



Partial results on the Cardiovascular Rehabilitation program and the Electronic Registry for Cardiovascular Rehabilitation applicable at a national level

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Doctoral study

Ever since 2023, with the provision of some equipment facilities (ergometric bicycles equipped with software that allows the quantification of the body's response to effort – including by performing the simple or cardio-pulmonary effort test - CPET), we initiated a doctoral study under the supervision of **Prof. Gelu Onose, M.D., Ph.D.** with the co-supervision of **Associate Prof. Ștefan Sebastian Busnatu, M.D., Ph.D.**



Universitatea de Medicină și Farmacie
„Carol Davila”, București - 2023



„Cercetări clinico-aplicative interdisciplinare în vederea realizării unei propuneri structurate de program și registru electronic aferent, naționale, pentru recuperarea cardio-vasculară”

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SPITALUL CLINIC DE URGENȚĂ BAGDASAR-ARSENI (SCUBA)

CLINICA DE RECUPERARE NEUROMUSCULARĂ

MAIN OBJECTIVES

- 1 The configuration of a Cardiovascular Rehabilitation Protocol within Badgasar-Arseni Clinical Emergency Hospital (BACEH)
- 2 The inclusion of a high number of patients (roughly 50) in the study group
- 3 The inclusion of a high number of patients (roughly 50) in the control group
- 4 The performance of statistical analysis of the obtained results
- 5 The publications of the results in an ISI indexed journal, IF $\geq$ 0.5
- 6 The initiation and the development of the Electronic Registry for Cardiovascular Rehabilitation (ERCVR), as part of an Electronic Registry for Cardiovascular Diseases (ERCVD), implementable nationwide.
- 7 The initiation of a related viable telemedicine system.

The situation of CV rehabilitation in Romania

- The electronic medical registries have emerged with the development of medical information systems, which are indispensable databases for medical research.
- Currently, these registries have evolved and are used inclusively in the prevention and public health programs.
- By studying the literature sources in the field, including by using PRISMA method in the development of a literature journal *, we noticed that *in Romania, there is no corresponding National Program nor an Electronic Registry for cardiovascular rehabilitation and cardiovascular diseases* – the need for such a program to exist is extremely necessary - but also the bibliographical references are scarce, from this point of view.



Literature review

Systematic literature review as knowledge base for the research efforts towards the inception of a National Programme for Cardiovascular Rehabilitation and of a National Electronic Register for Cardiovascular Diseases

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The situation of CV rehabilitation in Romania

- The existence of such registries is indisputably necessary, especially in the era of digitalization of medical services and moreover in the context in which Romania is a European Union (EU) member, and there are already a series of countries in the EU that have such registries, for example Sweden, Germany and the Netherlands. *, **, ***
- By establishing such a Registry, we could also be included in the modern version of 4P-medicine: *“predictive, preventive, personalized and participatory”* ****
- In this context, the conceptual framework of the 5-Ps of cardiovascular rehabilitation has recently occurred in the specialty literature: (1) *Personalization*, (2) *Processes and systems*, (3) *Patient-centered care*, (4) *Parlance*, and (5) *Partnership and unity* *****

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** M. Bäck et al., “The SWEDEHEART secondary prevention and cardiac rehabilitation registry (SWEDEHEART CR registry),” Eur Heart J Qual Care Clin Outcomes, vol. 7, no. 5, pp. 431–437, Sep. 2021, doi: 10.1093/EHJQCCO/QCAB039.

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The Electronic Registry for Cardiovascular Rehabilitation (ERCVR) implementable nationwide

- In collaboration with UMFCD in Bucharest, which provided the REDCap information platform – we conceived a proof-of-concept for the **National Electronic Registry for Cardiovascular Rehabilitation as part of the National Electronic Registry (NERCVR– see article in the Journal of Medicine and Life - JML).**
- This model represents a consistent support for the development and subsequent implementation of such a completely functional registry, applicable nationwide, regarding the report of cardiovascular diseases (NERCVD). All these achievements were possible through the exemplary interdisciplinary cooperation between the two Clinical Departments of BACEH, i.e. the Cardiology Department and the NMR Department, respectively.

*Mihaela Mandu, Gelu Onose et.al.:The preparation and inception of a National Electronic Register for Cardiovascular Rehabilitation (NERCVR) with initial results, as part of a National Electronic Register for Cardiovascular Diseases (NERCVD); Journal of Medicine and Life, 2025, Volume 18, Issue 7, pp

The preparation and inception of a National Electronic Register for Cardiovascular Rehabilitation (NERCVR) with initial results, as part of a National Electronic Register for Cardiovascular Diseases (NERCVD)

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REDCap

Recuperare_si_Preventie PID 15

Acasă Proiect Setări proiect Designer Online Dicționar de Date Dicționar de coduri

VİDEO: Cum folosești această pagină Creează instanțaneu al instrumentelor (Instrumente necesare)

Online Designer îți permite să modifice ușor câmpurile și instrumentele proiectului direct din browser. NOTĂ: Cât timp proiectul este în dezvoltare, toate modificările vor fi aplicate imediat.

Instrumente de Colectare a Datelor

Opțiuni formulare: Dragănot-un PDF Logica de Afișare a Formularului PDF (toate instrumentele) Pop-up-uri Descriptive

Numele Instrumentului	Câmp	PDF	Acțiune instrument
DATE PERSONALE/CIU CARACTER INDIVIDUAL	21		Alege acțiune
INFARCT - EVALUARE CARDIOLOGICĂ ÎN ÎNĂLĂ	51		Alege acțiune
INFARCT - EVALUARE ANGIOGRAFIE ÎN ÎNĂLĂ	15		Alege acțiune
INFARCT - TEST DE EFORT ÎN ÎNĂLĂ	20		Alege acțiune



The Electronic Registry for Cardiovascular Rehabilitation (ERCVR) implementable nationwide



Given our concrete initiative in this important and necessary scientific research directive, we obtained the Patent Certificate from the State Office for Inventions and Trademarks No. 023606/29.10.2025.



