local work patterns and public holidays to maximize attendance.
- Include gender-sensitive programming for women in conservative regions.

INFRASTRUCTURE AND RESOURCES

Rationale

In India, heterogeneous healthcare settings, from tertiary hospitals to rural clinics, pose unique challenges to ensuring consistent facility standards, equipment availability, and workforce capacity. Addressing these elements systematically helps physiotherapists design CR services that meet clinical demands and patient needs (Fig. 2.2).

Elements and their Components

- **Physical facilities:** Exercise area dimensions, access ramps, flooring, lighting, ventilation, and emergency exits.
- **Exercise equipment:** Treadmills, cycle ergometers, resistance training tools, balance aids, and portable monitoring kits.

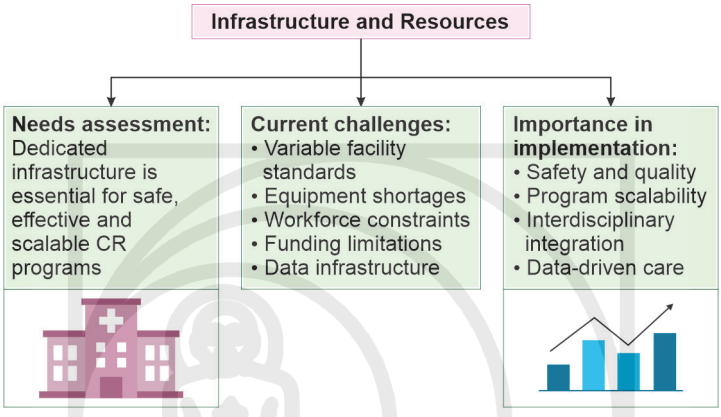

Figure 2.2: Infrastructure and resources for cardiac rehabilitation

- **Monitoring devices:** ECG telemetry, blood pressure monitors, pulse oximeters, defibrillators, and emergency response carts.
- **Digital infrastructure:** Tele-rehabilitation platforms, electronic medical record (EMR) systems, data servers, and secure patient portals.
- **Human resources:** CR-trained physiotherapists, cardiology support, nurses, dietitians, psychologists, and administrative staff.
- **Consumables and maintenance:** Sanitation supplies, disposable sensors, calibration tools, and service contracts.

Practical Considerations

- **Space optimization:** Plan modular layouts that accommodate group and individual sessions.
- **Budget planning:** Prioritize high-impact purchases; leverage bulk procurement and vendor partnerships.
- **Procurement processes:** Navigate public tendering, institutional approvals, and vendor negotiations effectively.
- **Maintenance protocols:** Establish routine checks, calibration schedules, and rapid repair workflows.
- **Training needs:** Embed equipment operation, troubleshooting, and emergency response in staff training curricula.
- **Data security and privacy:** Implement secure logins, access controls, and compliance with local data protection norms.

- Optimal utilization of available resources within budget constraints, guided by critical evaluation of patient and clinical needs.
- Innovative approaches to manage space limitations (e.g., multipurpose rooms, mobile CR units) through practical clinical reasoning.
- Collaboration with local health services for patient referrals and ongoing care, ensuring continuity and comprehensive management.
- Adoption of digital solutions and tele-rehabilitation platforms guided by clinical reasoning to ensure patient safety and effectiveness.

Integration Strategies

Integration of resources for a successful implementation of CR framework is summarized in Figure 2.3.

