Insuficiencia cardíaca

Definición

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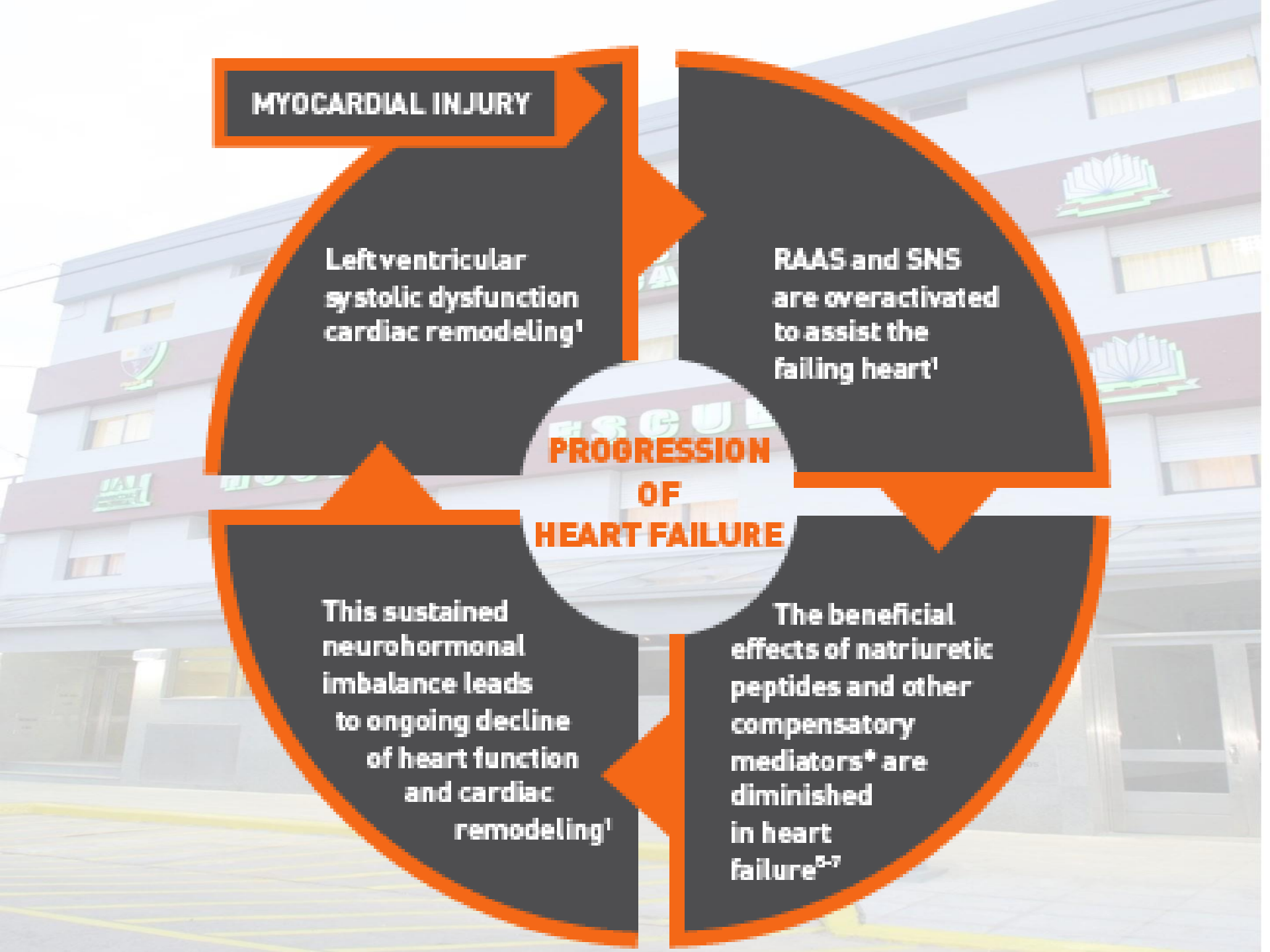
DEPARTAMENTO DE CARDIOLOGIA

