Riabilitazione cardiologica nello scompenso cardiaco : dove siamo e dove andiamo

Maurizio Volterrani
IRCCS San Raffaele

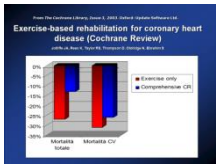
ROMA 15 Dicembre 2015

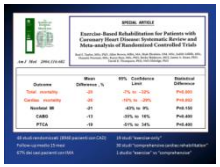
La Riabilitazione Cardiologica

Evidenze scientifiche

RISULTATI DELLA RC SU MORTALITA'

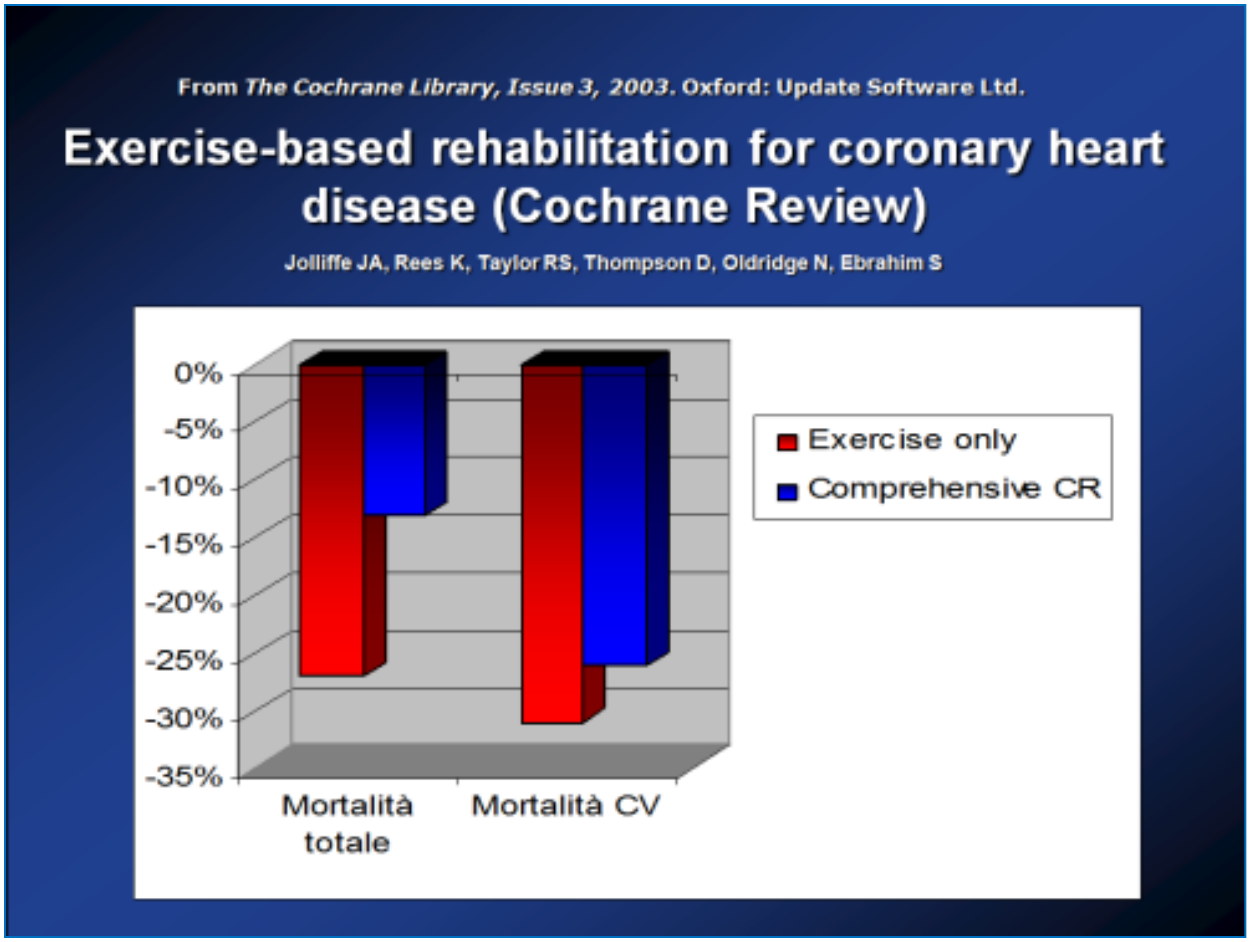
	Oldridge	O'Connor	Bobbio	Joliffe
MORTALITÀ TOTALE	- 24% *OR 0.63-0.92* NNT: 32	- 20% *OR 0.66-0.96* NNT: 46	- 32% *OR 0.53-0.86*	-13%/27% *OR 0.54-1.05* NNT: 72
MORTALITÀ CARDIOVASC.	-25% *OR 0.62-0.93*	- 22% *OR 0.78-0.96*	- 38% *OR 0.48-0.82*	- 26%/31% *OR 0.51-0.96*
MORTE IMPROVVISA		- 37% *OR 0.41-0.97*		
RE-INFARTO		- 25% *OR 0.59-0.95*		

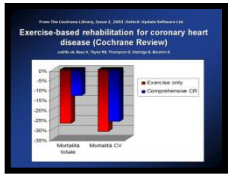


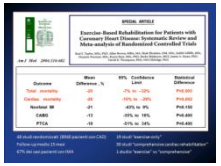


La Riabilitazione Cardiologica

Evidenze scientifiche







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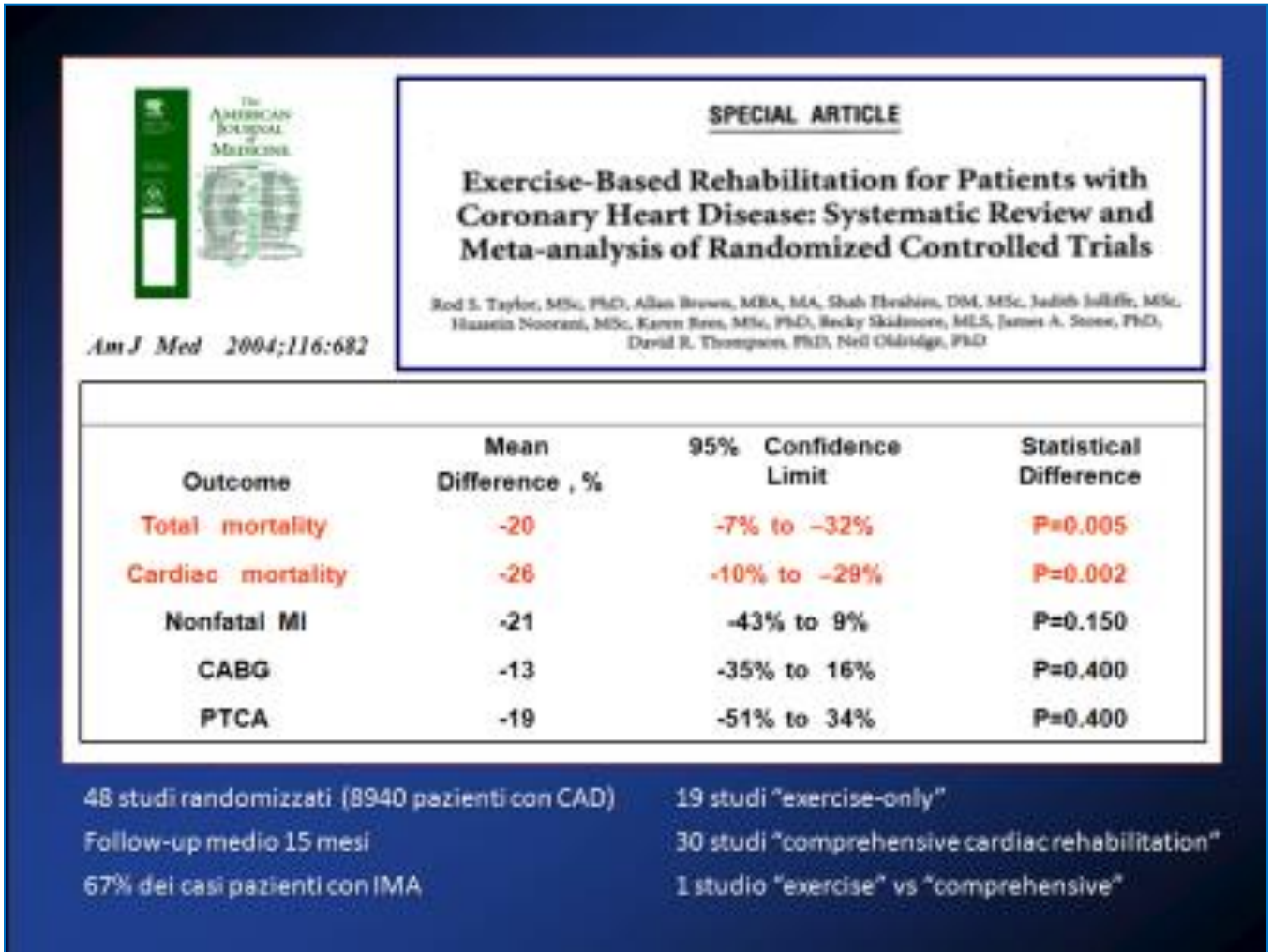

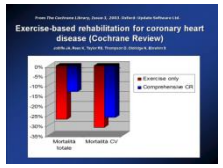

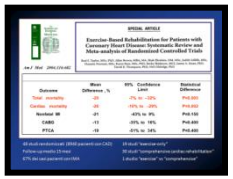

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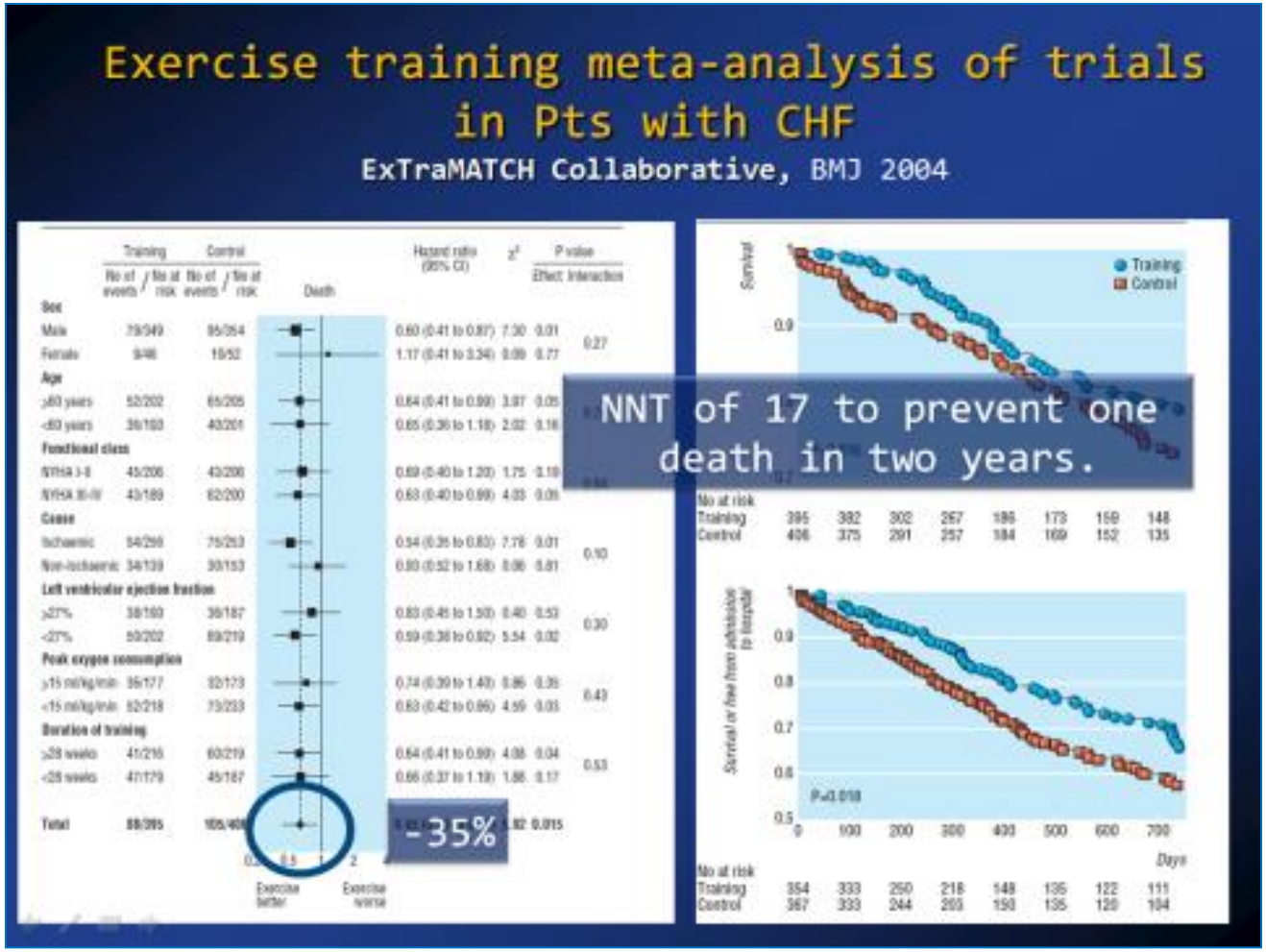
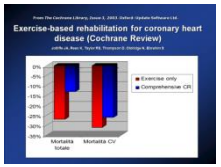
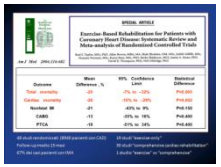
Evidenze scientifiche