(11) NUMĂR CERTIFICAT DE ÎNREGISTRARE DESEN/MODEL	023606
(15) Data acordării protecției	29.10.2025
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4) Mandatar	-
72) Autor	MANDU MIHAELA, MIOVENI ANDONE IOANA, BUCUREȘTI ANDREI CĂTĂLINA, BUCUREȘTI BĂȘNĂTU ȘTEFAN SEBASTIAN, BUCUREȘTI ION ALEXANDRU, BUCUREȘTI, LĂCRĂRU ANDREEA, BUCUREȘTI NĂSTĂȘĂ IULIAN, BUCUREȘTI ONOSE GELU, BUCUREȘTI TRACHE ALIN DRAGOȘ, BUCUREȘTI
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The general layout of the doctoral study

- **A comparative clinical study, with 2 components:**

- ***prospective (the study group)*** consisting in patients after acute myocardial infarction (acute MI), who require cardiovascular rehabilitation, who benefited from **aerobic training** on the sensor ergometric bicycle;
- ***retrospective (the control group)*** consisting in patients after acute MI who did not benefit from this type of intervention;

Comisia Națională de Bioetică a Medicamentului și a Dispozitivelor Medicale

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Către,

Spitalul Clinic de Urgență "Bagdasar- Arseni" București

Secției Clinice Recuperare Neuromusculară

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Referitor la studiul academic cu titlul "Cercetări clinico-aplicative în vederea realizării unei propuneri structurate de program și registru electronic aferent, naționale, pentru Recuperarea cardio-vasculară", discutat în ședința membrilor CNBMDM din data de 26.02.2025, cu numărul de înregistrare 4SNI, vă informăm că în urma analizării dosarului, se consideră că au fost îndeplinite exigențele etice și studiul se poate desfășura.



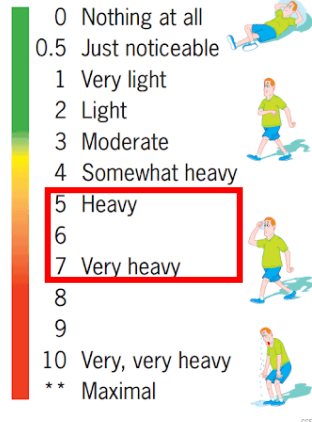
Definition of terms

- **Aerobic exercise** = type of repetitive and structured physical activity that requires that the metabolic system of the body use oxygen to produce energy.*
- **Aerobic exercise** = that type of physical activity of moderate intensity, during which the patient can talk, but cannot sing during effort. **

" This can be very individual and will relate to how experienced you are, but you will likely know how hard you want to work to achieve your objectives. A reasonable rule of thumb is to consider three exercise intensity bands:

- Low-intensity work (would score a 3 to 5 on the ratings of perceived exertion (RPE) scale seen on the right). It would be reasonable to aim for this level once a week, often as a recovery.
- Moderate intensity work (5 to 7 on the RPE scale). This might be factored in once to twice a week.
- High-intensity work (7 to 9 on the RPE scale). This too might be incorporated once or twice a week.

HOW HARD IS THE ACTIVITY?



Borg Rating Scale of Perceived Exertion (RPE)

the original Borg scale or **"no current recommendations exist regarding use of one scale in preference to another"** the revised category-ratio scale (0 to 10 scale)**



Body structures and functions (A, P)

Borg's Rating of Perceived Exertion (RPE) Scale	
Perceived Exertion Rating	Description of Exertion
6	No exertion; sitting and resting
7	Extremely light
8	
9	Very light
10	
11	Light
12	
13	Somewhat hard
14	
15	Hard
16	
17	Very hard
18	
19	Extremely hard
20	Maximal exertion

The Borg scale runs from 6-20 because the score should correspond to heart rate when multiplied by 10 – during physical exercise/testing.

1 - 10 Borg Rating of Perceived Exertion Scale	
0	Rest
1	Really Easy
2	Easy
3	Moderate
4	Sort of Hard
5	Hard
6	
7	Really Hard
8	
9	Really, Really, Hard
10	Maximal: Just like my hardest race

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Study hypotheses and the Main specific objectives

„It is assumed that the efficiency of rehabilitation physical exercise in patients after acute MI is influenced by demographic, clinical and functional parameters/ factors (such as age, sex, body mass index, etc.), and this can be quantified through the consumed energy (kJ) during physical exercise on the sensor ergometric bicycle”

MAIN OBJECTIVES

- To identify **factors/parameters** (demographic and clinical variables of patients) **which are associated with the efficiency of rehabilitation physical exercise**, measured in the energy that the patient consumed throughout the physical exercise.
- **To structure**, with the help of these **factors/parameters, methods/ procedural sequences that can completely restore the physical condition/ performance of patients after acute MI and implicitly, their life quality.**

The primary endpoint of this study was the energy consumed by the patient per session [kJ].

Material and methods

In order to achieve the proposed objectives, the process of development and implementation of a **structured program of cardiovascular rehabilitation** was initiated, formalized as a **work protocol** adopted by BACEH management (currently being optimized through the second revision).

This protocol was **developed** through the collaboration between **cardiologists** and **rehabilitation medicine physicians** and it was **implemented** within „Bagdasar-Arseni” Clinical Emergency Hospital (BACEH), Bucharest.