Steps for Integration

1. Stakeholder alignment (hospital administration, rehabilitation team).

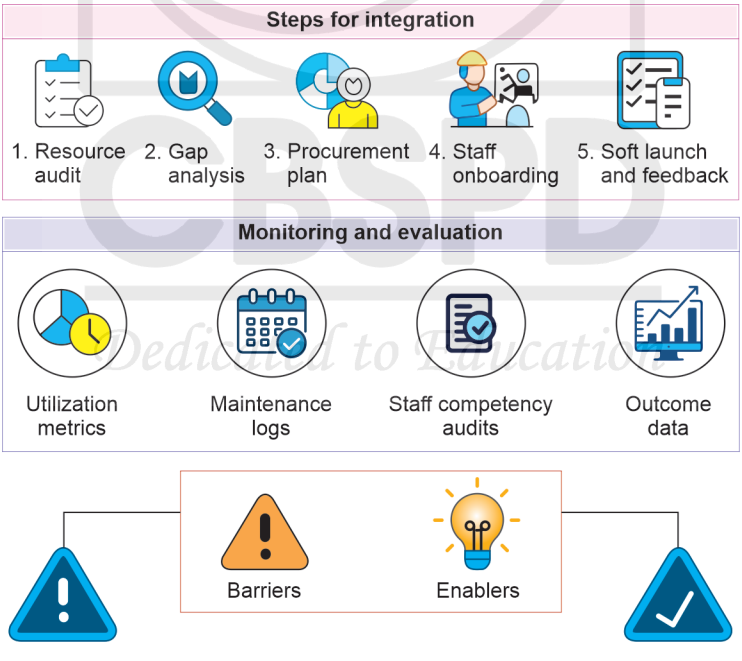

Figure 2.3: Implementation and integration strategies

2. Resource mapping and gap identification.
3. Identifying barriers and enablers.
4. Training and task-sharing protocols.
5. Development of SOPs and outcome metrics.
6. Pilot testing and feedback loop.

Key Indicators for Monitoring and Evaluation

- Program completion rate
- Change in 6MWT, BP, lipid profile
- Patient satisfaction scores
- Hospital readmission rates

Prioritized Frequently Asked Questions in Clinical Practice

Prioritized frequently asked questions (FAQs) are necessary to empower the practicing professionals to implement effective, standardized, patient centric and quality driven cardiac rehabilitation programs. Importance of prioritized FAQS for effective CR implementation is shown in Figure 2.4.

Implementation Strategy

- **Needs assessment and planning:** Employ clinical reasoning to identify target patient populations, existing resources, and potential gaps.

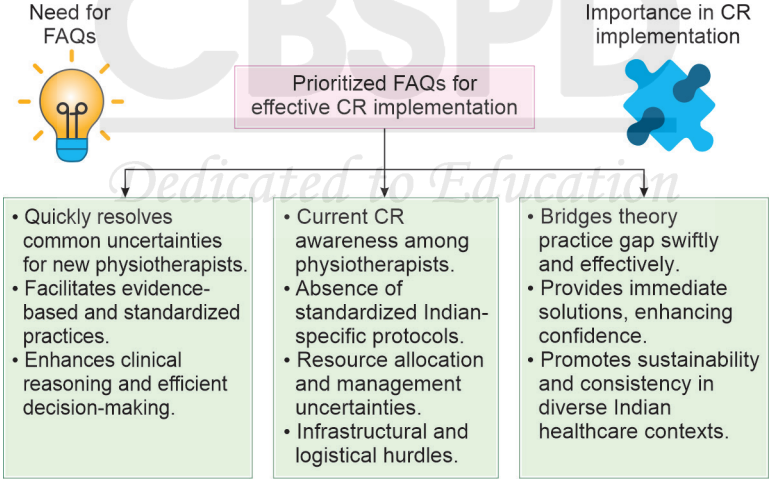

Figure 2.4: Prioritized frequently asked questions

- **Infrastructure setup:** Establish physical and digital infrastructure based on clinical demands and evidence-based needs.
- **Staff training:** Conduct CR-specific training workshops emphasizing critical thinking, clinical reasoning, and interdisciplinary communication.
- **Pilot implementation:** Utilize clinical reasoning to manage small patient cohorts effectively and adapt protocols as necessary.
- **Scaling up:** Gradually expand the program based on feedback, clinical outcomes, and continuous evaluation.
- **Monitoring and evaluation:** Establish clear metrics and benchmarks for evaluating outcomes.
- Continuous quality improvement through reviews and audits.

SPACE CONSTRAINTS FOR DELIVERING CARDIAC REHABILITATION

Rationale

Space constraints encountered in delivering CR are shown in Figure 2.5.

Practical Considerations

- **Space mapping:** Conduct a spatial audit to identify underutilized zones.
- **Time-blocked scheduling:** Stagger CR sessions during off-peak hours of other departments.
- **Equipment inventory management:** Employ mobile racks and wall-mounted storage.
- **Safety protocols:** Clear signage and floor markers; maintain safe distancing in compact spaces.
- **Flexible exercise zones:** Use multipurpose rooms, hallways or outdoor courtyards for group activities.
- **Modular equipment:** Portable treadmills, foldable bikes, and resistance bands facilitate quick setup and storage.
- **Tele-rehabilitation hubs:** Convert small offices into digital coaching stations equipped with video conferencing tools.
- **Shared resource partnerships:** Collaborate with community centers or gyms to access larger spaces.