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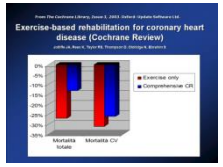

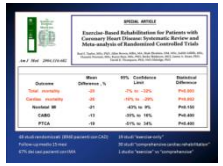

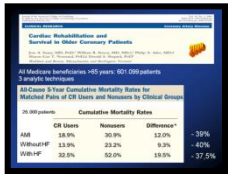

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CLINICAL RESEARCH — **Coronary Artery Disease**

Cardiac Rehabilitation and Survival in Older Coronary Patients

Jose A. Suaya, MD, PHD,* William B. Stason, MD, MSC1,* Philip A. Ades, MD,†
Sharon-Lise T. Normand, PHD,‡ Donald S. Shepard, PHD*
Waltham and Boston, Massachusetts; and Burlington, Vermont

2009

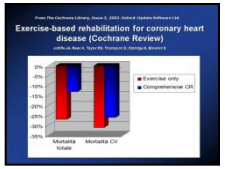
All Medicare beneficiaries >65 years: 601.099 patients
3 analytic techniques

All-Cause 5-Year Cumulative Mortality Rates for Matched Pairs of CR Users and Nonusers by Clinical Groups

26.000 patients

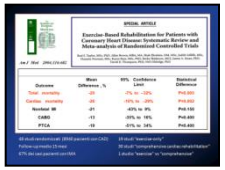
	Cumulative Mortality Rates			
	CR Users	Nonusers	Difference*	
AMI	18.9%	30.9%	12.0%	- 39%
Without HF	13.9%	23.2%	9.3%	- 40%
With HF	32.5%	52.0%	19.5%	- 37,5%

La Riabilitazione Cardiologica

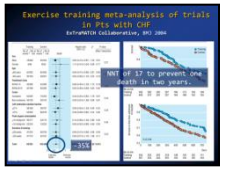


RIDUCE LA MORTALITA'

- **CARDIOVASCOLARE (Meta-Analisi e Cochrane) 27%**
- **PER REINFARTO 25%**
- **NELLO SCOMPENSO CARDIACO 35%**
- **NEL CARDIOPATICO ANZIANO 37%**

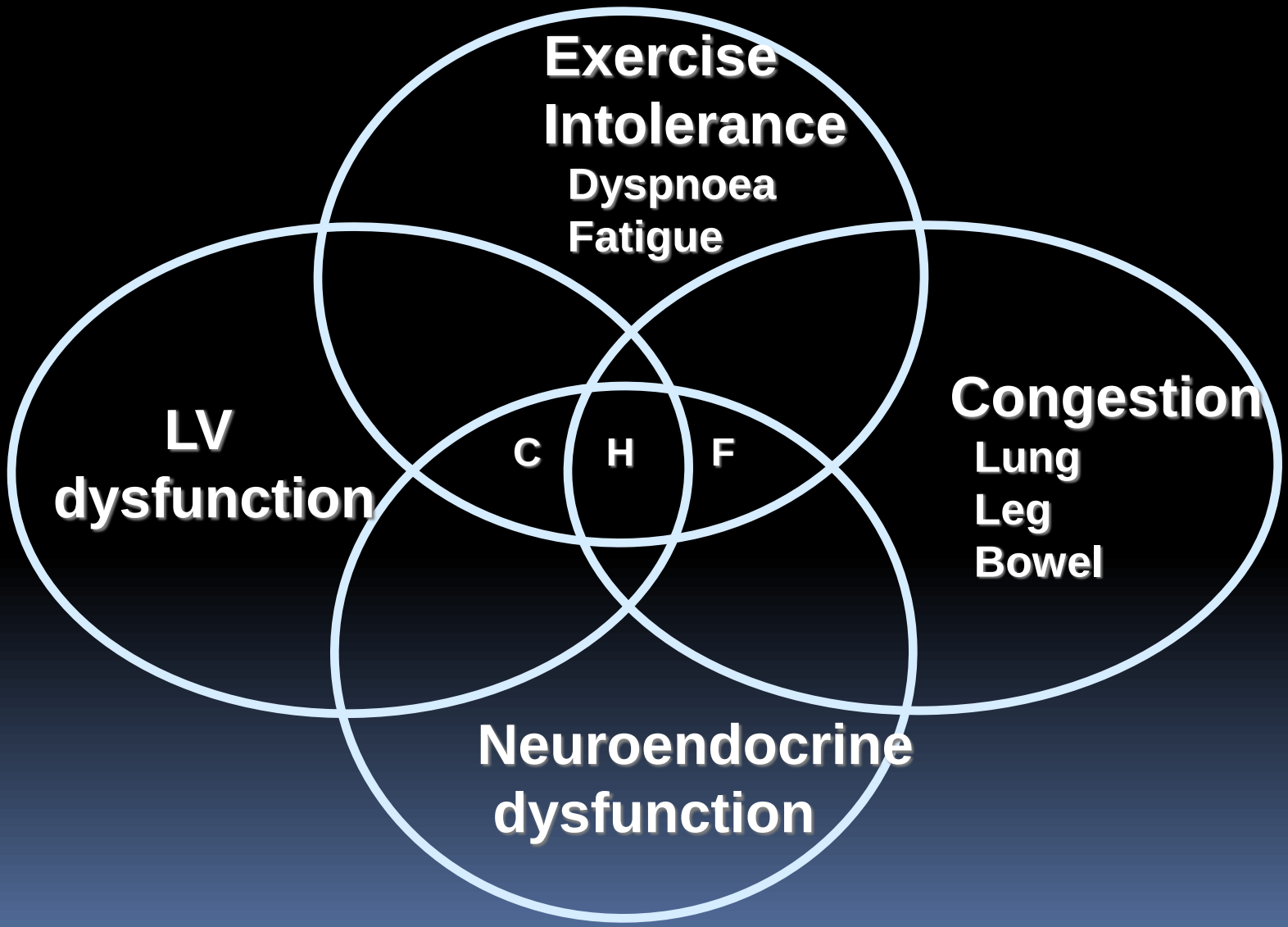


Se ci fosse una pillola molto economica, in grado di ridurre le morti per causa cardiaca del 27%, di migliorare la qualità della vita, di ridurre ansia e depressione, ci si aspetterebbe che tutti i cardiopatici europei l'assumessero.
Questa pillola non esiste, ma un programma di riabilitazione cardiaca può fornire tutti questi benefici.



Prof. Bob Lewin
European Society of Cardiology Congress
Amsterdam 2005

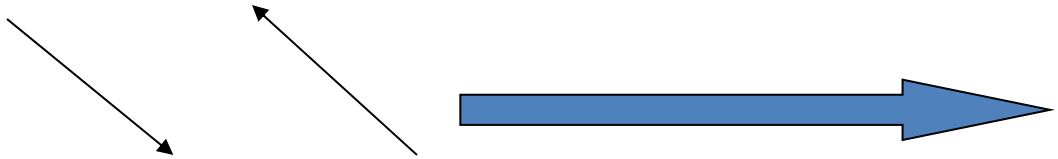
HEART FAILURE AS A SYNDROME



Perché prescrivere esercizio nei pazienti con scompenso cardiaco ?

Sino agli anni ’80:

Astenia, mancanza di forza,
Affanno da sforzo



Peggioramento dei sintomi

Riposo a letto o
astensione da sforzi fisici

MEDICO

Perché prescrivere esercizio nei pazienti con scompenso cardiaco ?

1) La limitata tolleranza all'esercizio è uno dei sintomi piu' importanti dello scompenso cardiaco

2) La capacità di fare esercizio è correlata alla sopravvivenza dei pazienti con scompenso cardiaco

3) I farmaci utilizzati per trattare lo scompenso cardiaco hanno scarsi effetti sulla tolleranza all'esercizio