CATEDRA DE FISIOLOGÍA

Universidad Abierta Interamericana


MYOCARDIAL INJURY
Left ventricular systolic dysfunction cardiac remodeling[1]
RAAS and SNS are overactivated to assist the failing heart[1]
PROGRESSION OF HEART FAILURE
The beneficial effects of natriuretic peptides and other compensatory mediators* are diminished in heart failure[5-7]
This sustained neurohormonal imbalance leads to ongoing decline of heart function and cardiac remodeling[1]

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Definición de icc
Epidemiología de la icc
Diagnostico
Etapas de la enfermedad

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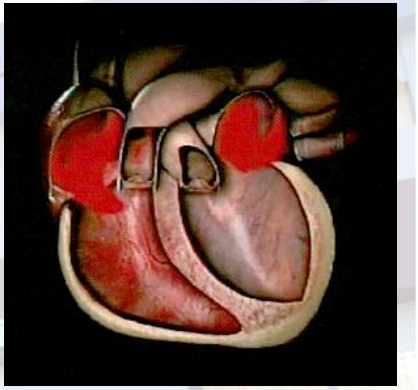

"The situation when the heart is incapable of maintaining a cardiac output adequate to accommodate metabolic requirements and the venous return."

E. Braunwald

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Definition of Heart Failure

Classification	Ejection Fraction	Description
I. Heart Failure with Reduced Ejection Fraction (HF*r*EF)	≤40%	Also referred to as systolic HF. Randomized clinical trials have mainly enrolled patients with HF*r*EF and it is only in these patients that efficacious therapies have been demonstrated to date.