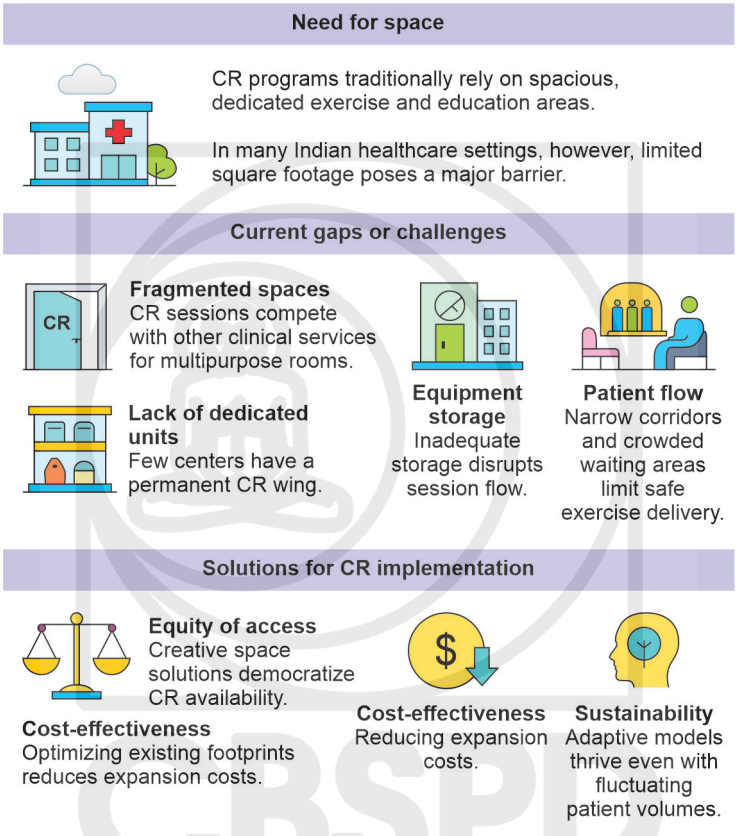

Figure 2.5: Space constraints in cardiac rehabilitation

Cultural and Contextual Adaptations

- Incorporate local home-based exercises for follow-up in cramped home environments.
- Leverage family members as volunteer assistants for small-group activities.
- Adapt education materials in regional languages for telerehabilitation interfaces.

DELIVERY MODELS: COMMUNITY-BASED AND INSTITUTION-BASED

Rationale for Diverse Delivery Models

Cardiac rehabilitation program uptake has various barriers, including geographic disparities, socioeconomic factors, healthcare system limitations, and a lack of awareness or referral by providers.

Given these challenges, expanding the reach of CR through diverse delivery models becomes essential. By tailoring delivery to meet contextual, cultural, and logistical needs, healthcare systems can optimize participation and adherence. Key CR delivery models, including hospital-based, outpatient, community-based, hybrid, and home-based, while providing strategic guidance on selecting, implementing, and evaluating these models across various healthcare settings are discussed as follows (Fig. 2.6).

1. Institution-Based Models/Hospital-Based CR

Hospital-based CR is the traditional, gold-standard model typically located in tertiary care centers or teaching hospitals. It is initiated either during inpatient recovery (Phase I) or after discharge (Phase II and III) and involves a multidisciplinary team comprising cardiologists, physiotherapists, dietitians, psychologists, and nurses.

Key Features

- Supervised aerobic and resistance training.
- Continuous ECG or telemetry monitoring.
- Structured educational sessions on lifestyle modification.
- Medication reconciliation and psychological support.
- Constant coordination with the parent physician.
- Patient support group activities.

Advantages

- High safety for patients at moderate to high-risk.
- Availability of immediate medical intervention.
- Enables standardized protocols and documentation.

Name	Hospital-based	Community-based	Hybrid
Target population	High-risk patients needing intensive monitoring	Low-to-moderate risk patients suitable for independent exercise	Appropriate for both high- and low-risk patients
Key features	Conducted in specialized hospital units • Supervised exercise • Medical oversight • Immediate access to emergency care	Held in local centers or primary care facilities • Less supervision • Focus on self-management • Integration with local resources	Combination of hospital sessions and remote or at-home care • Flexibility and convenience • Tele-rehabilitation components • Gradual transition to self-care
Advantages	High safety and support ideal for vulnerable patients	Greater accessibility and cost-effectiveness	Personalization, balances safety with accessibility
Limitations	Resource intensive transportation barriers	Limited medical supervision variable quality across sites	Technology challenges, possible compliance issues

Figure 2.6: Comparing cardiac rehabilitation delivery models

Limitations

- Geographic concentration in urban areas.
- Time and travel barriers for rural or employed patients.
- Higher operational costs due to staffing and equipment.