ESERCIZIO FISICO: Fonti energetiche

Muscoli scheletrici

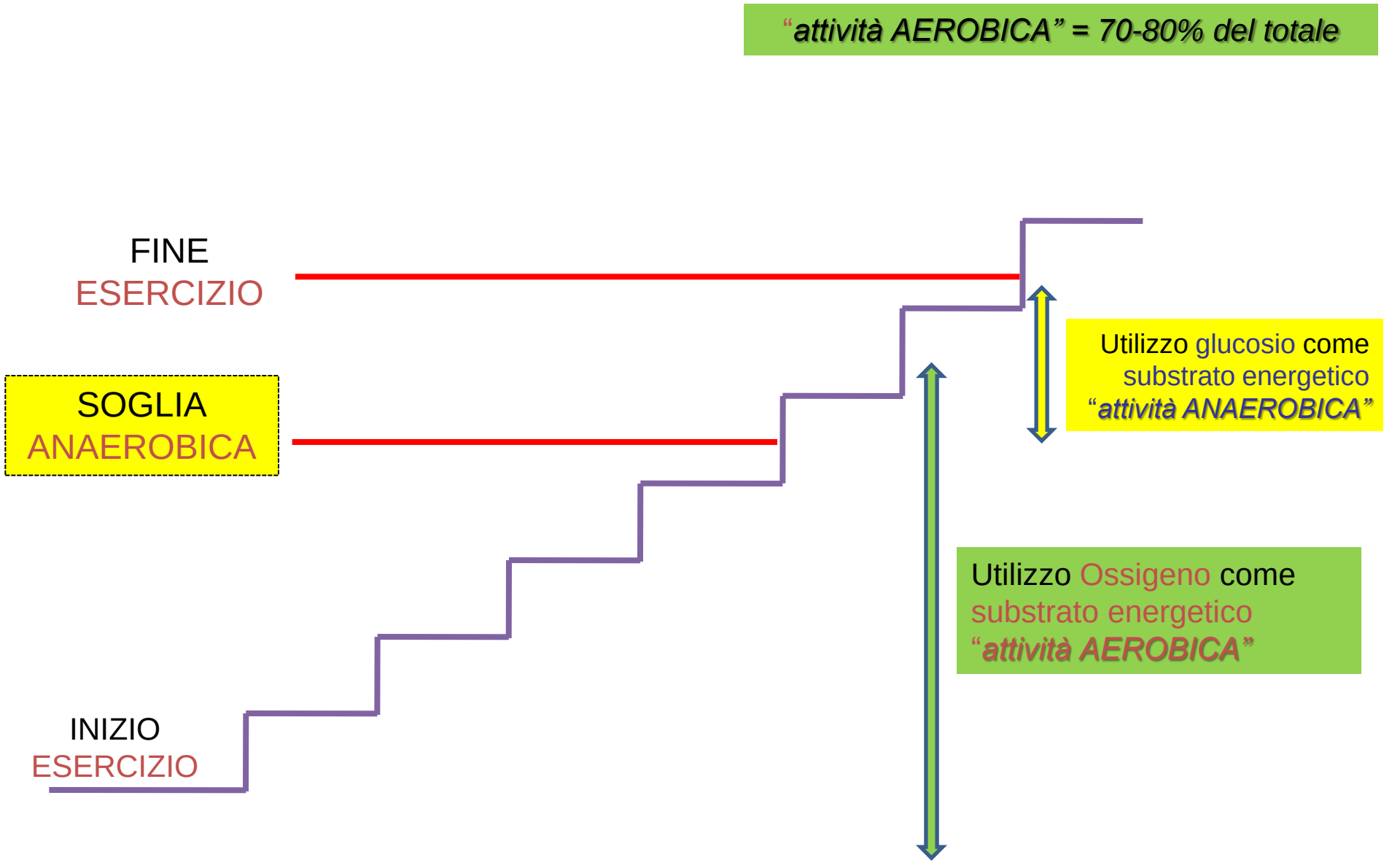
Energia da fonte “esterna”
OSSIGENO

Energia da fonte “interna”
GLUCOSIO

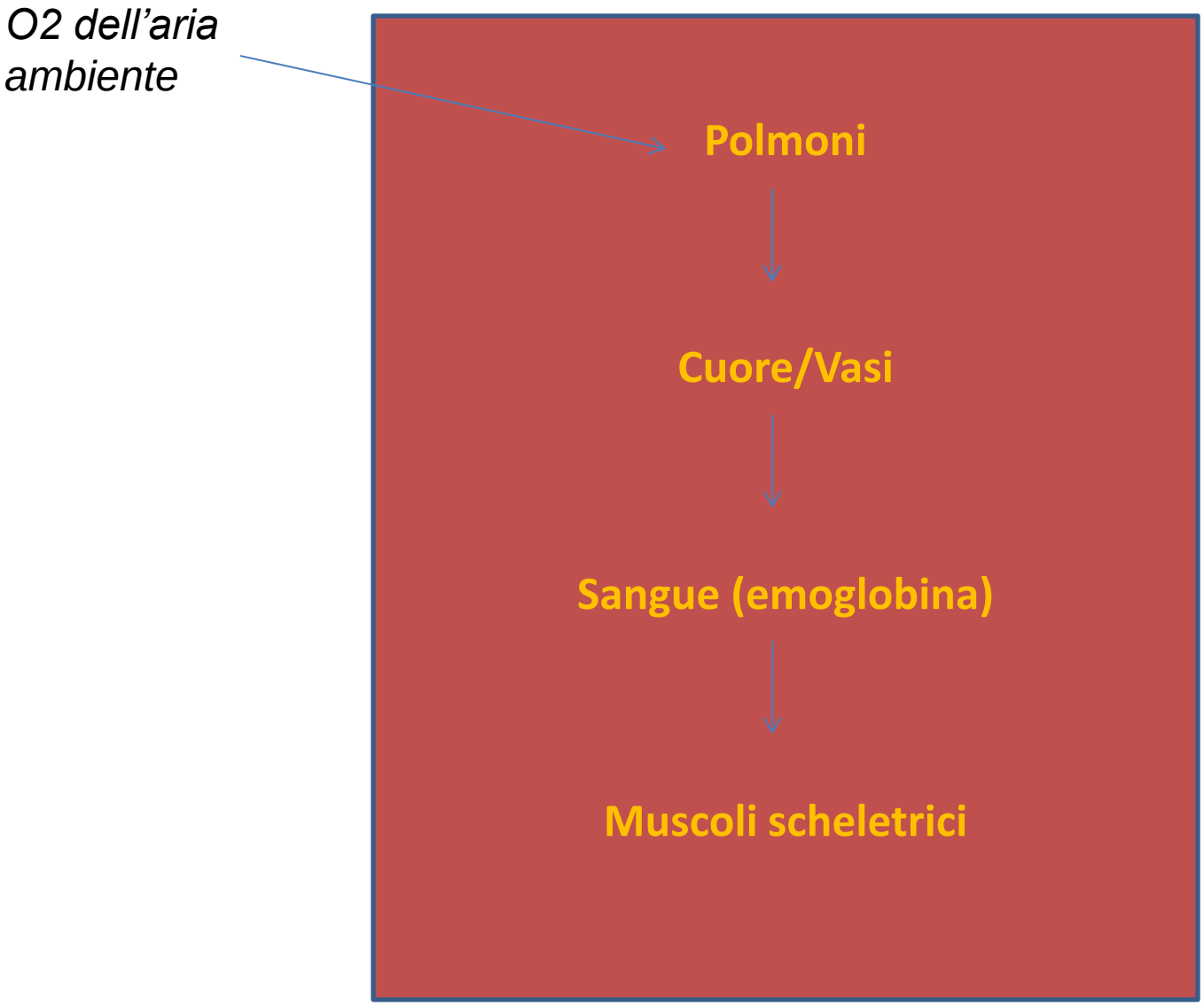
Contrazione muscolare

MOVIMENTO

ESERCIZIO FISICO E FONTI DI ENERGIA



“ Catena Aerobica ”

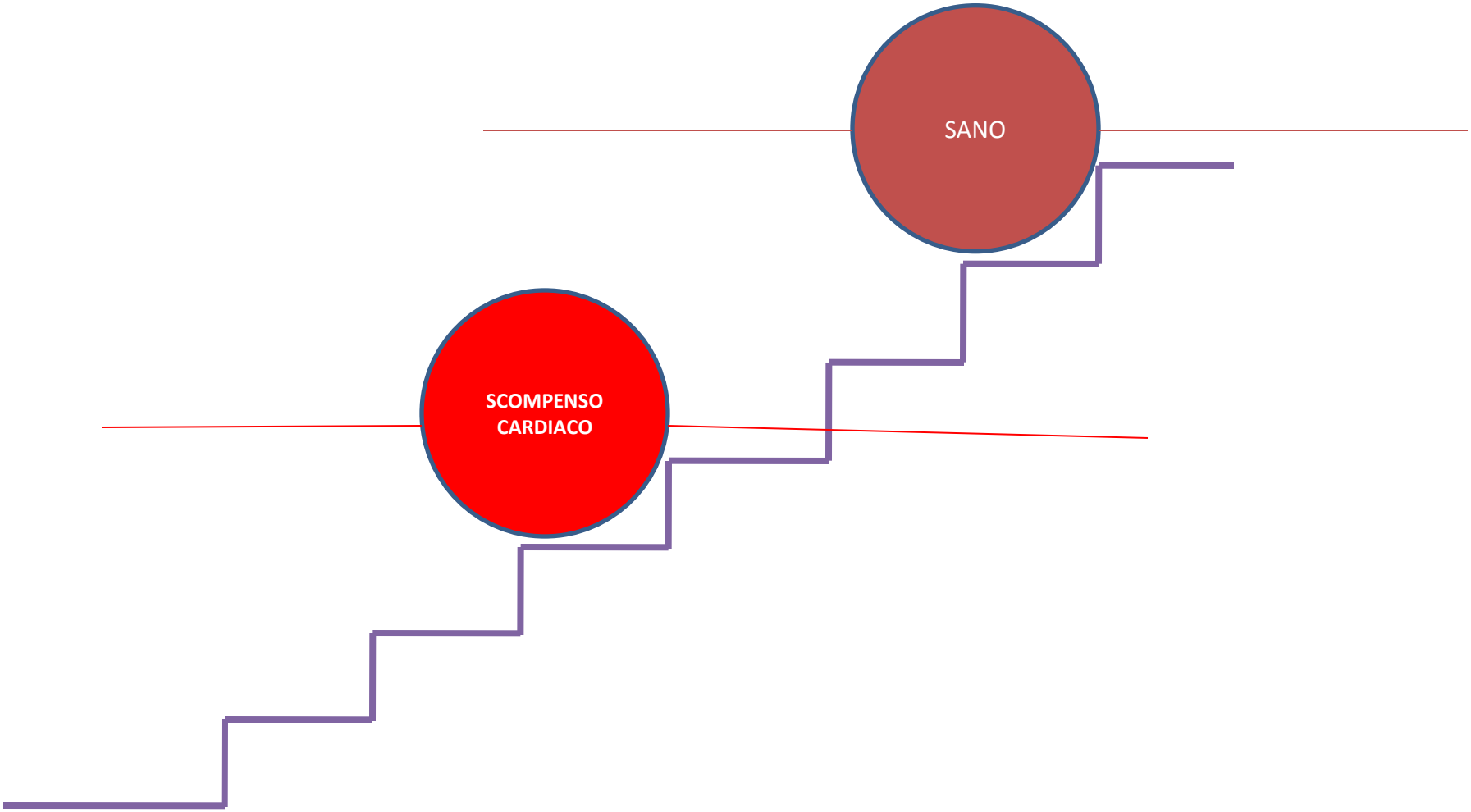


In confronto ad un soggetto sano, a parità di genere ed età, il paziente presenta:

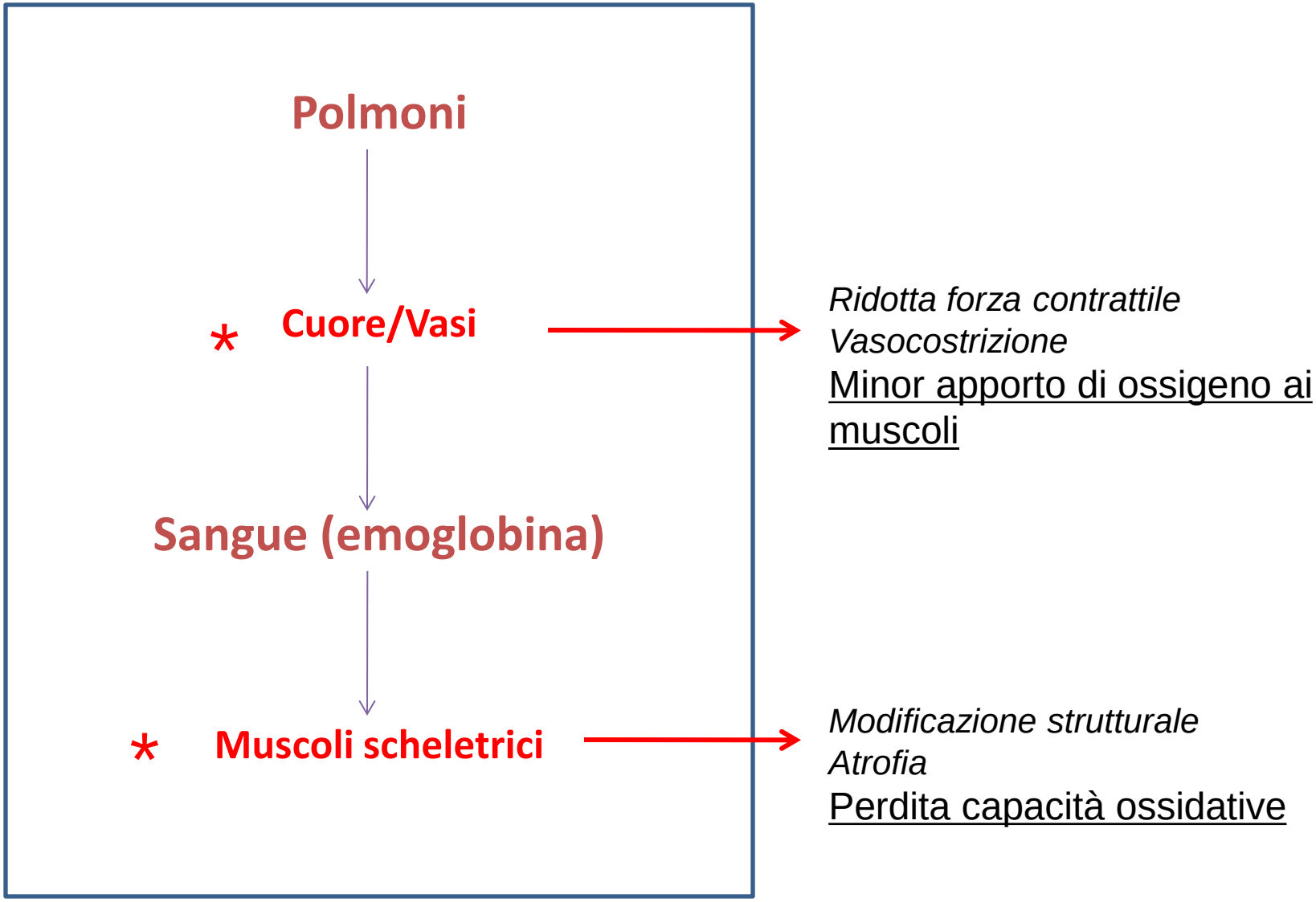
Riduzione della capacità aerobica complessiva (utilizzazione O2)

Precoce insorgenza della soglia anaerobica (produzione ac. lattico)

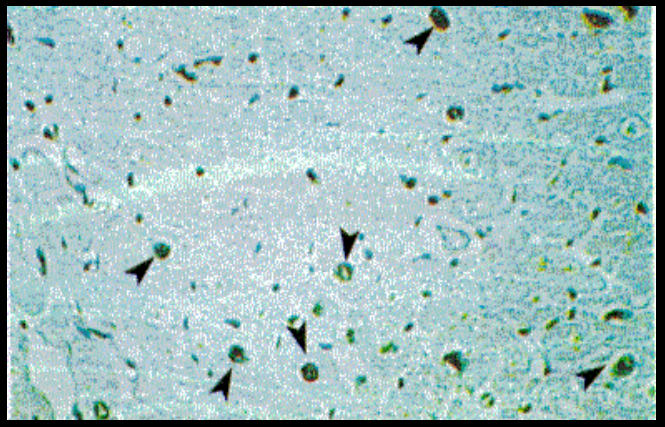
Minore durata dello sforzo e minore intensità di carico.