Nr. de înregistrare: 17099/09.04.2024

APROBAT
MANAGER
Așez. NODIT

PROTOCOL PRIVIND PROGRAMUL DE RECUPERARE CARDIO-VASCULARĂ ÎN CADRUL SPITALULUI CLINIC DE URGENȚĂ BAGDASAR-ARSENI

1. SCOP

Acest protocol documentează modul în care vor fi evaluați, selecți și tratați pacienții care vor lua parte la programul de recuperare cardio-vasculară în cadrul SCUBA și reprezintă un prim pas către implementarea la nivel național al unui Protocol și respectiv, a unui Registru național pentru Recuperarea cardio-vasculară.

Prezenta reglementare previne și tratează următoarele riscuri:
- abordarea neadecvată a pacienților cu afecțiuni cardio-vasculare
- riscurile legate de activitatea personalului implicat în manevrele de îngrijire ale pacientului.

2. DOMENIU DE APLICARE

Prezentul protocol se aplică de către toți cei care sunt implicați în evaluarea, selectarea, și tratamentul pacienților cu afecțiuni cardio-vasculare ce vor fi implicați în programul de recuperare cardio-vasculară. Secții implicate: Secția Clinică Cardiologie și Secția Clinică Recuperare Neuromusculară a SCUBA.

3. DEFINIȚII ȘI ABBREVIEN

Recuperare cardio-vasculară este definiție de Organizația Mondială a Sănătății (OMS) ca „suma activităților necesare pentru a influența favorabil cauza principală a bolii, precum și pentru a asigura cele mai bune condiții fizice, mentale și sociale posibile, astfel încât pacienții să-și poată relua prin eforturi proprii locul pierdut din comunitate.” [1],[2]

Recuperare cardio-vasculară (RCV) este un program multidisciplinar, adaptat fiecărui pacient în parte care ajută la scăderea mortalității și a morbidității, îmbunătățirea rezistenței la efort, scăderea intensității și frecvenței simptomelor clinice, îmbunătățirea staturii cognitive și emoționale, îmbunătățirea staturii metabolice, creșterea calității vieții pacienților cu afecțiuni cardio-vasculare. [3]

RCV = Recuperare cardio-vasculară

RNM = Recuperare neuro-musculară

MCT = Antrenament continuu moderat

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67. Jetté M, Sidney K, Blümchen G. Metabolic equivalents (METS) in exercise testing, exercise prescription, and evaluation of functional capacity. Clin Cardiol. 1990 Aug;13(8):555-65. doi: 10.1002/clc.4960130809. PMID: 2204507

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Material and methods **THE STUDY GROUP**

INCLUSION CRITERIA	EXCLUSION CRITERIA
Confirmed diagnosis of acute MI	Patients with cardiovascular disorders, others than acute MI
Performing a minimum of 7 days of cardiovascular rehabilitation through training on the sensor ergometric bicycle	Performing less than 7 days of cardiovascular rehabilitation on the sensor ergometric bicycle
Patients with 2 effort tests performed before and within at least 3 months from the sessions of CV rehabilitation	Patients who did not perform 2 effort tests before and within minimum 3 months after the sessions of CV rehabilitation
Clinical and biological stability at the onset of the CV rehabilitation program	Patients who are clinically-biologically instable at the moment of testing in order for possible inclusion
Informed consent signed for the participation to the study	Patients who did not sign the informed consent for the participation to the study

Material and methods **CONTROL GROUP**

INCLUSION CRITERIA	EXCLUSION CRITERIA
Confirmed diagnosis of acute MI	Patients with cardiovascular disorders, others than acute MI
Patients who underwent 2 effort tests at a minimum 3-month interval	Patients who did not undergo 2 effort tests at a minimum 3-month interval
Patients who follow standard medication treatment after acute MI, mentioned in the OC (medication according to the profile guidelines)	Patients without standard medication treatment after acute MI, mentioned in the OC (medication according to the profile guidelines)
Clinical-biological stability (with no major complications after acute MI) at the time of testing	Patients who are clinically-biologically instable at the time of testing
They did not participate in any structured cardiovascular rehabilitation program	They did not participate in any structured cardiovascular rehabilitation program
The informed consent signed for participation in the study	Patients who did not sign the informed consent for participation in the study

Materials and methods

Bio-functional factors/ parameters used

DEMOGRAPHIC	ANTHROPOMETRIC	PHYSIOLOGIC	FUNCTIONAL
Age (years)	Body mass index – BMI (Kg/sm)	Maximum cardiac frequency – MCF (bpm)	No. aerobic sessions (days)
Sex		Left ventricle ejection fraction – LVEF	Resistant load – LOAD (W)
			Maximum power (Wmax)
			Metabolic equivalents- METS
			Duration of effort – Time (min)
			Energy (Kj)

Many times, **functional capacity** is quantified using **MET (metabolic equivalent): 1MET represents a consumption of 3.5 ml/kg/min. oxygen** (in an individual lying/ sitting and at rest).
 Moreover, the **predicted value of MET, according to sex and age** (also **recommended** in*), is (according to the software of the Clinic of Cardiology) of $[14.7 - 0.11 \times \text{age}]$ for **men** and $[14.7 - 0.13 \times \text{age}]$ for **women**.
 During the **effort test we measure $\dot{V}O_2 \text{ max}$ and we report in percentage to the predicted value (ml/Kg/min)**.

We consider that the presentation of some **types of physical activities** is necessary in relation with **MET** value and with their **energy consumption**, for the **optimization of the recommendations of physical activity according to their tolerance to effort achieved after CPET**.