Hospital-based CR is particularly beneficial in the early phases of recovery or in patients with multiple comorbidities or high clinical complexity. It is recommended as the primary model in resource-rich settings with adequate infrastructure.

2. Outpatient/Clinic-Based CR

Outpatient CR programs are often affiliated with standalone cardiac centers/physiotherapy private clinics. These allow patients to commute regularly for exercise sessions and education after hospital discharge. They typically see patients in phases I, III, and IV of CR.

Features

- Scheduled group or individual exercise training.
- Risk factor monitoring and behavioral counseling.
- Less intensive medical oversight compared to inpatient models.

This model enhances flexibility but still provides professional supervision, making it an effective transitional option for many patients.

3. Community-Based CR Models

Community-based CR leverages local infrastructure such as community halls, primary health centers, gyms or yoga centers. These are especially valuable in extending CR to rural or underserved populations. Community-based CR classes cater mainly to phase III or IV patients.

Key Features

- Group-based exercise under a physiotherapist or trained nonphysician supervision.
- Peer support and culturally contextual education.
- Periodic physician or specialist reviews.

Examples

- **REACH-HF (UK):** Delivered by trained nurses in patient homes.
- **Canadian models:** Nurse-led CR in community halls.
- **Kerala's mobile cardiac rehab units:** Deliver phase II rehabilitation in villages equipped with basic medical and fitness tools.

Advantages

- Cost-effective, scalable, and culturally adaptable.
- Facilitates greater family and community engagement.

Limitations

- Lower monitoring capabilities for high-risk patients.

- Variability in program quality depending on staff training and infrastructure.

Evidence from LMICs shows that culturally relevant community CR can improve enrolment and adherence while reducing stigma and isolation.

4. Hybrid and Home-Based CR Models

Hybrid models combine institutional or outpatient initiation with remote continuation using tele-rehabilitation, mobile apps, and wearable technologies. Home-based CR is entirely conducted at the patient's residence with remote monitoring.

Key Features

- Initial face-to-face risk stratification and baseline testing.
- Tele-supervised exercise sessions.
- Mobile applications for goal tracking, feedback, and reminders.

Examples

- Pilot hybrid models from India have been proposed and implemented in selected tertiary care hospitals and NGOs, combining initial hospital-based assessment with community or home-based follow-up using low-cost telemonitoring tools. These pilot models leverage mobile apps, wearable heart rate monitors, and trained community health workers to support rural cardiac patients postdischarge, though systematic evidence and standardization remain limited.
- The American Heart Association's roadmap for telehealth integration in CR.

Benefits

- Overcomes travel and scheduling barriers.
- Supports long-term adherence beyond supervised phases.
- Enhances patient autonomy and comfort.

Challenges

- Requires digital literacy and access to technology.
- Concerns about data privacy and clinical liability.
- Not suitable for high-risk patients without initial in-person evaluation.

Home-based models are increasingly relevant in post-COVID healthcare environments where digital health uptake has accelerated.

Steps for Delivery Model Selection and Integration

To operationalize CR across settings, the following steps are recommended:

1. **Assess the target population:** Demographics, cardiac risk profile, socioeconomic background.
2. **Evaluate infrastructure:** Facilities, equipment, trained human resources.
3. **Select delivery model:** Based on risk stratification, geographic spread, and resources.
4. **Build capacity:** Train staff in exercise science, motivational interviewing, and telemonitoring.
5. **Establish referral pathways:** Automatic referral at discharge and primary physician engagement.
6. **Monitor outcomes:** Track functional improvements, behavioral change, and safety.

Barriers and Enablers in Implementation

Barriers

- Lack of automatic referral systems and physician awareness.
- Limited funding for nonhospital programs.
- Professional resistance to nonphysician-led models.
- Inconsistent policies for CR reimbursement in LMICs.

Enablers

- Government support *via* noncommunicable disease (NCD) programs.
- Integration with national health missions and insurance schemes.
- Use of trained community health workers (e.g., ASHAs in India).
- Adoption of digital health tools and telemonitoring.

Monitoring and Quality Assurance

For delivery models to be sustainable and evidence-informed, they must incorporate a robust evaluation framework:

- **Process indicators:** Enrolment, session adherence, dropout rates.

- **Clinical outcomes:** 6-minute walk test (6MWT), BP, lipid profiles, weight, HRR.
- **Patient-reported measures:** PROMs (e.g., SF-36), PREMs (e.g., satisfaction scores).
- **System metrics:** Readmission, emergency visits, cost-effectiveness.