Alterazioni della “catena aerobica” nello scompenso cardiaco

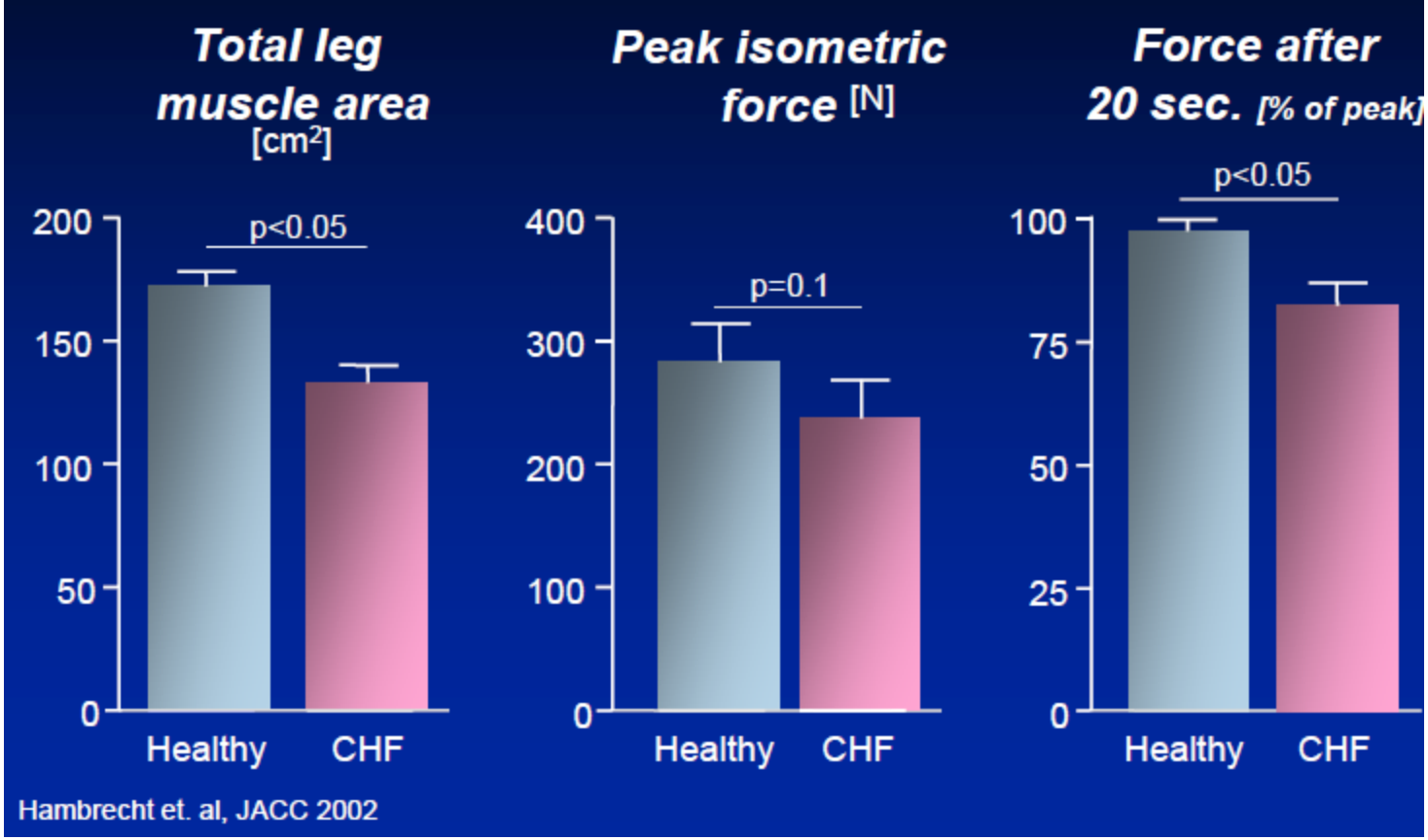


Skeletal muscle in heart failure



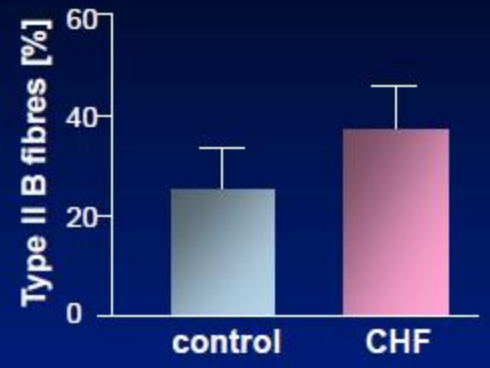
Blood flow		ml/min reduced
Metabolism		early lactic acid production phosphate depletion
Function		Weakness, increased fatigue
Morphology	**Quantity**	Loss of muscle mass (or bulk)
	Site	Localised to legs or general abnormality Orientation and fibre position
	Quality	Atrophy, damage and/or necrosis Change of fibre type

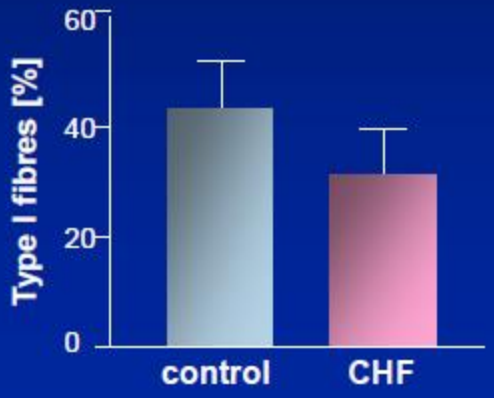
Muscle Size and Muscle Function



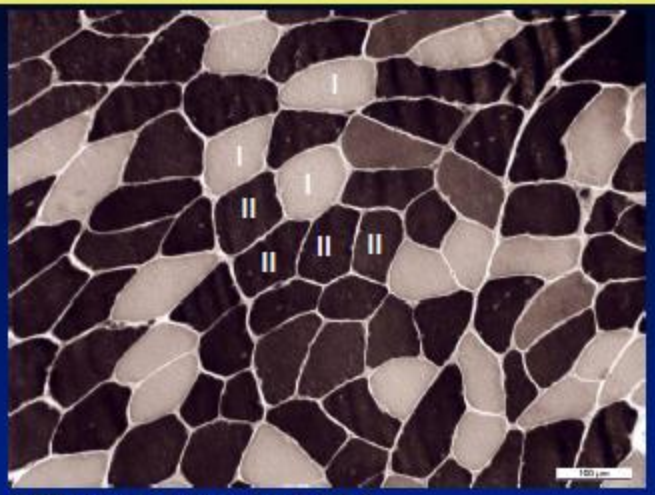
Hambrecht et. al, JACC 2002

Skeletal Muscle Fibre Type Distribution





Schaufelberger et al; Eur Heart J 1997



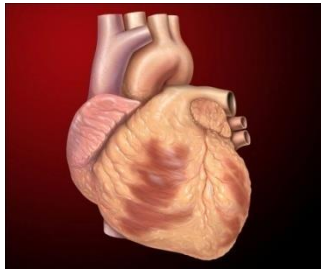
ATPase staining at pH 10.4

Fibre type switch in the skeletal muscle of CHF patients

- type I (lower power but good endurance)

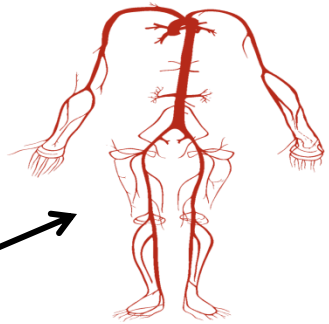
+ type II (fast but fatigue quickly).

FEED-BACK CARDIO-MUSCOLARE



↑ Gittata cardiaca
(Volume sangue/minuto)

–Frequenza
↑ Forza contrattile



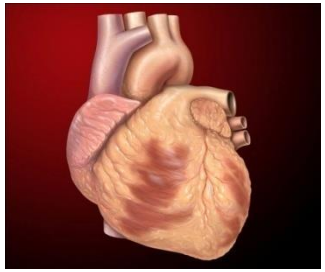
Rilassamento

Impulsi da recettori
MECCANICI e CHIMICI

Sistema nervoso “autonomo”
SIMPATICO/PARASIMPATICO

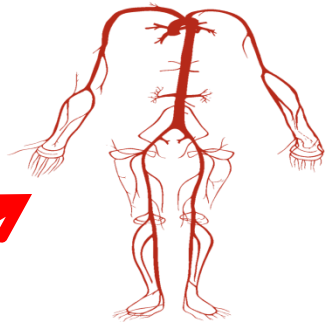
> Ventilazione

FEED-BACK CARDIO-MUSCOLARE nello SCOMPENSO CARDIACO



↑↑ Frequenza

↓ Gittata cardiaca

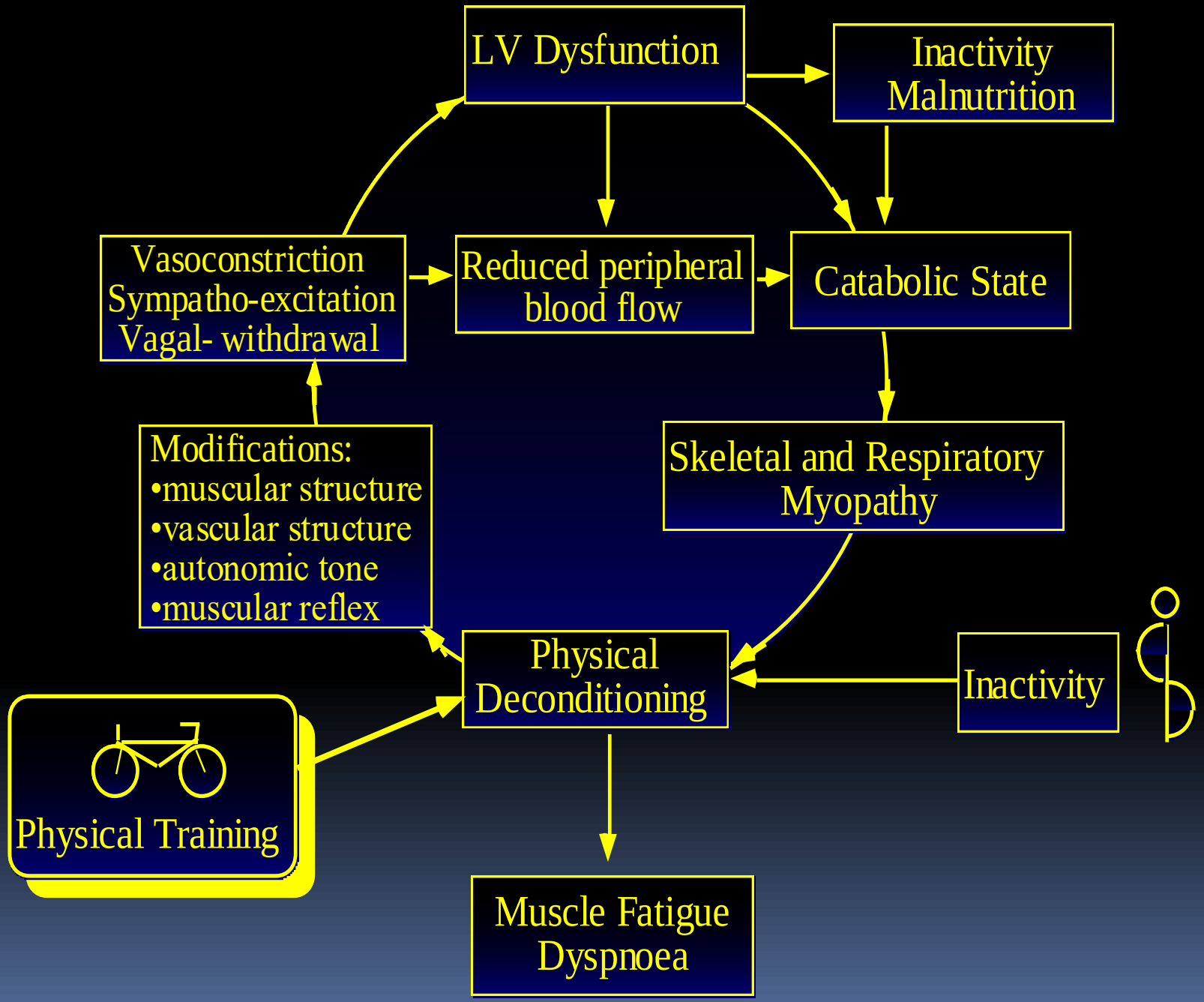


>contrazione

Impulsi da recettori MECCANICI e CHIMICI

Sistema nervoso “autonomo” **SIMPATICO/PARASIMPATICO**

>> Ventilazione


LV Dysfunction
Inactivity
Malnutrition
Vasoconstriction
Sympatho-excitation
Vagal- withdrawal
Reduced peripheral
blood flow
Catabolic State
Modifications:
•muscular structure
•vascular structure
•autonomic tone
•muscular reflex
Skeletal and Respiratory
Myopathy
Physical
Deconditioning
Inactivity
Physical Training
Muscle Fatigue
Dyspnoea