Table: Various types of physical activity and their correspondent in MET, and respectively the determined energy consumption**

Type of activity	MET value	Energy consumption
Rest (Sitting or lying)	1 MET	60 cal
Exercises (30 minutes)		
Pilates	3.5 METs	105-131 cal
Fast walking 4.8 km/h	5 METs	150-188 cal
Weight lifting	6 METs	180-225 cal
Crawl swimming	8 METs	240-300 cal
Calisthenics (rhythmic gymnastics)	8 METs	240-300 cal
Running 9 minutes	11 METs	330-413 cal
Household activities (30 minutes)		
Vacuum the carpet	3.3 METs	99-124 cal
Gardening	4 METs	120-150 cal
Activities with the pet (dog)	4 METs	120-150 cal
Cleaning and polishing the car	4.5 METs	135-168 cal
Playing with children	5 METs	150-188 cal
Moving furniture	6 METs	180-225 cal
Sports activities		
Volleyball	3 METs	90-113 cal
Golf	4.5 METs	135-169 cal
Dancing	4.8 METs	144-180 cal
Backpacking	7 METs	210-263 cal
Basketball	8 METs	240-300 cal
Football	10 METs	300-375 cal

* Naji P, Griffin BP, Barr T, Asfahan F, Gillinov AM, Grimm RA, Rodriguez LL, Mihaljevic T, Stewart WJ, Desai MY. Importance of exercise capacity in predicting outcomes and determining optimal timing of surgery in significant primary mitral regurgitation. J Am Heart Assoc. 2014 Sep 11;3(5):e001010. doi: 10.1161/JAHA.114.001010. PMID: 25213567; PMCID: PMC4323806.

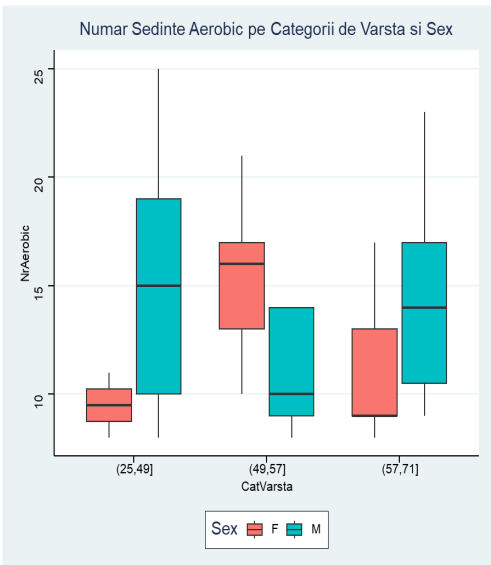
** (dupa): Holtermann, Andreas & Stamatakis, Emmanuel. (2018). Do all daily metabolic equivalent task units (METs) bring the same health benefits?. British Journal of Sports Medicine. 53. bjsports-2017. 10.1136/bjsports-2017-098693 - cu unele modificari

Materials and methods

- For the statistical analysis, we used **R program, version 4.5.1, (c) 2025 (The R Foundation for Statistical Computing)**
- The alpha significance level of the study was **0.05**, the p values lower than 0.05 being considered statistically significant.
- The exploratory/ preliminary statistic processing for the training on the sensor ergometric bicycle was done separately, according to sex and age, for each variable the following being calculated: the Average, the Standard Deviation(SD), the Mean value, the Minimum, the Maximum, the Number for each category.
- Moreover, the relation between the variable from the bicycle test was represented graphically and: the **LVEF value from the beginning of the therapy** and the **BMI value at the beginning of the therapy.**

Preliminary results

The number of sessions of aerobic exercise according to age and sex



Age cat	Sex	average	SD	Mean value	Minimum	Maximum
(25,49]	F	9.5	2.12	9.5	8	11
(25,49]	M	18.08	13.13	15	8	58
(49,57]	F	15.4	4.16	16	10	21
(49,57]	M	16.35	15.87	10	8	73
(57,71]	F	11.2	3.77	9	8	17
(57,71]	M	14.43	5.16	14	9	23

For all age groups, men participated in more aerobic sessions than women, on average, the difference being higher, almost double for the age group 25-49 years, which can indicate **more active involvement of younger man in the program.**

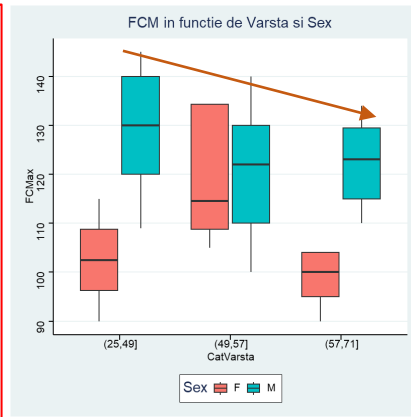
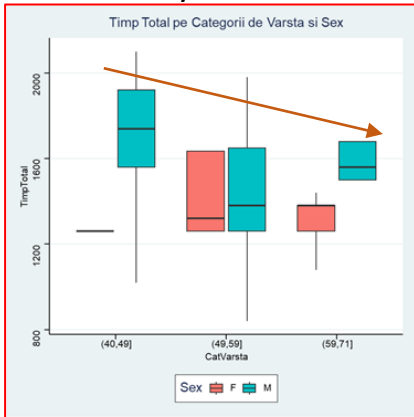
Moreover, it can be noticed that **middle-aged women had the best involvement from all female groups** (on average 15.4 sessions).

However, for the men in the age group 49-57, the average is 16.35, but the mean value is 10, which indicates a „increased” distribution by some high values (outliers).

Preliminary results

The analysis of the parameters regarding the **Rehabilitation Protocol**

For an additional intrinsic verification, we statically objectified what we also predicted, i.e. ***the parameters used in our CV Rehabilitation Program were adjusted correctly according to age, body mass and the deconditioning level to physical effort*** of the patients enrolled in the study.



