

# Cardiac Rehabilitation: Is it important with Modern Interventional Reperfusion Techniques?



Written by Pdraig Denn, Clinical Nurse Manager 3, Mater Private Network

Reperfusion techniques have their origins in the work of Alexis Carrell in the early 20th century with his initial concepts regarding coronary perfusion and subsequent intrathoracic anastomosis of aorta and myocardial tissue in dogs. This eventually lead to a technique of attaching an adjunct artery into the myocardium of the left ventricle with the theorised result that collateral perfusion would be provided to the left anterior descending (LAD) coronary artery called the Veinberg procedure. This work was developed further when Ake Senning placed a patch over the left main stem (LMS) to improve blood flow. Modern coronary artery bypass grafting was eventually an option when Mason Sones inadvertently injected contrast dye into the right coronary artery (RCA) of a patient with rheumatic heart disease and mapped the coronary perfusion system allowing for direct identification of the coronary arteries. This discovery allowed conduit vessels to be attached directly to blocked arteries and thus “bypassing” the occlusions. This has been refined in the subsequent years to now being carried out very effectively utilising microsurgical techniques with various vascular conduits to bypass blockages in main coronary arteries as well as branch vessels. Such techniques allow for early discharge and reduced adverse events as a result.

Similarly, percutaneous interventional reperfusion has had significant improvements since the early work of the Italian Dr Gruentzig. From the initial treatments with balloons

to most recent drug eluting stents and techniques allow those appropriately trained and experienced to treat the most complex of coronary disease including chronic total occlusions.

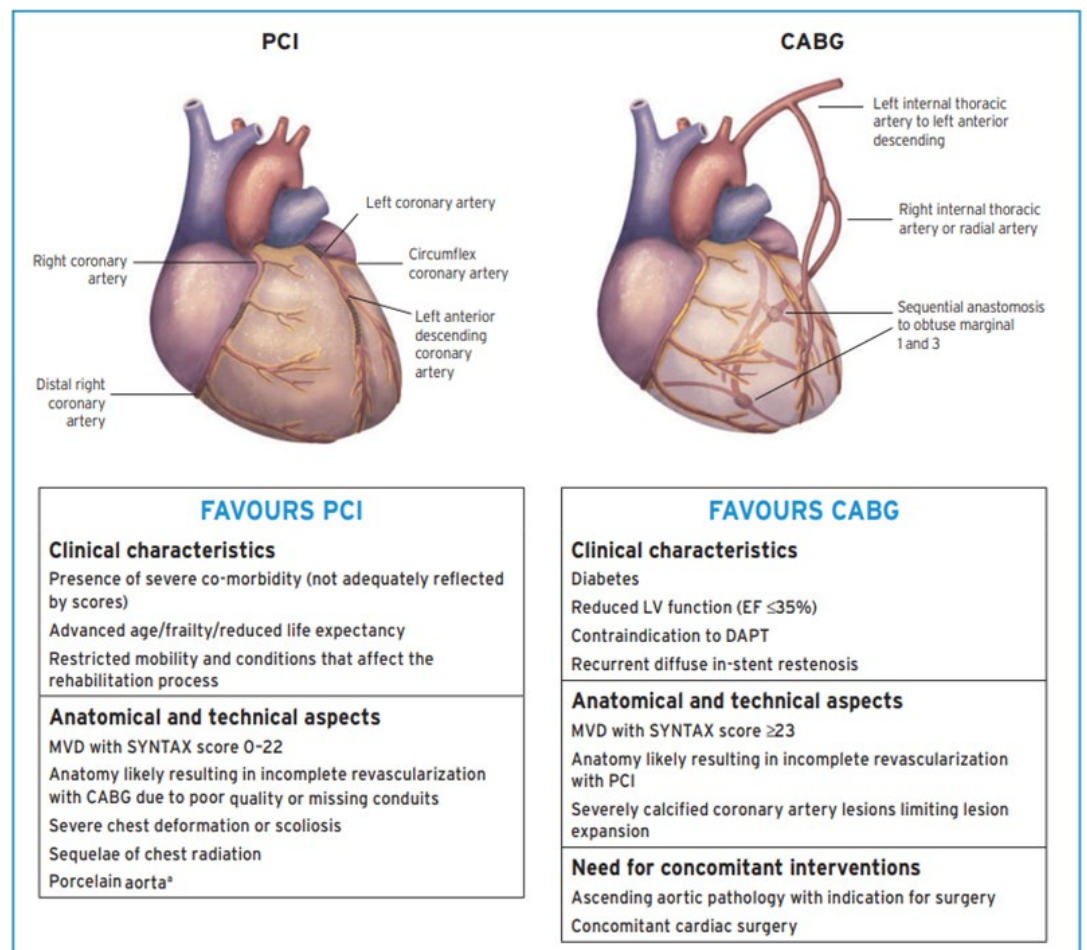
Both Coronary Artery Bypassing Grafting (CABG) and Percutaneous Coronary