Effetti dell'esercizio nei pazienti con scompenso cardiaco

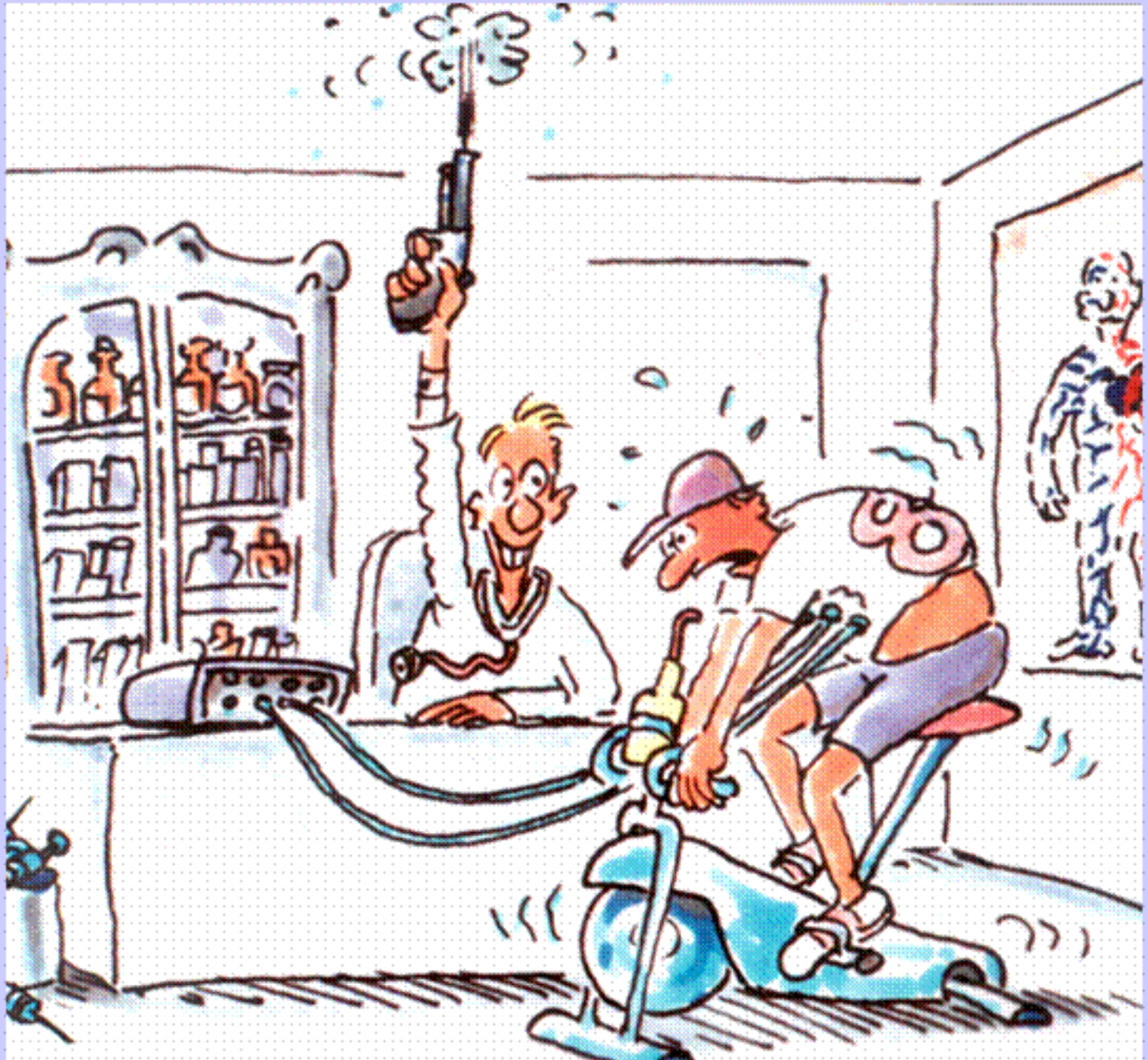
SISTEMA	EFFETTO
Sistema nervoso autonomo	Riduce l'eccessiva attività del Sistema nervoso **SIMPATICO** ed aumenta quella del **PARASIMPATICO**
Arterie	Promuove la dilatazione delle arterie "muscolari"
Muscolo	Migliora la struttura e la capacità ossidativa Riduce l'eccessiva attivazione dei meccanocettori e dei chemocettori muscolari
Cuore	Riduce la tendenza alla dilatazione ed al "rimodellamento concentrico"
Polmoni	Riduce l'eccessiva ventilazione, migliorando l'efficienza ventilatoria.

Effetti dell'esercizio nei pazienti con scompenso cardiaco

La letteratura scientifica disponibile, indica chiaramente che un periodo di training fisico, della durata di almeno 3 mesi, determina un aumento della tolleranza all'esercizio con:

- Aumento della capacità aerobica massimale
- Innalzamento della soglia anaerobica
- Riduzione della dispnea da sforzo

-Riduce la mortalità
-Riduce le riospedalizzazioni



Contents lists available at SciVerse ScienceDirect

International Journal of Cardiology

journal homepage: www.elsevier.com/locate/ijcard

Dose–response relationship of baroreflex sensitivity and heart rate variability to individually-tailored exercise training in patients with heart failure

Ferdinando Iellamo [a,b,*], Vincenzo Manzi [b], Giuseppe Caminiti [a], Barbara Sposato [a], Michele Massaro [b], Anna Cerrito [a], Giuseppe Rosano [a], Maurizio Volterrani [a]

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Exercise training
Baroreflex sensitivity
Heart rate variability
Cardiac rehabilitation

ABSTRACT

Background: Heart Rate Variability (HRV) and Baroreflex Sensitivity (BRS) are impaired in patients with Chronic Heart Failure (CHF) and carry negative prognosis. Exercise training improves these parameters. However, the relationship between exercise training with HRV and BRS has been investigated without regard for individual training loads. We tested the hypothesis that in CHF patients changes in HRV and BRS are dose–response related to individual volume/intensity training load (TL).

Methods: Twenty patients with stable postinfarction CHF under optimal medical treatment were randomized to either aerobic continuous training (ACT) or aerobic interval training (AIT) for 12 weeks. Individualized TL was monitored by the Training Impulses ($TRIMP_i$) method, which was determined using the individual HR and lactate profiling determined during a treadmill test at baseline. HRV (standard deviation of mean R-R interval) and BRS were assessed at rest and 3 weeks apart, throughout the study.

Results: HRV, BRS and R–R interval increased significantly with training, being very highly correlated to the dose of exercise with a second-order regression model (r^2 ranged from 0.75 to 0.96; $P<0.001$), resembling a bell-shaped in the ACT, and an asymptotic-shaped curve in the AIT groups, respectively. These changes were accompanied by a significant increase in functional capacity. No significant differences were detected between ACT and AIT in any variable.

Conclusions: These results suggest that improvements in HRV and BRS by exercise training in CHF patients are dose related to TL in a non-linear fashion on an individual basis, with optimal results at moderate doses of exercise.

Contents lists available at ScienceDirect

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Validation of rate of perceived exertion-based exercise training in patients with heart failure: Insights from autonomic nervous system adaptations

Ferdinando Iellamo [a,*], Vincenzo Manzi [a], Giuseppe Caminiti [a], Cristiana Vitale [a], Michele Massaro [a], Anna Cerrito [a], Giuseppe Rosano [a], Maurizio Volterrani [a]

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Baroreflex sensitivity
Heart rate variability
Cardiac rehabilitation

ABSTRACT

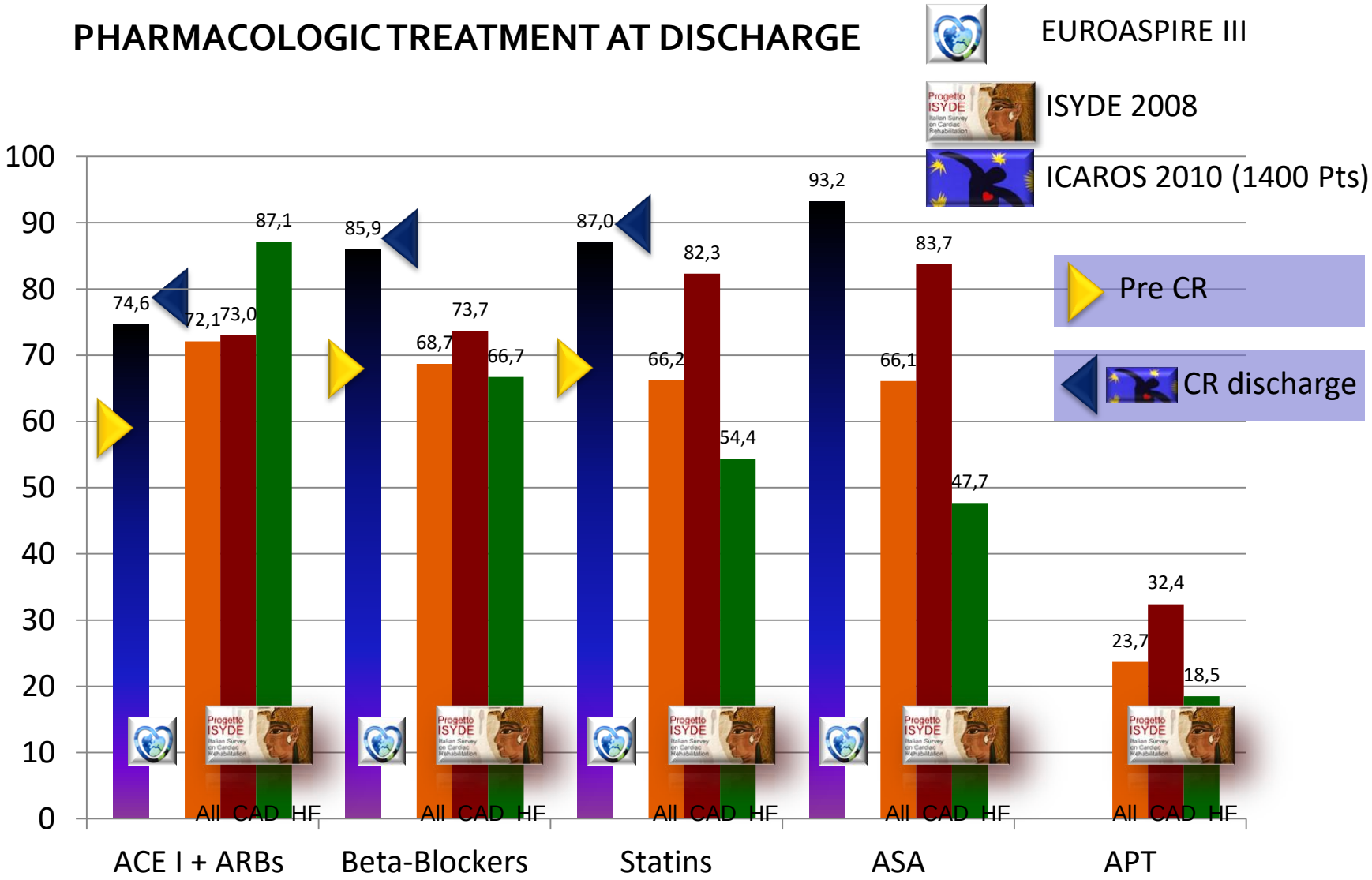
Background: Exercise prescription in cardiac patients is based on heart rate (HR) response to exercise. How to prescribe long-term exercise training outside medically-supervised settings also considering changes in individual physical capacity over time is unknown. In this study we hypothesized that in patients with chronic heart failure (CHF) the session-rate of perceived exertion (RPE), a subjective-based training methodology, provides autonomic and functional capacity changes superimposable to those observed with HR-based Training Impulses (TRIMPi) method.

Methods: Twenty patients with stable CHF were randomized to either aerobic continuous training (ACT) or aerobic interval training (AIT) for 12 weeks. For each TRIMPi-guided exercise session, the session-RPE was recorded. By this method, internal training load (TL) is quantified by multiplying the RPE of the whole training session, using the Borg CR10-scale, by its duration. Heart rate variability (HRV), and baroreflex sensitivity (BRS) were assessed at baseline and at 3 weeks intervals.

Results: Significant correlations were found between $TRIMP_i$ and individual session-RPE, for both ACT and AIT ($r = 0.63$ to 0.81), ($P < 0.05$). The same occurred when ACT and AIT groups were pooled together ($r = 0.72$; $P < 0.01$). R–R interval, HRV and BRS were significantly and very highly correlated with weekly RPE-session (r^2 ranged from 0.77 to 0.97; $P < 0.001$). A significant relationship between session-RPE and performance at the 6MWT was also found.