Benchmarking and audits should be integrated into the delivery plan, with quality assurance tied to program accreditation or funding.

Best Practice Recommendations

- **Match model to risk:** High-risk patients benefit from institutional CR; stable or low-risk patients may safely participate in community or hybrid models.
- **Adopt core components:** Exercise training, lifestyle education, nutrition, psychosocial support, and surveillance must be maintained across all models.
- **Ensure cultural relevance:** Adapt delivery content to local language, diet, and beliefs.
- **Promote family engagement:** Encourage spousal and caregiver involvement, particularly in South Asian contexts where family influence is significant.

Cultural and Contextual Adaptations

Successful implementation depends on culture-sensitive strategies.

- **Scheduling flexibility:** Align with local festivals, prayer timings, and occupational patterns.
- **Linguistic localization:** All educational materials should be translated into the patient's native language.
- **Gender sensitivity:** Create women-only sessions or female-led CR teams to improve participation.
- **Religious and dietary inclusivity:** Accommodate dietary advice based on local food availability and religious practices.

TELE-REHABILITATION

Tele-rehabilitation in cardiac rehabilitation is a contemporary delivery model for enhanced patient outcomes.

Rationale

Tele-rehabilitation, a form of digital health service delivery, utilizes communication technologies to provide remote, supervised, and structured cardiac rehabilitation. It encompasses synchronous (real-time video consultations) and asynchronous (prerecorded modules, app-based tracking) modalities to replicate the core components of CR, exercise training, patient education, psychological support, and risk factor modification—in home or community settings. It is an adaptive, scalable, and patient-centered alternative delivery model. It bridges accessibility gaps while maintaining the core components of CR. There is a need for expanding tele-rehab, especially where infrastructure, workforce, and follow-up adherence remain challenges.

Practical Guidelines for Remote Cardiac Rehabilitation Implementation

- Patient Selection and Risk Stratification
  - **Use clinical criteria to assess suitability:** Include: Low-to-moderate risk patients post-MI, PCI, CABG, stable heart failure (NYHA I–II).
  - **Exclude/Refer to CBCR:** High-risk patients (e.g., uncontrolled arrhythmias, unstable angina, NYHA IV).
  - **Use tools:**
    - Duke activity status index (DASI)
    - ePROs (SF-36, EQ-5D, HADS)
    - PAR-Q+, mMRC, CPET (if available)
- **Program components:** As per Core CR elements (Table 2.1).

TABLE 2.1: Suggested delivery mode as per the component of cardiac rehabilitation program

Component	Delivery mode
Exercise training	Video-based live sessions, home-exercise app logs
Patient education	App modules, PDFs, Webinars
Psychological support	Virtual counseling, group calls
Risk factor management	Diet/lifestyle coaching apps, teleconsults
Monitoring	Wearables, symptom logs, BP/HR diary

- **Technology platform and infrastructure:** Uses secure, HIPAA-compliant platforms.
  Includes:
  - Video call/telehealth functionality (Zoom, Google Meet, etc.)
  - Messaging/notifications
  - **Data capture:** BP, HR, glucose, weight
  - Integration with wearables (Fitbit, Apple Watch, Polar)
  - Ensure a multilingual, user-friendly UI for elderly or tech-naive users.
- **Staff training and roles:** Conduct team training in telehealth etiquette, emergency protocols, privacy, and use of technology (Table 2.2).
- **Monitoring and safety protocols:**
  - **Presession checklist:** Vitals, symptoms, medication review
  - **Emergency action plan:** Educate patients on red flags (angina, syncope, dizziness, palpitations, etc.), provide hotline/contact for escalation.
  - Remote vital sign monitoring (optional but recommended)
  - Have a caregiver available during the remote session.
  - Also, have an emergency contact number.
- **Duration and frequency:**
  - **Minimum:** 36 sessions over 12 weeks (AHA and ESC recommend 3x/week exercise + 1–2 education/support sessions/week).
  - **Allow flexibility:** Morning/evening slots, video-on-demand modules.
- **Documentation and outcomes:** Track and document exercise logs, attendance, medication adherence, SF-36, HADS, QoL scores (pre/post), functional improvements (6MWT if feasible remotely), patient satisfaction and feedback.

TABLE 2.2: Responsibilities of team members

Role	Responsibilities
CR physician	Risk stratification, clinical evaluation
Cardiorespiratory physiotherapist	Evaluation, exercise prescription, monitoring, and delivery
Dietitian	Remote dietary counseling
Psychologist	Stress/depression screening (PHQ-9, HADS)
Wellness coach	Adherence monitoring, motivational calls