Interventions (PCI) have a Level 1A recommendation from a multitude of international bodies. Figure 1 below identifies the type of patient that is best suited to the PCI versus CABG intervention.

However, this level of recommendation is only valid for proven ischaemic or flow limiting coronary disease. New research released initially in 2019 has proven that PCI and CABG have no additional benefit for the management of non-ischaemic coronary disease above medical therapy. Research has shown that utilisation of non-internal mammary vascular conduits for CABG have limited duration of patency especially if there is competitive flow from the native system. PCI techniques are limited to specific areas of coronary disease and care needs to be taken to prevent inadvertent occlusion of branch vessels which can cause on-going symptoms of angina after successful treatment of a significant coronary occlusion.

One must also consider that both CABG and PCI reperfusion techniques are limited to the three main coronary arteries and a limited number of branch vessels. Therefore, when we look at Figure 2 we can see that the coronary perfusion system is far more elaborate than the three main arteries and main branches. Therefore, we can see why pharmacological treatment after initial intervention for the management of certain risk factors of coronary artery disease (CAD) is necessary. However, an individual’s tolerance of pharmacological treatments varies significantly and in the era of an ageing population with multiple co-morbidities the risk of polypharmacy needs to be considered and can

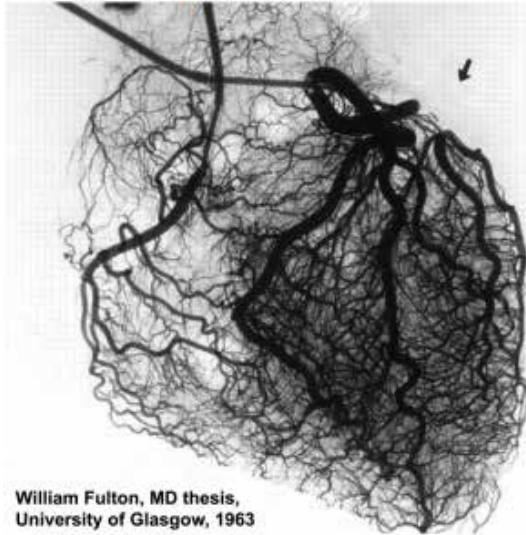
Figure 1: PCI Vs CABG



## Stereo-arteriogram

## Coronary angiogram

## Imaging resolution

30  $\mu\text{m}$ 300  $\mu\text{m} +$ 

William Fulton, MD thesis,  
University of Glasgow, 1963

Figure 2: Representation of  
Coronary Perfusion

often complicate the decision-making processes of effective pharmacological treatment of the risks of CAD.

We must also note that CAD causes are multifactorial (See Table 1) and many of them cannot be managed either pharmacologically or with invasive interventions. Risk factors such as increased body mass index (BMI), increased alcohol consumption, poorly managed levels of stress and smoking all require more complex interventions to ensure that they are effectively managed without worsening the risk of polypharmacy.

It is for the above, and many other, research guided reasons that Cardiac Rehabilitation (CR) has a Level 1A recommendation for all those who have a confirmed diagnosis of CAD without any restrictions from the initial causes or treatment modalities utilised for the management of the disease. A Cochrane systematic review and meta-analysis has shown that participation in a CR programme reduces cardiovascular mortality, reduces hospitalisations and improves quality of life. International governing bodies have recommended the utilisation of CR for the management of CAD leading to CR reported to be utilised in nearly one-hundred and twenty countries worldwide. CR in Ireland falls under the remit of the Irish Association of Cardiac Rehabilitation (IACR) and this

service is overseen by the Irish Heart Foundation (IHF).