Conclusions: Session-RPE is an easy-to-use, inexpensive and valid method for exercise prescription and health maintenance, consistent with objective physiological indices of training, that could be used for long-term physical activity in patients with CHF.

PHARMACOLOGIC TREATMENT AT DISCHARGE



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Heart Failure

Effect of Long-Acting Testosterone Treatment on Functional Exercise Capacity, Skeletal Muscle Performance, Insulin Resistance, and Baroreflex Sensitivity in Elderly Patients With Chronic Heart Failure

A Double-Blind, Placebo-Controlled, Randomized Study

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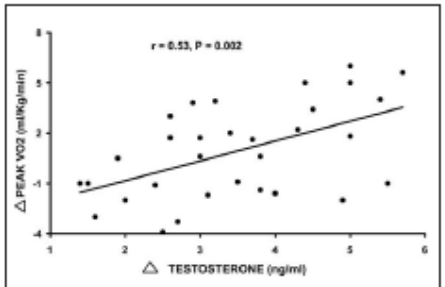

Figure 1 Relation Between Changes (Δ) in Total Testosterone Levels and in Peak VO_2 in the Testosterone-Treated Group

In heart failure patients treated with testosterone, there was a significant direct relationship between the increase in plasma levels of testosterone and the increase in peak oxygen consumption (VO_2).

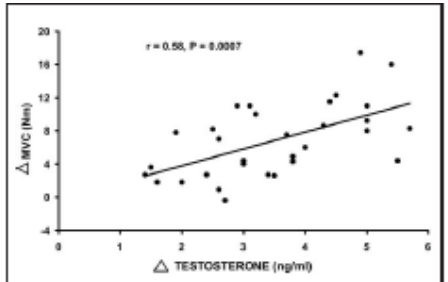

Figure 2 Relation Between Changes (Δ) in Total Testosterone Levels and in MVC in the Testosterone-Treated Group

In heart failure patients treated with testosterone, there was a significant direct relationship between the increase in plasma levels of testosterone and the increase in maximal isometric muscle strength (maximal voluntary contraction [MVC]).

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Heart Failure

Testosterone Therapy in Women With Chronic Heart Failure

A Pilot Double-Blind, Randomized, Placebo-Controlled Study

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Roma, Italy; Cincinnati, Ohio; and London, United Kingdom

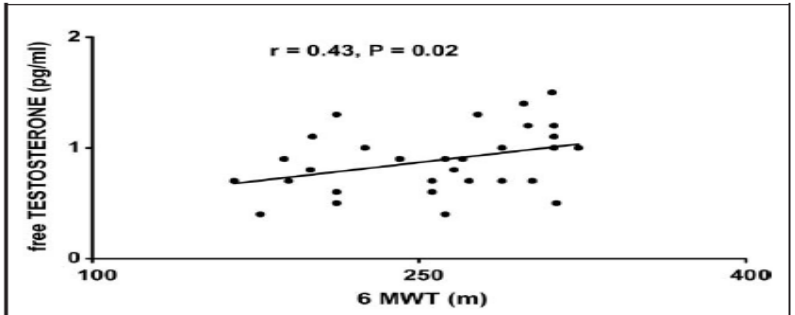
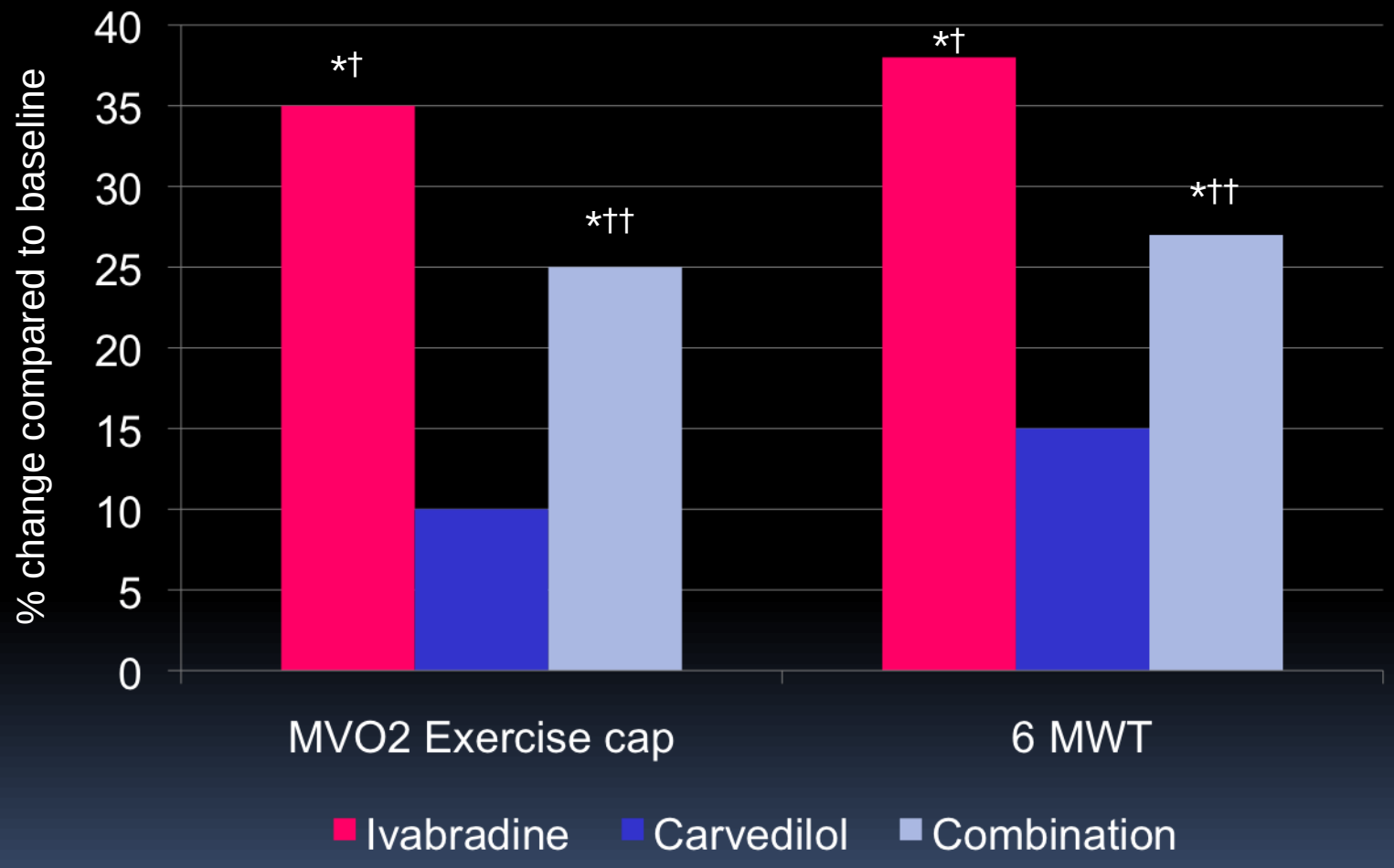


Figure 1 Relation Between Free Testosterone Levels and Distance Walked at 6MWT at Baseline

At baseline, there was a significant direct relationship between free testosterone levels and the distance walked in the 6-min walking test (6MWT).

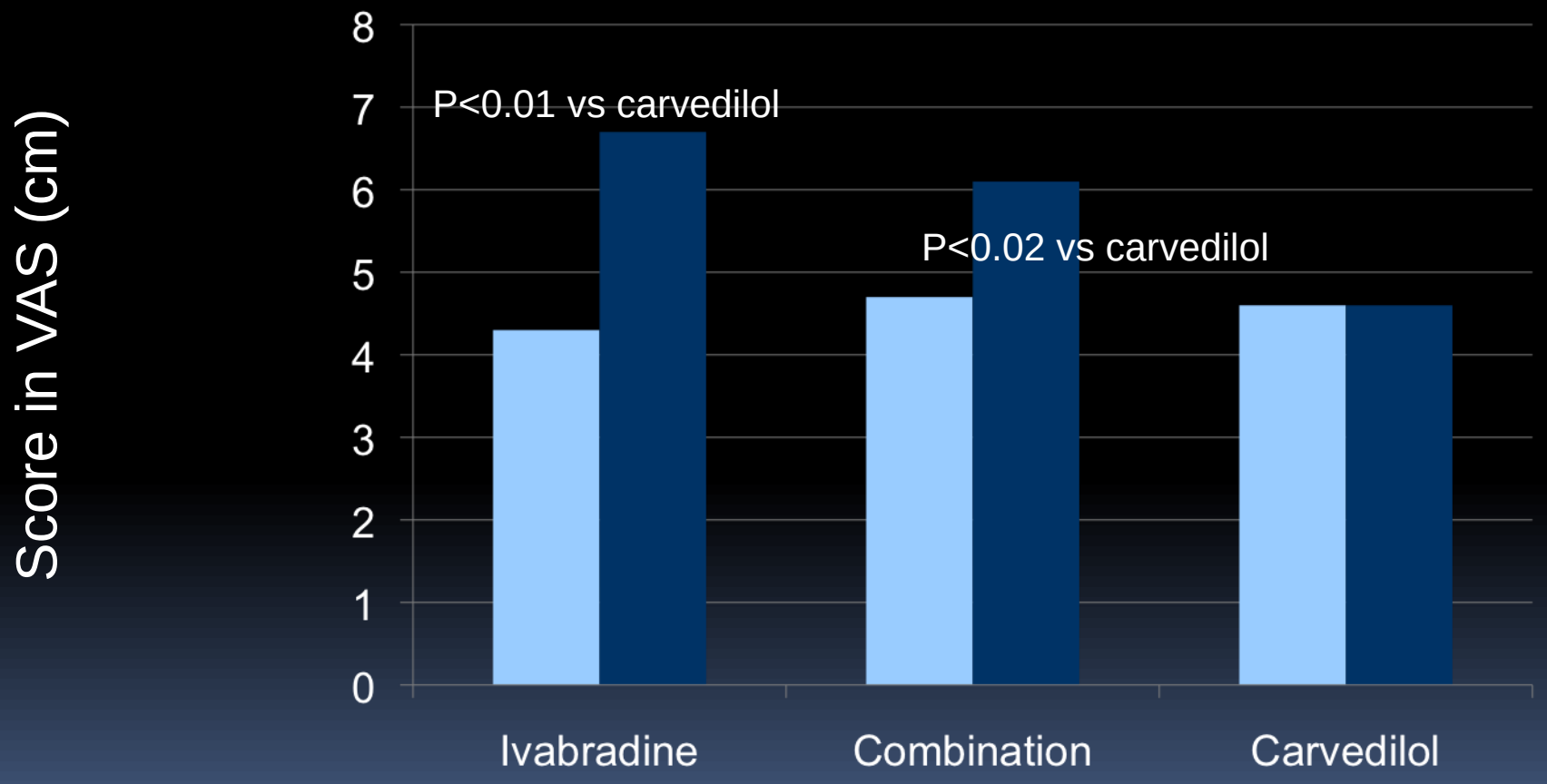
Change in exercise capacity



*P<0.01 vs baseline. †P<0.01, ††P<0.02 vs carvediolol

Volterrani et al Int J Cardiol 2011

Quality of Life - VAS



Volterrani et al Int J Cardiol 2011

Multicenter randomised trial on home-based telemanagement and telerehabilitation to prevent hospital readmission of patients with chronic heart failure

International Journal of Cardiology 2008

Risultati (Follow-up 360 gg)

	Controllo (n=230)	*HBT (n=230)*	
Pz. Ospedalizzati (%)	83 (36.2)	55 (23.9)	
Rischio relativo		0.56	p<0.01
Intervallo di confid. 95%		0.38 – 0.82	
N. totale di ricoveri	142	91	36 % p<0.01
Probabilità di reospedalizzazione per SCC a 360 gg	42 %	28 %	

Analisi dei costi

	Controllo	*HBT*	
Costo medio reospedalizzazioni per SCC ($)	**1648 ± 2949**	**1070 ± 2201**	**-35%** **P<0.01**
Costo annuale per prevenire una reospedalizzazione ($)		**880**	**IC 95%** **1080-2430**

Lifestyle and non –pharmaceutical/device/ surgical intervention

Recommendations	Class	Level
It is recommended that regular aerobic exercise is encouraged in patients with heart failure to improve functional capacity and symptoms.	I	A*
It is recommended that patients with heart failure are enrolled in a multidisciplinary-care management programme to reduce the risk of heart failure hospitalization.	I	A*

* O'Connor CM, Whellan DJ, Lee KL, Keteyian SJ, Cooper LS, Ellis SJ, Leifer ES,Kraus WE, Kitzman DW, Blumenthal JA, Rendall DS, Miller NH, Fleg JL, Schulman KA, McKelvie RS, Zannad F, Pin¨a IL; HF-ACTION Investigators. Efficacy and safety of exercise training in patients with chronic heart failure: HFACTION randomized controlled trial. JAMA 2009;301:1439–1450.
Piepoli MF, Conraads V, Corra U, Dickstein K, Francis DP, Jaarsma T, McMurray J, Pieske B, Piotrowicz E, Schmid JP, Anker SD, Solal AC, Filippatos GS, Hoes AW, Gielen S, Giannuzzi P, Ponikowski PP. Exercise training in heart failure: from theory to practice. A consensus document of the Heart Failure Association and the European Association for Cardiovascular Prevention and Rehabilitation. Eur J Heart Fail 2011;13:347–357.