II. Heart Failure with Preserved Ejection Fraction (HF*p*EF)	≥50%	Also referred to as diastolic HF. Several different criteria have been used to further define HF*p*EF. The diagnosis of HF*p*EF is challenging because it is largely one of excluding other potential noncardiac causes of symptoms suggestive of HF. To date, efficacious therapies have not been identified.
a. HF*p*EF, Borderline	41% to 49%	These patients fall into a borderline or intermediate group. Their characteristics, treatment patterns, and outcomes appear similar to those of patient with HF*p*EF.
b. HF*p*EF, Improved	>40%	It has been recognized that a subset of patients with HF*p*EF previously had HF*r*EF. These patients with improvement or recovery in EF may be clinically distinct from those with persistently preserved or reduced EF. Further research is needed to better characterize these patients.

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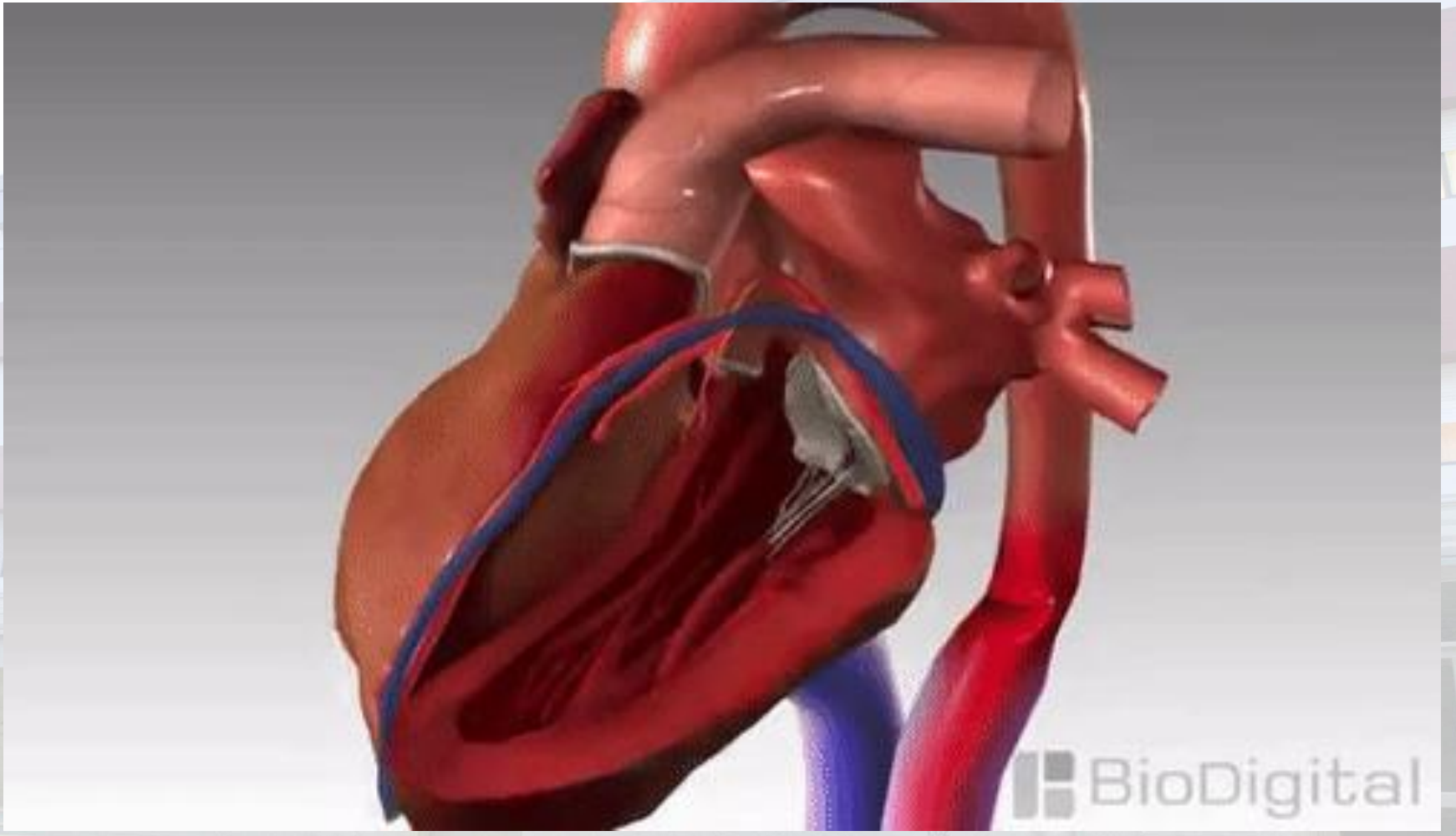
BioDigital