CR in Ireland is recommended to be delivered on a phased basis. Figure 3 identifies the four phases of CR in Ireland. According to IACR information prior to the COVID 19 pandemic CR was delivered in thirty-seven centres across Ireland, mostly in the acute care setting. The services appeared to have stagnated over the previous ten years and were often provided by the nursing profession alone in each setting, despite national and international recommendations that CR be provided by a multidisciplinary team (MDT). The guidelines recommend that the MDT is made up of physiotherapists, social workers, occupational therapists, psychologists and administrative staff. Unfortunately, for periods

of the COVID 19 pandemic some facilities have had their nursing allocation decimated for prolonged periods due to the acute care service needs.

It is recommended that the CR programs be multidisciplinary to ensure all specialities expert knowledge is utilised to better educate the participants on how best to manage their condition independently in the community setting. It is this that is the cornerstone of the CR programs. CR phases one and two are designed to ensure that participant takes personal change of the management of their disease.

In phase I, according to the IACR guidelines, patients are usually hospitalised for two to five days after a significant cardiac event. It is at this time when the CR process should commence with the visit of a member of the CR team. The duration of stay is dependent upon the cause of the patient's admission to hospital. The recommendation of the IACR guidelines is that this phase of the programme should involve

- Give support and information to the patient and their families about heart disease
- Assist the patient to identify personal cardiovascular risk factors
- Discuss lifestyle modifications of personal risk factors and help provide an individual plan to support these lifestyle changes
- Gain support from family members to assist the patient in maintaining the necessary progress
- Plan a personal discharge activity programme and encourage the patient to adhere to this and commence daily walks

Major independent risk factors	Predisposing risk factors
Cigarette smoking	Physical inactivity <sup>a</sup>
Hypertension	Obesity <sup>a</sup>
Elevated total and LDL cholesterol	Family history of premature coronary disease
Low HDL cholesterol	Ethnicity
Diabetes mellitus	Psychosocial factors
Older age	

Table 1: Risk Factors for CAD

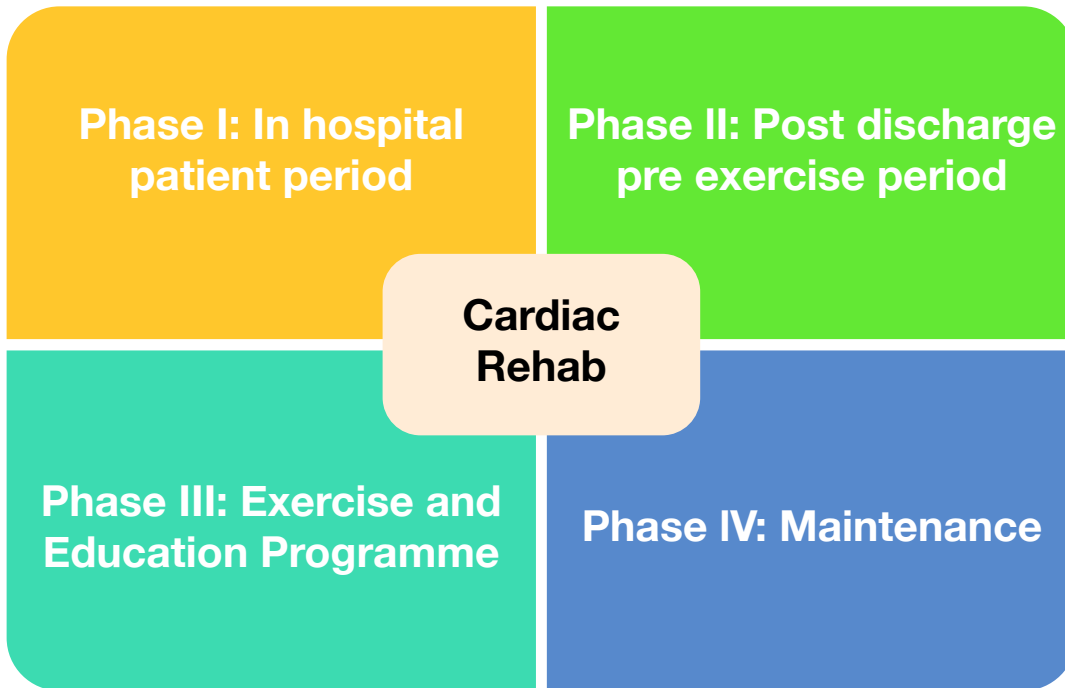


Figure 3: Phases of Cardiac Rehabilitation

- Inform patients regarding Phase II and Phase III programmes, if available, and encourage their attendance