Characteristics and components of management programmes for patients with heart failure with reduced ejection fraction and heart failure with

Characteristics	Should employ a multidisciplinary approach (cardiologists, primary care physicians, nurses, pharmacists, etc.)
	Should target high-risk symptomatic patients
	Should include competent and professionally educated staff
Components	Optimized medical and device management
	Adequate patient education, with special emphasis on adherence and self-care
	Patient involvement in symptom monitoring and flexible diuretic use
	Follow-up after discharge (regular clinic and/or home-based visits; possibly telephone support or remote monitoring)
	Increased access to healthcare (through in-person follow-up and by telephone contact; possibly through remote monitoring)
	Facilitated access to care during episodes of decompensation
	Assessment of (and appropriate intervention in response to) an unexplained increase in weight, nutritional status, functional status, quality of life, and laboratory findings
	Access to advanced treatment options
	Provision of psychosocial support to patients and family and/or caregivers

European Heart Journal (2012) 33, 1787–184

heartfailurematters.org

ANNA, YOUR
VIRTUAL GUIDE

- Understanding heart failure
- What can your doctor do
- What can you do
- Living with Heart Failure
- For caregivers
- Warning signs
- FAQ
- Ask Your Doctor

HEART FAILURE MATTERS:

PRACTICAL INFORMATION FOR PATIENTS, FAMILIES AND CAREGIVERS.

- English
- Deutsch
- Nederlands
- Español
- Français
- Português
- Ελληνικά
- Русский
- العربية

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English

ANNA, YOUR VIRTUAL GUIDE

HEART FAILURE MATTERS:

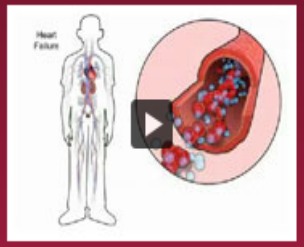
PRACTICAL INFORMATION FOR PATIENTS, FAMILIES AND CAREGIVERS

Living with Heart Failure

AN ANIMATED JOURNEY THROUGH HEART FAILURE

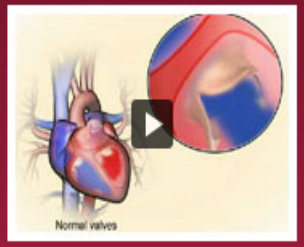
A series of 9 simple, captivating animations explaining heart failure and its treatment

These narrated animations explain how a healthy heart works, what happens to it in heart failure and how various treatments work to improve your health

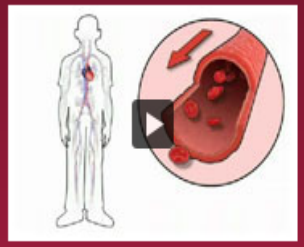


How heart failure causes fluid accumulation

How abnormal heart valves can cause heart failure



How vasodilators work in heart failure



How diuretics work in heart failure

USEFUL TOOLS

BACK TO TOP

- Symptoms and events diary
- Monitoring chart
- Warning signs
- Appointment record
- Medicine chart

Click to print these tools to help you monitor your heart failure

WARNING SIGNS

WARNING SIGNS

heartfailurematters.org

IT IS IMPORTANT TO MONITOR ALL YOUR SYMPTOMS ON A REGULAR BASIS.
This document is a quick reminder of symptoms that you should look out for and what you should do if they occur.

CALL FOR IMMEDIATE HELP IF YOU EXPERIENCE:

- **Persistent chest pain** that is not relieved by nitroglycerin
- **Severe and persistent shortness of breath**
- **Fainting**

INFORM YOUR DOCTOR OR NURSE AS SOON AS POSSIBLE IF YOU EXPERIENCE:

- **Increasing shortness of breath** and tolerating less and less activity
- **Consistently awakening short of breath**
- **Needing more pillows to sleep comfortably**
- **Rapid heart rate or worsening palpitations**

DISCUSS WITH YOUR DOCTOR OR NURSE:

- **Rapid weight gain** of more than 2 kilos (3 pounds) in three days
- **Progressive swelling or pain in the abdomen**
- **Increasing swelling of the legs or ankles**
- **Worsening dizziness**
- **Loss of appetite/nausea**
- **Increasing fatigue**
- **Worsening cough**

If you have any other symptoms that are causing you concern you should discuss them with your doctor or nurse.

IN CASE OF EMERGENCY, CALL: *enter your doctor or nurse's name*	
TELEPHONE NUMBER:	

Developed by the Heart Failure Association of the European Society of Cardiology

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PATIENT AND CAREGIVERS VIDEOS

In this section you can watch, listen or read interviews with other people with heart failure and their caregivers.

Access all the videos

Patient in exercise training

An LVAD as a bridge to transplantation

Living with an LVAD

Seeing other bypass patients exercising made him feel more positive

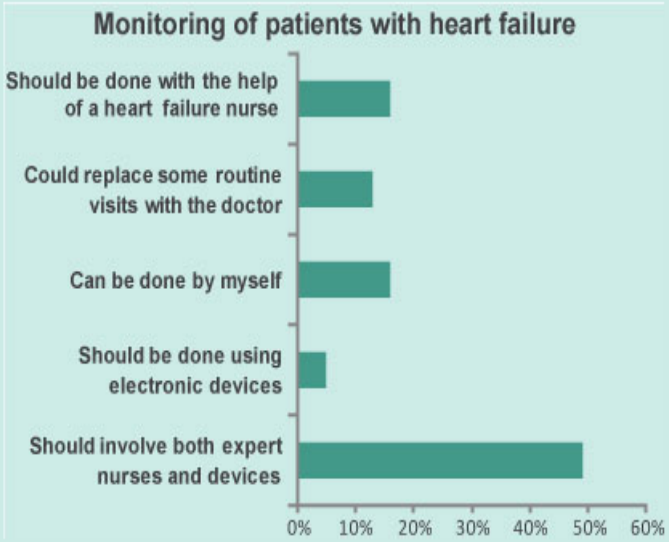
POLL

The most common other medical problems that occur in heart failure are:

- ○ lung disease
- ○ kidney disease
- ○ anemia
- ○ diabetes
- ○ depression

Vote

Previous poll results



BACK TO TOP

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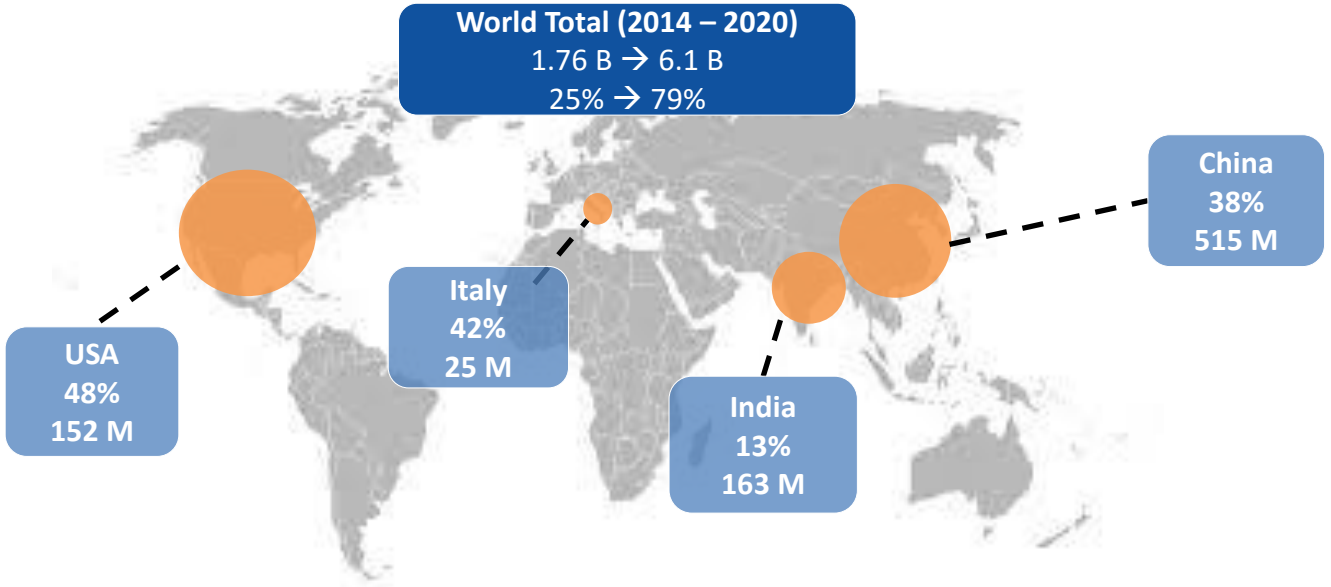
Next

Smartphone usage has and will continue to increase in the near future, particularly in developing countries

Smartphone penetration in target markets
(2014, % of total population)



Global smartphone trends

- Current statistics and trends
  - There are currently **1.76 B smartphone users worldwide**
  - **Two of every three** smartphones connections are made **from developing countries**
  - **Asia Pacific** accounts for the **highest number of smartphone ownership and sales**
- Future projections (by 2020)
  - **Smartphone penetration** is expected to i**ncrease to 6.1 B**
  - There will be **8X growth in smartphone traffic**
  - **Four of every five** smartphone connections will come **from the developing world**

APPs

Snap-n-Eat app automatically calculates nutritional info from picture of your plate

Researchers describe an app to automatically calculate the nutritional info from just a picture of your plate.

Satish Misra, MD | May 1, 2015

How Apple Watch's ability to measure blood oxygen saturation can be used in medicine

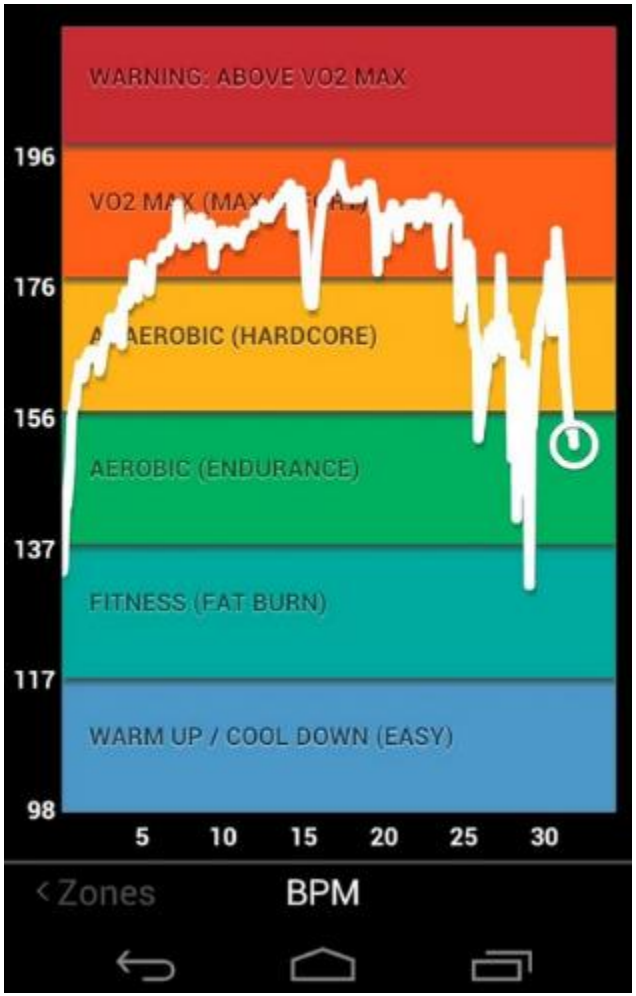
The Apple Watch was found to have the ability to measure blood oxygen saturation. Here's how it could be used in medicine.