By analyzing the parameters **Total Time** and **FCM** according to Sex and Age, we notice significant differences between sexes, more obvious in the age category [57-71] years, which means that men in this category have followed a higher intensity protocol than women, taking into account the physiological particularities which are usually in favor of men, related to:

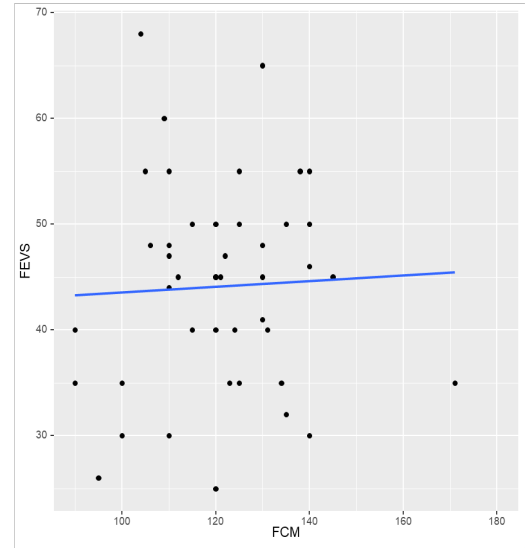
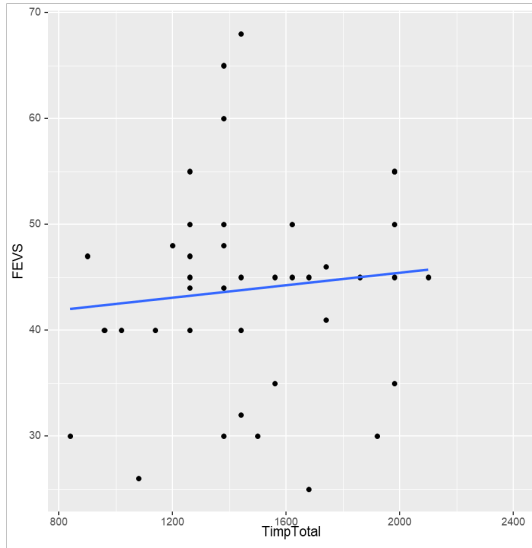
Moreover, we noticed that both the **Total time** and the **Max VR** dropped slowly with aging, irrespective of the sex. This difference can be accounted for by the physiologic decline of the effort capacity with aging through:

- The decrease of active body mass
- structural and functional changes of the CV system
- The reduction of the maximum chronotropy response with aging.

- Muscle mass
- The CV response to physical effort
- The initial level of physical performance

Preliminary results

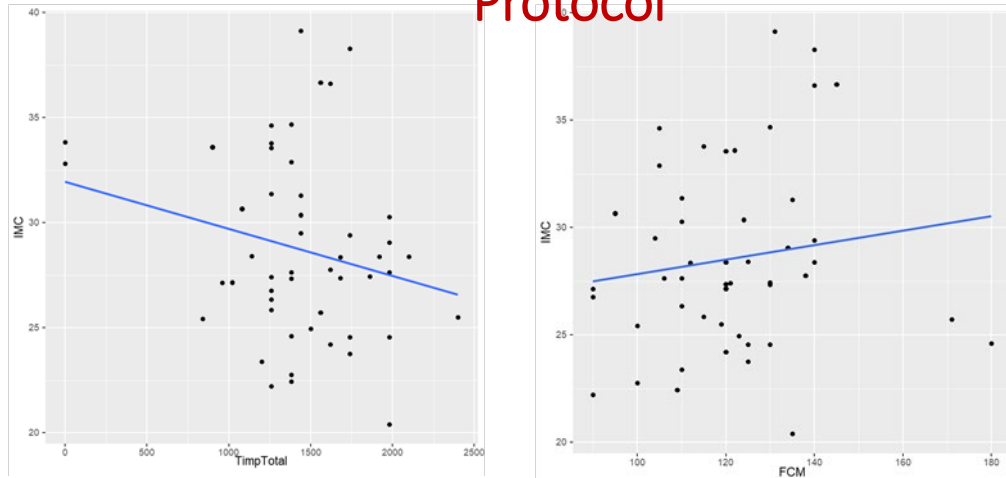
The analysis of the parameters regarding the **Rehabilitation Protocol**



In the graphs *SCATERPLOT WITH A REGRESSION LINE*, the relationships between the initial values of LVEF and the Total Time of aerobic training, respectively FCM are positive, which indicates the fact that the patients with a better cardiac function followed a protocol with a higher level of effort.

Preliminary results

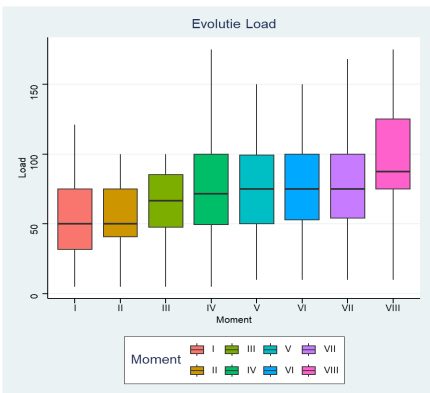
The analysis of the parameters regarding the **Rehabilitation Protocol**



- There is a reversed proportional relation between the Total Time of training on the sensor ergometric bicycle and the BMI, which indicates the fact that the patients with a higher BMI were suggested more reduced times of training to ensure an adequate tolerance to training and to avoid cardiac overexertion.
- On the other hand, there is a directly proportional relation between FCM and BMI, suggesting that the patients with a high BMI were determined higher valued of FCM, corresponding to the necessary effort to attain an efficient cardiovascular response in the context of increased muscle mass.
- These correlations confirm again that the Rehabilitation protocol was calibrated individually, depending on the weight status and the cardiac function of the patients.