2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure

DOI: http://dx.doi.org/10.1093/eurheartj/ehw1282129-2200 First published online: 20 May 2016

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HF is a

clinical syndrome

characterized by typical symptoms (e.g. breathlessness, ankle swelling and fatigue) that may be accompanied by signs (e.g. elevated jugular venous pressure, pulmonary crackles and peripheral oedema) caused by a structural and/or

functional cardiac abnormality, resulting in a reduced cardiac output and/or elevated intracardiac pressures at rest or during stress.

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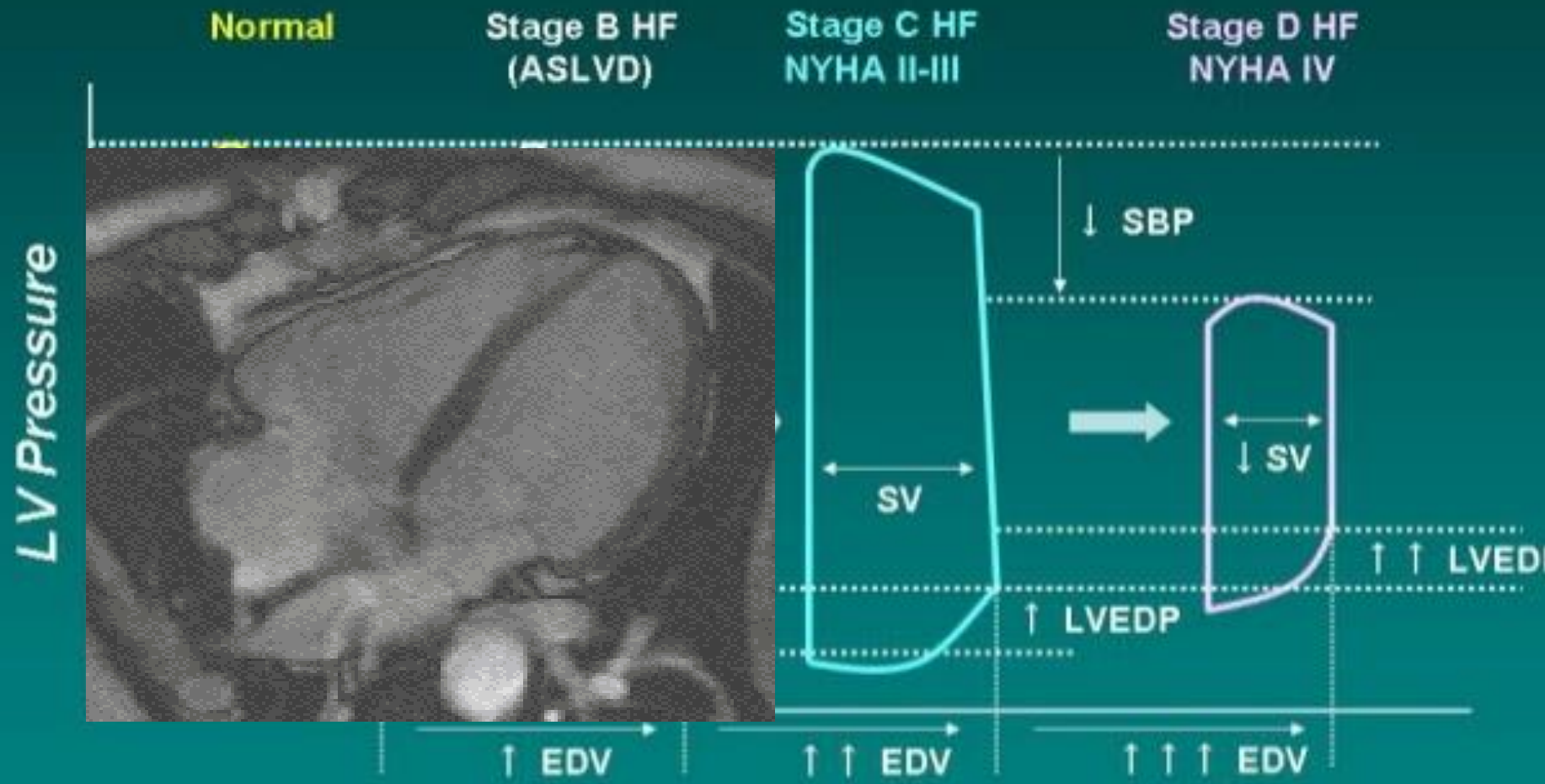
Hemodynamic Derangements in HFrEF: A Progression



Borlaug BA, unpublished

Type of HF		HFrEF	HFmrEF	HFpEF
CRITERIA	1	Symptoms ± Signs[1]	Symptoms ± Signs[1]	Symptoms ± Signs[1]
	2	LVEF <40%	LVEF 40–49%	LVEF ≥50%
	3	–	1. Elevated levels of natriuretic peptides[b]; 2. At least one additional criterion: a. relevant structural heart disease (LVH and/or LAE), b. diastolic dysfunction (for details see Section 4.3.2).	1. Elevated levels of natriuretic peptides[b]; 2. At least one additional criterion: a. relevant structural heart disease (LVH and/or LAE), b. diastolic dysfunction (for details see Section 4.3.2).

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Insuficiencia cardiaca en cifras

La insuficiencia cardiaca impacta a más de **60 millones** de personas en todo el mundo.[8]

La insuficiencia cardiaca provoca **2 a 3 veces** más muertes que los cánceres avanzados como el cáncer de intestino o el de mama.[9]

1 de cada 5 personas mayores de 40 años padecerá insuficiencia cardiaca.[10,11]

PREVALENCIA
INCIDENCIA
REINTERNACIONES
MORTALIDAD

PREVALENCIA

Prevalencia

- Informa que proporción de la población padece insuficiencia cardíaca
- Generalmente son estudios de tipo Cross section que pueden subestimar la realidad