Iltifat Husain, MD | April 30, 2015

Exercise

Fitbit

Digifit iCardio



Heart Failure Zone

Heart Failure Zones are used for management of congestive heart failure conditions
Every day patient should monitor himself for Warning Signs and Symptoms

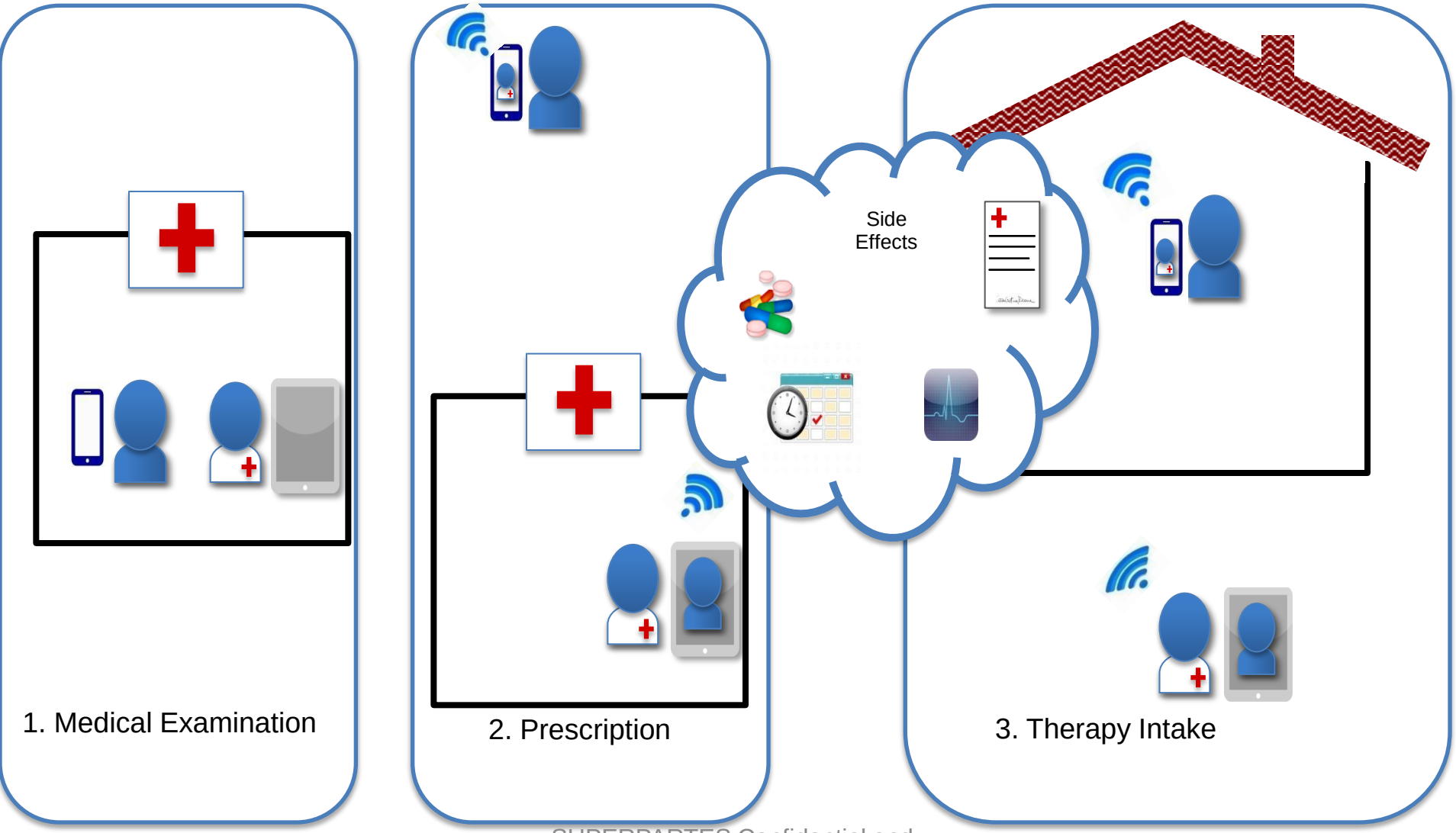
Green Zone Means that patient met his daily health Goal

Yellow Zone Means Caution. Patient symptoms may indicate that he needs an adjustment of his medications. He should call his physician, nurse coordinator, or home health nurse

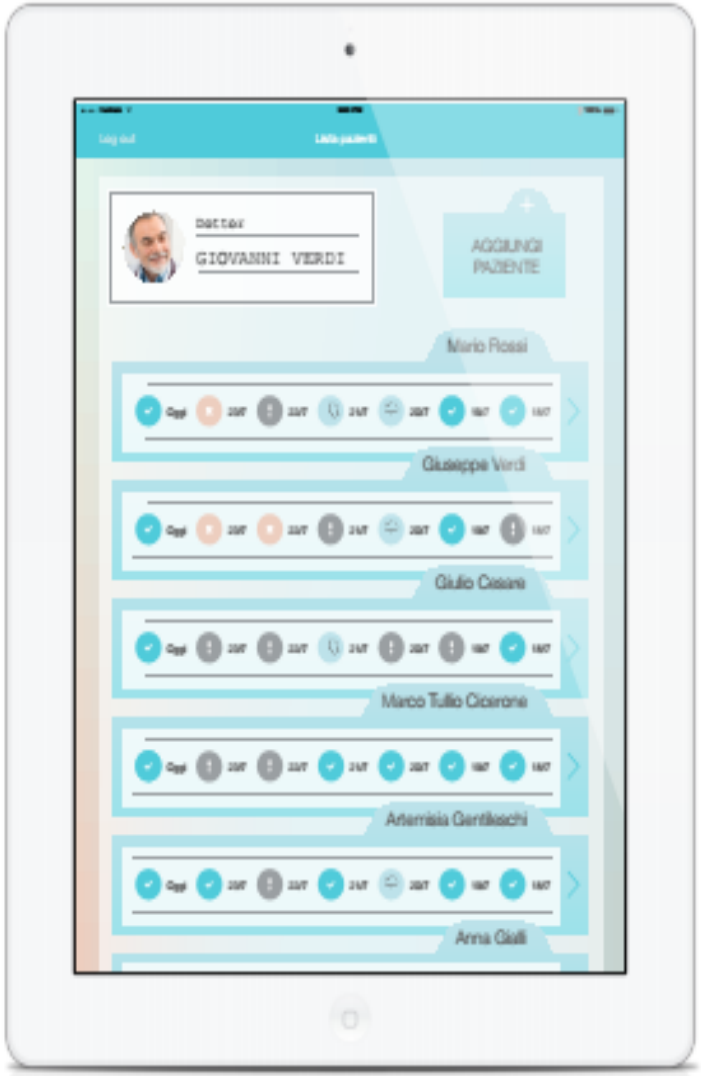
Red Zone Means that patient needs to be evaluated by a physician right away

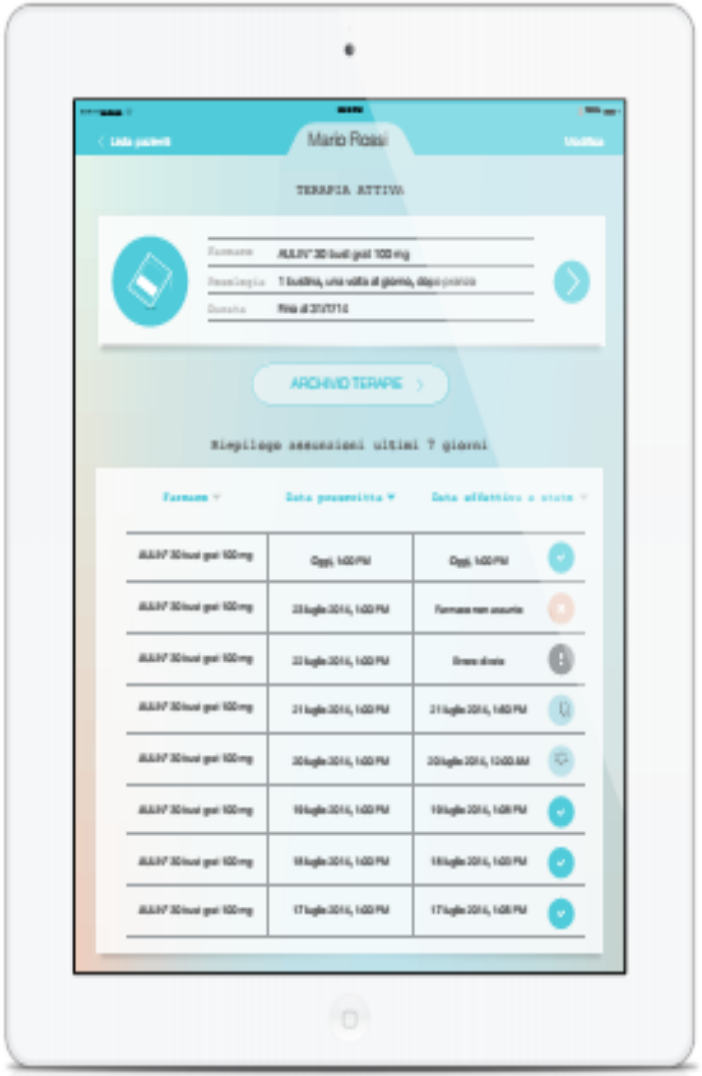
€ 1,79

TAKES2CARE Scenario



TAKES2CARE


Dottor
GIOVANNI VERDI
AGGIUNGI PAZIENTE
Mario Rossi
Giuseppe Verdi
Giulio Cesare
Marco Tullio Cicerone
Artemisia Gentileschi
Anna Gialli


Mario Rossi
TERAPIA ATTIVA
ARCHIVIO TERAPIE
Riepilogo assunzioni ultimi 7 giorni


TAKES2CARE

TAKES2CARE

TAKES2CARE

TAKES2CARE Scenario

DRUG-INTAKE Symbolism

- Correct intake (es. ± 30 min)
- Early intake
- Late intake
- Missing intake
- No Internet Connection (data temporarily unavailable)

TAKES2CARE Scenario

GAMIFICATION

Adherence ≥ 90%

Adherence > 70% and < 90%

Adherence > 50% and < 70%

Adherence < 50%

TAKES2CARE Scenario

COMPETITION AMONG PATIENTS

Adherence Top Scores

1.	Vizon	98%
2.	NS	96%
3.	Sunnytree	95%
4.	1control	90%
5.	Matteo 1960	87%
6.	YOU	84%
7.	andru	81%
8.	Ralex014.	77%
9.	Tewk51	68%
10.	Webbas	65%

QUAL' E' IL PROBLEMA

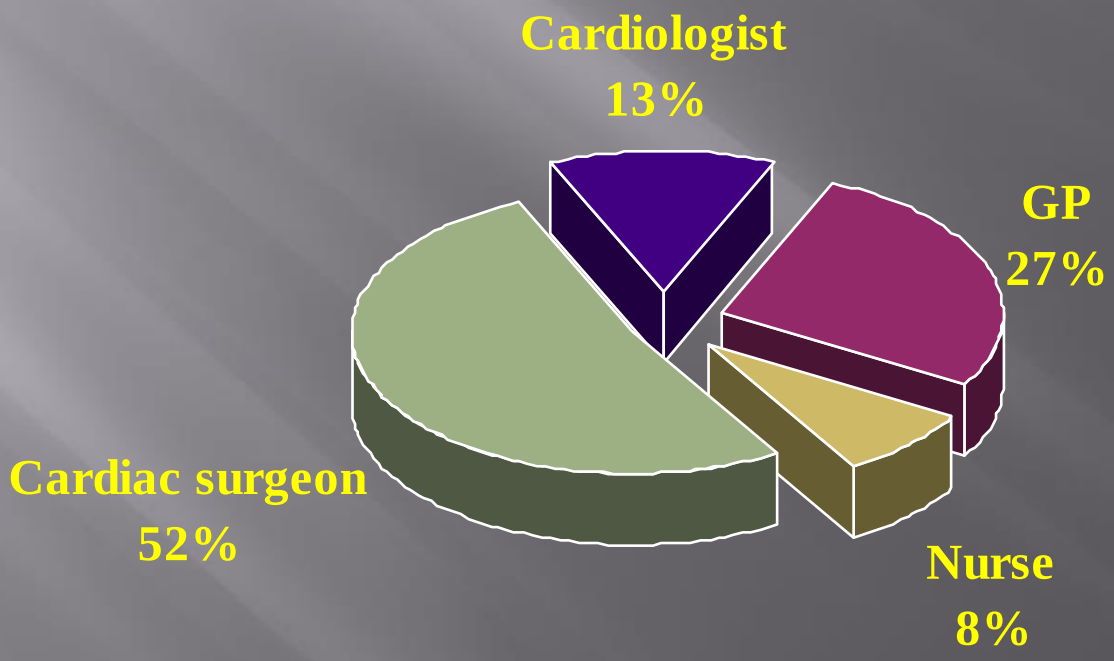
Frequenza di arruolamento

	Eleggibile CR	Riferito CR	Riferito CR	Arruolato CR	Arruolato CR
	N	N	%	N	%
UOMINI	118	52	44.1	36	69.2
DONNE	84	35	41.7	13	37.1

Halley et al. , Rehabilitation Nursing, 29,4,2004

Referral Source

Div di Cardiologia Riabilitativa IRCCS San Raffaele 2014




Forse è solo questione di attenzione !!!