Preliminary results

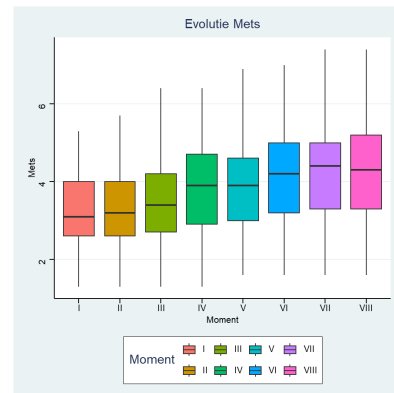
The analysis of the evolution of variables measured for the *Bicycle test*



The linear analysis in which:

- the dependent variable is the variable measured **Resistant load** - Load (W)/METS
- the predictor is the **Moment** (that is, the consecutive moments of testing)

As a statistical reference, we used **the value of intercept** which represents the estimated value of the dependent variable (that is **Resistant load** - Load/METS) when the predictor (the **Moment**) is 0 .



Predictori	Estimates	Load CI	p
(Intercept)	54.69	44.90 – 64.47	<0.001
Moment [II]	4.83	-9.01 – 18.67	0.493
Moment [III]	13.25	-0.59 – 27.09	0.061
Moment [IV]	16.58	2.74 – 30.42	0.019
Moment [V]	19.73	5.89 – 33.57	0.005
Moment [VI]	24.85	11.01 – 38.69	<0.001
Moment [VII]	28.19	14.35 – 42.03	<0.001
Moment [VIII]	35.88	22.03 – 49.72	<0.001
Observations	384		
R ² / R ² adjusted	0.097 / 0.080		

Predictori	Estimates	Mets CI	p
(Intercept)	3.22	2.84 – 3.60	<0.001
Moment [II]	0.18	-0.36 – 0.72	0.518
Moment [III]	0.45	-0.09 – 0.99	0.101
Moment [IV]	0.64	0.10 – 1.18	0.021
Moment [V]	0.59	0.05 – 1.13	0.031
Moment [VI]	0.97	0.43 – 1.51	<0.001
Moment [VII]	1.09	0.55 – 1.63	<0.001
Moment [VIII]	1.08	0.54 – 1.62	<0.001
Observations	360		
R ² / R ² adjusted	0.080 / 0.062		

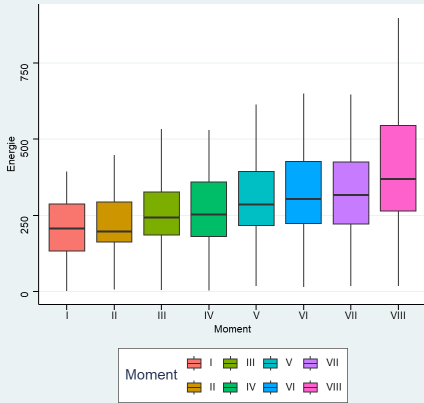
The resistant load (Load/METS) increases progressively from the initial moment (the reference measure from the **intercept** value), the maximum increase being registered in the last day.

Starting with **Moment 4** the differences become statistically significant, and starting with **Moment 6**, $p < 0.001$ already.

Preliminary results

The analysis of the evolution of variables measured for the *Bicycle test*

Evolution Energie



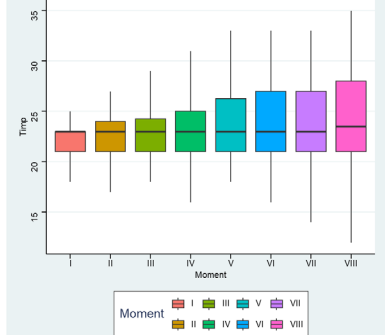
The energy evolution was constantly increasing, and starting with moment IV the evolution from intercept was statistically significant.

Therefore, *patients can sustain extensive physical effort safely* – a clear marker of the improvement of effort capacity and the cardiovascular condition.

Energie			
Predictori	Estimates	CI	p
(Intercept)	216.79	177.00 – 256.59	<0.001
Moment [II]	15.52	-40.76 – 71.80	0.588
Moment [III]	39.67	-16.61 – 95.95	0.167
Moment [IV]	57.02	0.74 – 113.30	0.047
Moment [V]	84.96	28.68 – 141.24	0.003
Moment [VI]	103.33	47.05 – 159.61	<0.001
Moment [VII]	105.02	48.74 – 161.30	<0.001
Moment [VIII]	180.35	124.08 – 236.63	<0.001
Observations	384		
R ² / R ² adjusted	0.133 / 0.117		

Temp			
Predictori	Estimates	CI	p
(Intercept)	22.29	21.01 – 23.57	<0.001
Moment [II]	0.48	-1.33 – 2.29	0.603
Moment [III]	0.42	-1.39 – 2.23	0.651
Moment [IV]	0.46	-1.35 – 2.27	0.619
Moment [V]	1.54	-0.27 – 3.35	0.095
Moment [VI]	1.60	-0.21 – 3.41	0.082
Moment [VII]	1.27	-0.54 – 3.08	0.168
Moment [VIII]	2.29	0.48 – 4.10	0.013
Observations	384		
R ² / R ² adjusted	0.026 / 0.008		

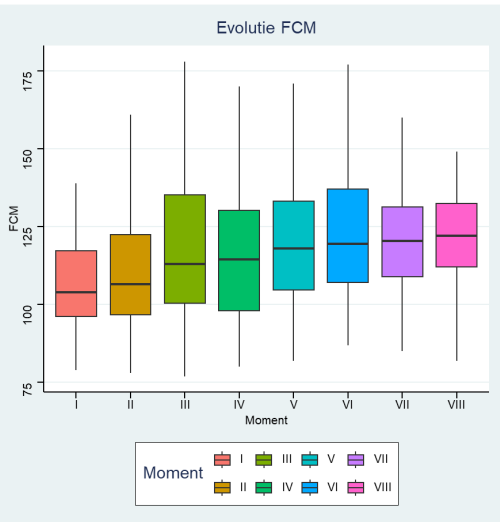
Evolution Temp



Regarding the variable **Time for training** on the sensor ergometric bicycle, this leads to an increase in the exercise duration, but the difference from intercept was significant only for the last session.