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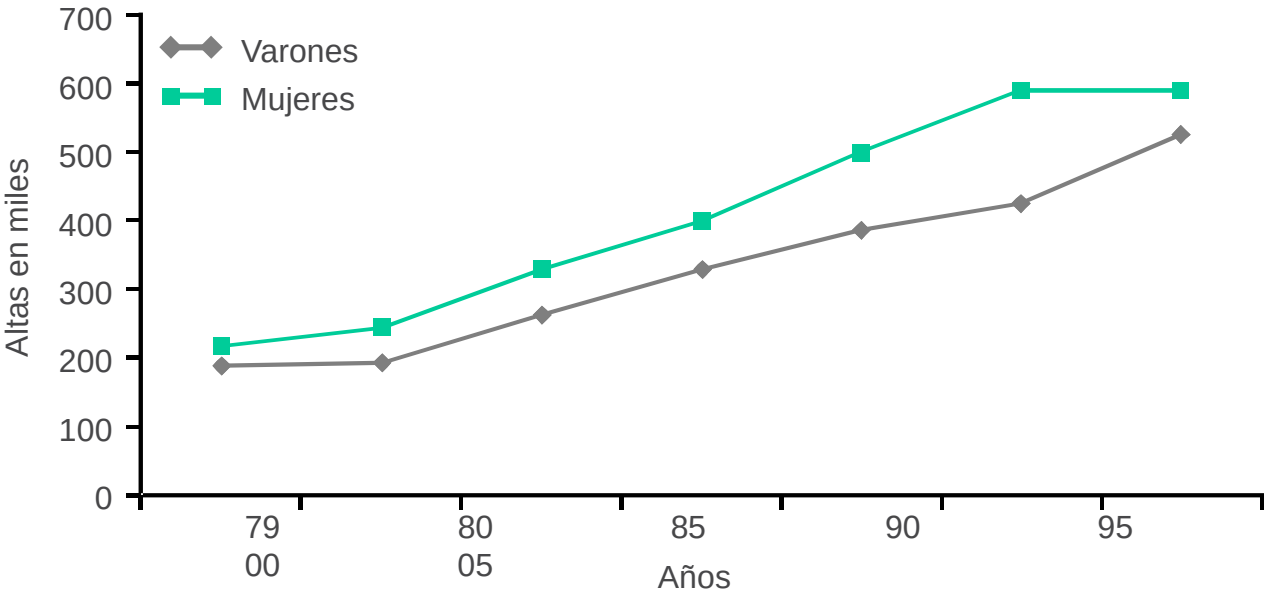
La prevalencia de la IC está en aumento

Altas hospitalarias por IC por sexo (EE. UU.: 1979–2006)*



*Las altas hospitalarias incluyen personas dadas de alta vivas, muertas y con estado desconocido
IC: insuficiencia cardíaca; EE. UU.: Estados Unidos de América

Lloyd-Jones et al. Circulation 2010;121:e46–e215

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Prevalencia de insuficiencia cardíaca En USA

Table 1.3 Projections of crude cardiovascular (CVD) prevalence (%), 2010–2030 in the USA. (From reference [11].)

Year	All CVD[a]	Hypertension	CHD	HF	Stroke
2010	36.9	33.9	8.0	2.8	3.2
2015	37.8	34.8	8.3	3.0	3.4
2020	38.7	35.7	8.6	3.1	3.6
2025	39.7	36.5	8.9	3.3	3.8
2030	40.5	37.3	9.3	3.5	4.0
% Change	9.9	9.9	16.6	25.0	24.9

Abbreviations: CVD indicates cardiovascular disease; CHD, coronary heart disease; HF, heart failure.
a. This category includes hypertension, CHD, HF, and stroke.

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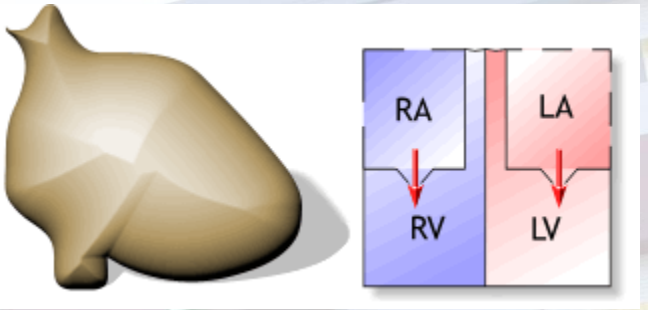

