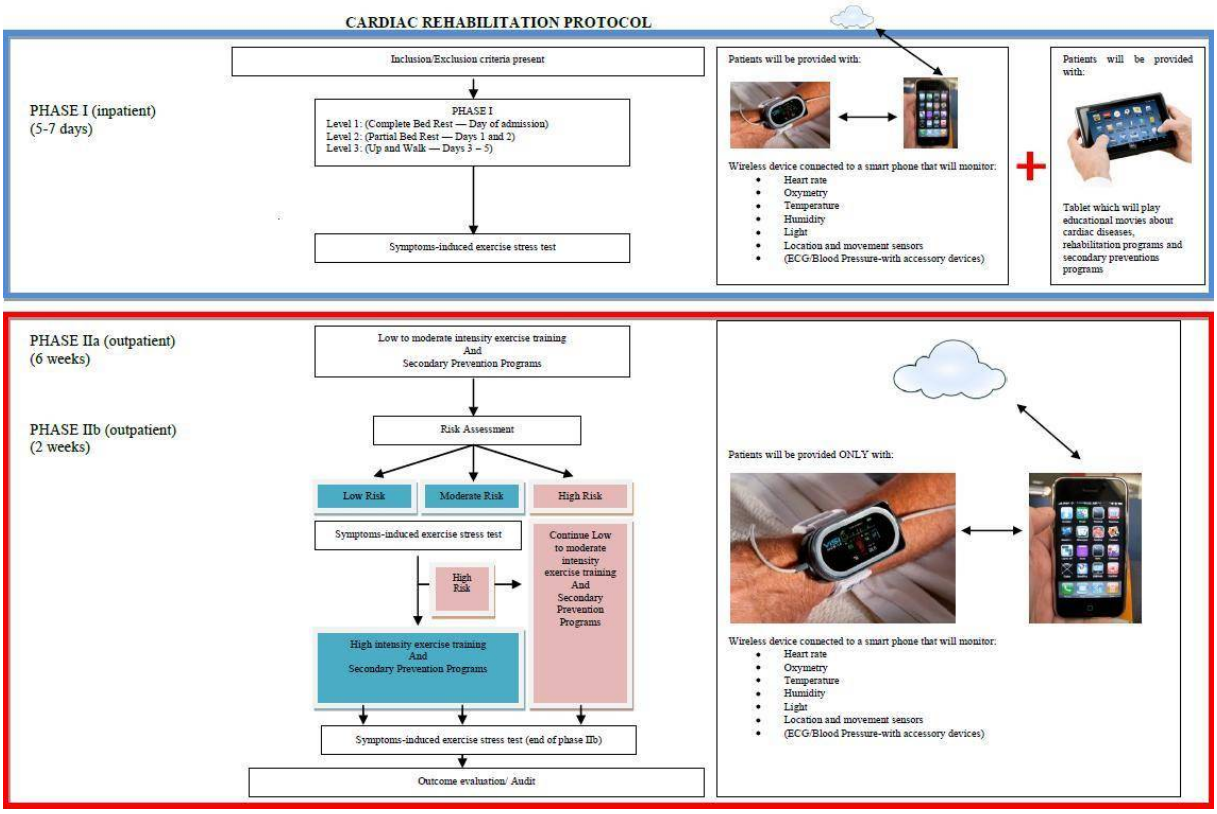
„Carol Davila" University of Medicine and Pharmacy will provide the cardiac rehabilitation case scenario by the use of a broad range of diagnostic imaging modalities and highly qualified personnel.

We will focus on the development of an improved cardiac rehabilitation program in order to achieve faster "back to work" time, decreased health care costs and improved quality of life for our patients. These targets will be achieved by the development of an interactive cardiac rehabilitation program, by testing software applications in the integration experimentation site, real-time vital parameters internet-monitoring, improvement of physical training and improvement in secondary prevention programs.

Patients will have attached to their wrist a wireless device which will monitor in real-time biological parameters, location and movement parameters and additional parameters regarding the environment (humidity, light, maybe air quality and noise); this wrist device will communicate with a smart phone/tablet with wireless connection for real-time information uploading. Medical personnel will have real-time access to vital parameters of the patients especially in phase two when outpatients will perform physical exercises, thus allowing personalization of the cardiac rehabilitation program for each individual and also prompt intervention when dangerous situations occur.



The case scenario will include patients with the following pathologies: myocardial infarction; coronary artery by-pass surgery; percutaneous coronary interventions; chronic heart failure; heart valve surgical repair or replacement; heart or heart/lung transplantation. The **exclusion criteria** are: unstable angina, class IV NYHA heart failure, uncontrolled sustained tachyarrhythmias or bradyarrhythmias, severe and symptomatic aortic or mitral stenosis, hypertrophic obstructive cardiomyopathy, severe pulmonary hypertension and other conditions that could be worsened by exercise (such as resting systolic blood pressure >200 mm Hg or resting diastolic blood pressure >110 mm Hg, active or suspected myocarditis or pericarditis, thrombophlebitis, recent significant systemic or pulmonary embolus), life expectancy less than one year.