Preliminary results

*The analysis of the evolution of variables measured for the **Bicycle test***



The average values of FCM have slightly increased throughout the 8 sessions, with statistically significant differences at **Moment VI and VIII**.

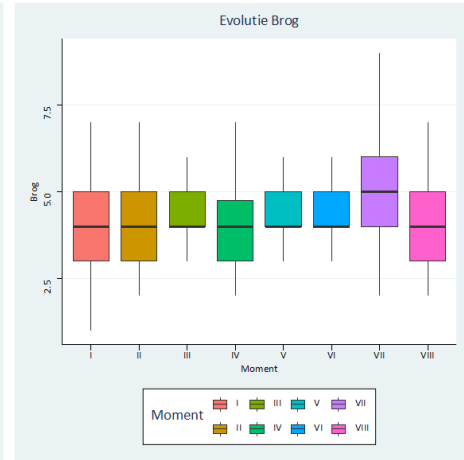
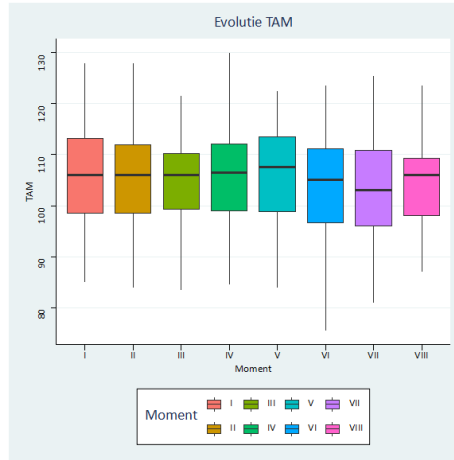
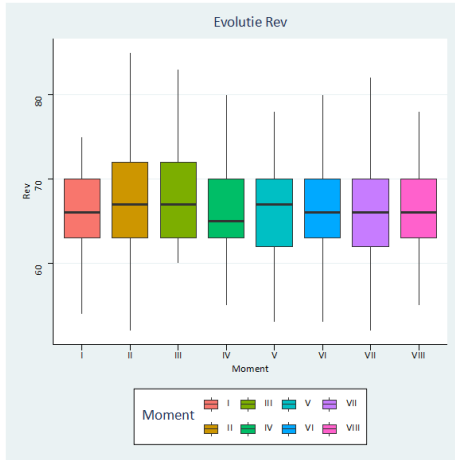
This graph indicates an improvement of the autonomic cardiac control, the increase in myocardial contractile efficiency and a progressive cardiovascular adaptation to the effort tasks prescribed, with no exaggerated values of VR during physical effort.

The evolution indicates ***efficient cardiac adaptation and increase tolerance to effort throughout the program.***

FCM			
Predictori	Estimates	CI	p
(Intercept)	112.15	105.25 – 119.04	<0.001
Moment [II]	0.63	-9.12 – 10.37	0.900
Moment [III]	7.94	-1.81 – 17.69	0.110
Moment [IV]	5.29	-4.46 – 15.04	0.287
Moment [V]	9.21	-0.54 – 18.96	0.064
Moment [VI]	11.50	1.75 – 21.25	0.021
Moment [VII]	9.65	-0.10 – 19.39	0.052
Moment [VIII]	10.77	1.02 – 20.52	0.030
Observations	384		
R ² / R ² adjusted	0.029 / 0.011		

Preliminary results

*The analysis of the evolution of variables measured for the **Bicycle test***



- No statistically significant changes were noticed regarding the evolution of REV as an expression including the methodology paradigm established along with the profile/ personalization according to age, sex, BMI, and effort tolerance.
- Thus, REV was held constant, only the degree of resistance to the sensor ergometric bicycle being different.
- The TAS/TAD/TAM evolution was in decline, variable and without statistically significant differences.
- There was not an evolution with statistically significant differences from the intercept value regarding the Borg value, but we must take into account the fact that it is a subjective measurement of the degree of physical effort.

Conclusions

1. Through close and constant monitoring, **we managed to maintain the development of programs according to the sustained procedural matrix.**
2. **The objectives** of this doctoral study contributed to **the stage fulfillment** of the overall doctoral endeavor:
 - ✓ The CV Rehabilitation Program was created and standardized through a corresponding Protocol implemented within BACEH
 - ✓ A number of approximately 80 patients were included in this program
 - ✓ After the implementation of the inclusion/ exclusion Criteria, we created a study group of 35 patients and a control group, respectively, which includes 25 patients
 - ✓ After the performance of exploratory statistical analysis, we will subsequently expand our analysis to an interferential one by including 50 patients in the study group
 - ✓ We already published two articles as part of the doctoral endeavor in journals ISI indexed with an $IF \geq 0.5$ and an article published in a PubMed indexed journal.
 - ✓ Moreover, we developed the telemedicine system to which specialists from both clinics have contributed

Hybrid cardiac rehabilitation as an Optimal Strategy for Post-MI Recovery: A 14-Week Prospective Study on Clinical and Functional Outcomes

Conclusions

- Our endeavor is a first step in building a structural and complex National Cardiovascular Rehabilitation Program, which we would like to introduce nationwide in order to meet the performance standards in the field along with the other countries that acknowledged the need of such an endeavor.
- Moreover, the necessary *sine qua non* is also the Electronic Registry of Rehabilitation for cardiovascular diseases, also implementable nationwide, both accomplishments being synergetic and with significant benefits on health, life quality and the psychological-social-economic consequences among patients with cardiovascular disorders, but also related to minimizing costs, the burden of cardiovascular diseases both for the individual and on the social-economic level, is multifaceted and it thus significantly affects the medical system and not only.