The CR member who meets with the patient in this phase is dependent upon the structure of the programme in that specific setting. Ideally education on the components of the CR programme (e.g. disease process, medication management, exercise regime) should be provided by those with that specific expertise (e.g. CNS, Pharmacist, Physiotherapist). This phase is also an opportunity for the patient to become actively involved in their own care through completion of assessments and identification of their own risk factors for CAD. This will facilitate the patient to take ownership of their condition and its future management. The focus of this phase of the programme is to create an individualised plan of care for each patient. This involves assessments of the various components of CAD including psychological status, risk factor profile, activity level, smoking and others. Based on these assessments appropriate referrals should be made to relevant healthcare professionals.

In Phase II the aim is to reinforce the education that was provided in Phase I and to maintain lifestyle changes. It happens after discharge but prior to the commencement of Phase III. It can occur in a wide variety of settings (e.g. phone contact, clinic reviews, patient's own home or GP's office). The patient should commence some degree

of exercise in this phase which is often self-directed and is dependent upon the initiating event that caused the referral to the CR system.

Phase III is a structured longitudinal exercise programme that entails regular attendance (most often twice weekly for six weeks) and each session involves a warm-up, aerobic and cool down phase. Some programmes may also include heart rhythm monitoring and resistance training.

According to the IACR 2013 Guidelines Phase III comprises all the following:

- Exercise prescription based on clinical status, risk stratification, previous activity and future needs
- Education for patient and family regarding:
- Cardiac anatomy and physiology related to the cardiac event
- Recognition of cardiac pain and symptom management
- Risk factor identification and management
- Benefits of physical activity
- Energy conservation/graded return to activities of daily living
- Cardio protective healthy eating
- Prescribed cardiac medication and importance of compliance with same
- Resumption of sexual activity
- Benefits and entitlements

- Stress management and relaxation techniques
- Counselling and behaviour modification
- Smoking cessation
- Vocational counselling

This phase is dependent upon the expertise of the MDT to ensure that all components of the programme are met.

Phase IV of CR is designed to consolidate the improvements in exercise levels and to reinforce the education provided in Phase III. The aim is to maintain lifestyle changes to best ensure long-term change. This can be facilitated in several settings if there are appropriately qualified and experienced providers of this phase of the programme. Unfortunately, this appears to be an area that is lacking in Ireland with only ten recognised providers of Phase IV CR and only one of the thirty-seven registered CR sites providing this phase within their facility.

There is no published evidence as to what extent each of the thirty-seven sites for CR in Ireland adhere to these guidelines. The author was further unable to gain access to any official numbers of patients that attend each of the programmes. Similarly, there is no available information to the author regarding the short, medium or long-term benefits of CR programmes in Ireland as any information regarding this is generally maintained in site specific databases. The IACR have previously requested

participating sites to complete Excel spreadsheets regarding numbers and outcomes for individual patients through each CR site but this information has not yet been made public.

International research has shown that CR is inconsistently implemented not only between countries but within individual countries. Further research has shown that guideline implementation is often improved through the utilisation of Information and Communication Technologies (ICT). The use of such technologies may also assist as we migrate from previous group setting for CR to the new COVID restriction limitations on indoor group activities, allowing for remote interaction of groups. The CR team in the Mater Private Cork have managed to utilise Skype to allow for group exercise and education sessions to be facilitated without impinging on the restrictions in effect during this international pandemic. Further utilisation of ICT should be considered not only to assist the members of the MDT to effectively document the various components of CR programs but to subsequently assess the effectiveness of individual programs and potentially improve the effectiveness of programs.

It is clear that the utilisation of CR for those who have a confirmed diagnosis of CAD is clearly beneficial for the long-term outcomes of patients irrespective of the interventional reperfusion method utilised for confirmed occlusive CAD. CR is designed to equip the participant with the skills and knowledge to best manage all aspects of their lifestyle to reduce symptoms of and progression of their CAD. It is also designed to create a support network for on-going management of symptoms and the psychological impact of a diagnosis of CAD. Therefore, Cardiac Rehabilitation should be considered a pivotal treatment modality for any individual with a diagnosis of coronary artery disease.