UMFCD experimentation site for cardiac rehabilitation program:

- **Will enroll at least 54 patients during 27 weeks**
- **Total duration of this task is 36 weeks.**
- **Duration of case scenario for one patient: 9 weeks.**
- **First patient in: week 1 and last patient in: week 27; last patient out: week 36.**

A diagram representing the phases of the case scenario is represented below. All phases will be provided with medical treatment and care, apart the rehabilitation program. Patients will have attached to their wrist a device which will monitor in real-time biological parameters (the heart rate, oximetry, temperature; additional sensors for blood pressure measurement and electrocardiogram that can be attached to the device when needed), location and movement parameters (useful for energy consumption measurement) and additional parameters regarding the environment (humidity, light, maybe air quality and noise); this wrist device will communicate with a smartphone/tablet with wireless connection for real-time information uploading. In phase one, patients will also be provided with a tablet which will play educational movies about cardiac diseases, rehabilitation programs and secondary prevention programs. Medical personnel will have real-time access to vital parameters of the patients especially in phase two when outpatients will perform physical exercises, thus allowing personalization of the cardiac rehabilitation program for each individual and also prompt intervention when dangerous situations occur.

Phase one (I) (inpatient, 5-7 days) will be divided into three levels. Level 1 (the day of admission) will consist of bed rest, relaxation, breathing exercises and active range of motion exercises (ankle foot movements and finger and wrist movements) performed five times, three times per day. Level 2 (days 1 and 2) will involve initially sitting (1-2 hours / day) and self-feeding, relaxation, breathing exercises, active range of motion exercises to hip and knee (five repetitions, three times per day) on day 1 and sitting-arm bending / stretching up / bending (five repetitions, three times per day), progress sitting time (3-4 hours / day), independent in toileting (bedside), alternate heel drags, static quadriceps and glutei and static + spinal extension (five repetitions, three times per day) on the 2nd day. Level 3 (up and walk-days 3 to 5) will provide 3 types of *minimal exercise training*:

- progress exercises to 10 repetitions, walk within room (three times per day), standing-upper limb flexion (five repetitions three times per day)
- walk-standing-lower limb flexion (five repetitions three times per day), stride-standing-hip and knee flexion (five repetitions three times per day), walking outside the room (three times per day)
- bend standing-elbow circling, trunk bending, walking outside the room with arm swings, climbing one flight of step.

A symptom-induced exercise test will be performed at the end of this phase.

Phase two (II) of the program (outpatient) will have two components:

- **Phase IIa** (6 weeks) will consist of low to moderate exercise training and secondary prevention programs, according to the below details.
- **Phase IIb** (2 weeks) will follow by assessing the risk for cardiovascular complications for each patient: those at low and moderate risk will pass to a high intensity exercise training program and those at high risk will continue low to moderate exercise training; both options will be doubled by secondary prevention programs. Patients with physically demanding work or leisure time activity may achieve added benefit from high intensity exercise. A symptom-induced exercise test (treadmill, cycle ergometer, 6 or 12 minutes timed walking test) will be performed at the end of this phase to demonstrate the level of recovery, fitness and physical capacity to resume work and will usually reassure the patient, family, medical practitioner and, if necessary, employer.

Goals for the secondary prevention programs (patients will be monitored and counseled at home whenever possible):

- for patient assessment: review medical history (diagnoses, interventional procedures, comorbidities, test results, symptoms, risk factors and medication) and develop a goal-directed treatment plan with short- and long-term goals for cardiovascular risk reduction and improvement in health-related quality of life.
- for lipid management: LDL <100 mg/dL; secondary goals: HDL <40 mg/dL, triglycerides <150 mg/dL.
- for hypertension management: blood pressure <130 mm Hg systolic and <80 mm Hg diastolic (if applicable).
- for diabetes management: HbA1C <7.0% and fasting blood glucose 80 -110 mg/dL.
- for weight management: if weight risk identified: energy deficit of 500-1000 kcal/day with diet and exercise to reduce weight by at least 10% (1-2 lb/week).
- for psychosocial management: reduction of psychological distress, enhance coping and stress management skills and address issues affecting health-related quality of life by group counselling twice a week for eight weeks.
- for physical activity counseling: 30 minutes daily, at least 5 days/week for moderate exercise.
- for nutritional counseling: individualized prescribed diet based on needs assessed; promote diet adherence.

- for smoking cessation: abstinence from smoking and use of all tobacco products.

Links:

European Society of Cardiology:

http://www.escardio.org/Pages/index.aspx

European Association for Cardiovascular Prevention & Rehabilitation:

http://www.escardio.org/COMMUNITIES/EACPR/Pages/welcome.aspx