Conclusions:



The existence of a permanently updated record of the population at risk



The improvement of prevention and health education actions



The subsequent reduction in incidence and prevalence, as well as mortality or disabilities caused by them



The increase of adherence of patients in need/ who benefit from cardiovascular rehabilitation interventions, including the consecutive improvement of life quality

privind aprobarea Strategiei naționale pentru combaterea bolilor cardiovasculare și cerebrovasculare 2025 - 2030*)

Publicată în: Monitorul Oficial Nr. 678 bis din 21 iulie 2025

*) Hotărârea Guvernului nr. 582/2025 a fost publicată în Monitorul Oficial al României, Partea I, nr. 678 din 21 iulie 2025 și este reprodusă și în acest număr bis.

În temeiul art. 108 din Constituția României, republicată,

Guvernul României adoptă prezenta hotărâre.

Art. 1 - Se aprobă Strategia națională pentru combaterea bolilor cardiovasculare și cerebrovasculare 2025 - 2030, denumită în continuare *SNBCC*, prevăzută în anexa care face parte integrantă din prezenta hotărâre.

Art. 2 - Finanțarea obiectivelor prevăzute în *SNBCC* se face cu încadrare în bugetul aprobat instituțiilor implicate prin legile bugetare anuale, precum și din alte surse legal constituite, potrivit legii.

PRIM-MINISTRU
ILIE-GAVRIL BOLOJAN

Contrasemnează:
Viceprim-ministru,
Marian Neașu

Ministru sănătății,
Alexandru-Florin Rogobete

Ministru finanțelor,
Alexandru Nazare

Ministru investițiilor și proiectelor europene,
Dragoș-Nicolae Pislaru

Anexă



MINISTERUL SĂNĂTĂȚII



STRATEGIA NAȚIONALĂ PENTRU COMBATAREA BOLILOR
CARDIOVASCULARE ȘI CEREBROVASCULARE

1.9.4. Reabilitarea cardiovasculară și cerebrovasculară

Principalele obiective generale pentru reabilitarea cardiovasculară și cerebrovasculară în România sunt:

1. Construirea unui cadru legal privind modul de desfășurare a programelor de reabilitare cardiovasculară și cerebrovasculară;
2. Construirea de modele inovative de programe de reabilitare cardiovasculară și cerebrovasculară pe viață;
3. Creșterea accesului pacienților la programe de reabilitare cardiovasculară și cerebrovasculară, atât în spital cât și în ambulatoriu;
4. Creșterea aderenței pacienților la programele de reabilitare cardiovasculară și cerebrovasculară.
5. Dotarea cu aparatură modernă a structurilor spitalicești și ambulatorii de reabilitare medicală.
6. Creșterea finanțării alocate reabilitării pacienților cu afecțiuni cardiovasculare și cerebrovasculare în ambulatoriu de specialitate și spitalizare continuă.

Principalele ținte sunt:

1. Dezvoltarea reabilitării în ambulatoriu, în așa fel încât **cel puțin 90% din reabilitarea cardiovasculară să poată fi efectuată în ambulatoriu.**
2. Creșterea accesului la servicii de spitalizare de zi în ambulatoriile din orașele reședință de județ. Dezvoltarea coordonată a sectorului ambulatoriu de spitalizare de zi și integrarea acestuia în continuumul ofertei de servicii de sănătate ambulatorii conform cu prevederile din Strategia Națională de Sănătate 2023 - 2030 aprobată prin Hotărârea Guvernului nr. 1.004/2023.
3. **Includerea în programele de reabilitare cardiovasculară și neuroreabilitare a:**
 - a. peste 90% din pacienții eligibili cu AVC; 20% dintre aceștia să poată fi transferați direct spre reabilitare;
 - b. peste 80% din populația eligibilă cu **sindroame coronariene acute;**
 - c. peste 40% din populația eligibilă cu **sindroame coronariene cronice;**
 - d. peste 40% din populația eligibilă cu **intervenții coronariene percutane sau după implantarea de dispozitive;**
 - e. peste 30% din populația eligibilă cu **insuficiență cardiacă;**
 - f. peste 30% din populația eligibilă **după intervenții chirurgicale cardiace.**
4. Asigurarea unei alocări bugetare corespunzătoare în anexele la legile anuale ale bugetului de stat pentru asistența medicală ambulatorie de specialitate, astfel încât să se creeze spațiu bugetar suficient pentru completarea pachetului de servicii de bază cu posibilitatea ca specialitățile de cardiologie și neurologie să fie printre specialitățile care încheie **contracte cu casele de asigurări de sănătate** și pentru servicii conexe actului medical.
5. Creșterea capacității resursei umane și a finanțării în clinicile de reabilitare existente.
6. Dezvoltarea de **echipe multidisciplinare** care să includă și personal cu titlu de calificare în fizioterapie și psihologie, poate chiar și nutriționist, având în vedere prevenția secundară a pacienților cu BCC, care conține alături de reabilitarea fizică și alte măsuri de stil de viață: abandonarea fumatului, măsuri de dietetică.
7. **Creșterea finanțării serviciilor de reabilitare cardiovasculară și cerebrovasculară;** includerea de noi servicii decondate în cadrul sistemului de asigurări sociale de sănătate.
8. Dezvoltarea **acțiunilor prioritare pentru tratarea pacienților cu accidente vasculare cerebrale acute** în secțiile de neurologie prin acțiuni prioritare.
9. Dezvoltarea programelor de atestare a studiilor complementare în domeniul **reabilitării cardiovasculare și cerebrovasculare.**

Our initiative started in 2023 and it was entirely confirmed and supported through this Governmental Decision, which once again confirmed the need to actively prioritize prevention, treatment and rehabilitation in CV diseases.

THANK YOU FOR YOUR ATTENTION!

Cardiovascular rehabilitation not only prolongs lives, but it also restores life quality – through science, personalization and multidisciplinary.



Platforma de telemedicină destinată
recuperării cardiovasculare



Mai multe informații pe www.cardionline.ro