8/1000 entre 50-59 años

66/1000 entre 80-89 años

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From: **Heart Failure**

JCHF. 2013;1(1):1-20. doi:10.1016/j.jchf.2012.10.002

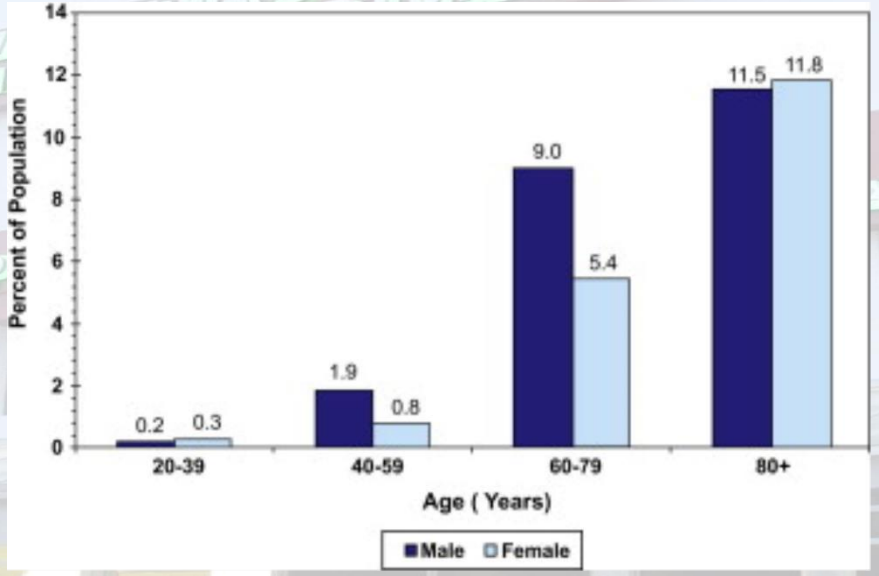
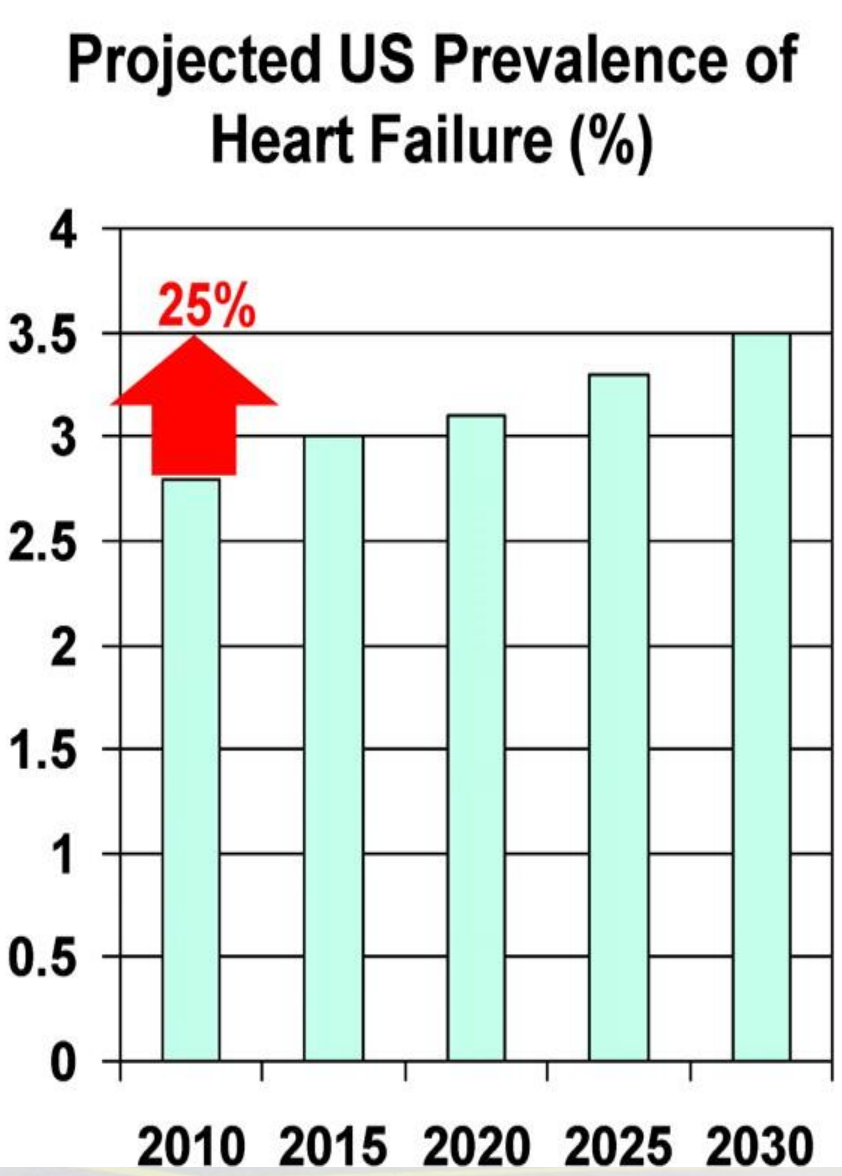
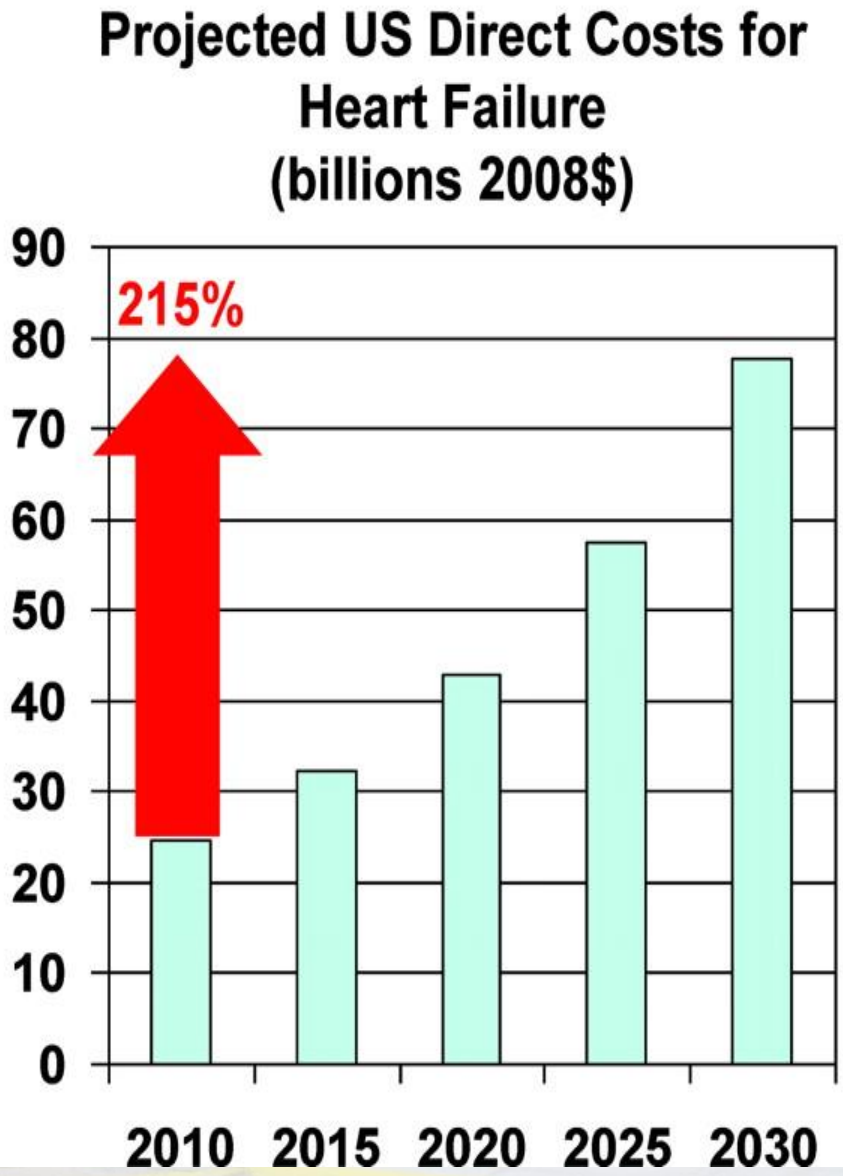


Figure Legend:

Prevalence of Heart Failure, by Sex and Age (National Health and Nutrition Examination Survey, 2005–2008)

Projected US Heart Failure Prevalence and Direct Cost





INCIDENCIA

Incidencia

- **Número de casos nuevos de insuficiencia cardíaca en un determinado período , generalmente se toma un año**
- **0.14% mujer por año**
- **0.23% en hombre por año**
- **Llega al 3% en pacientes entre 85-94 años**

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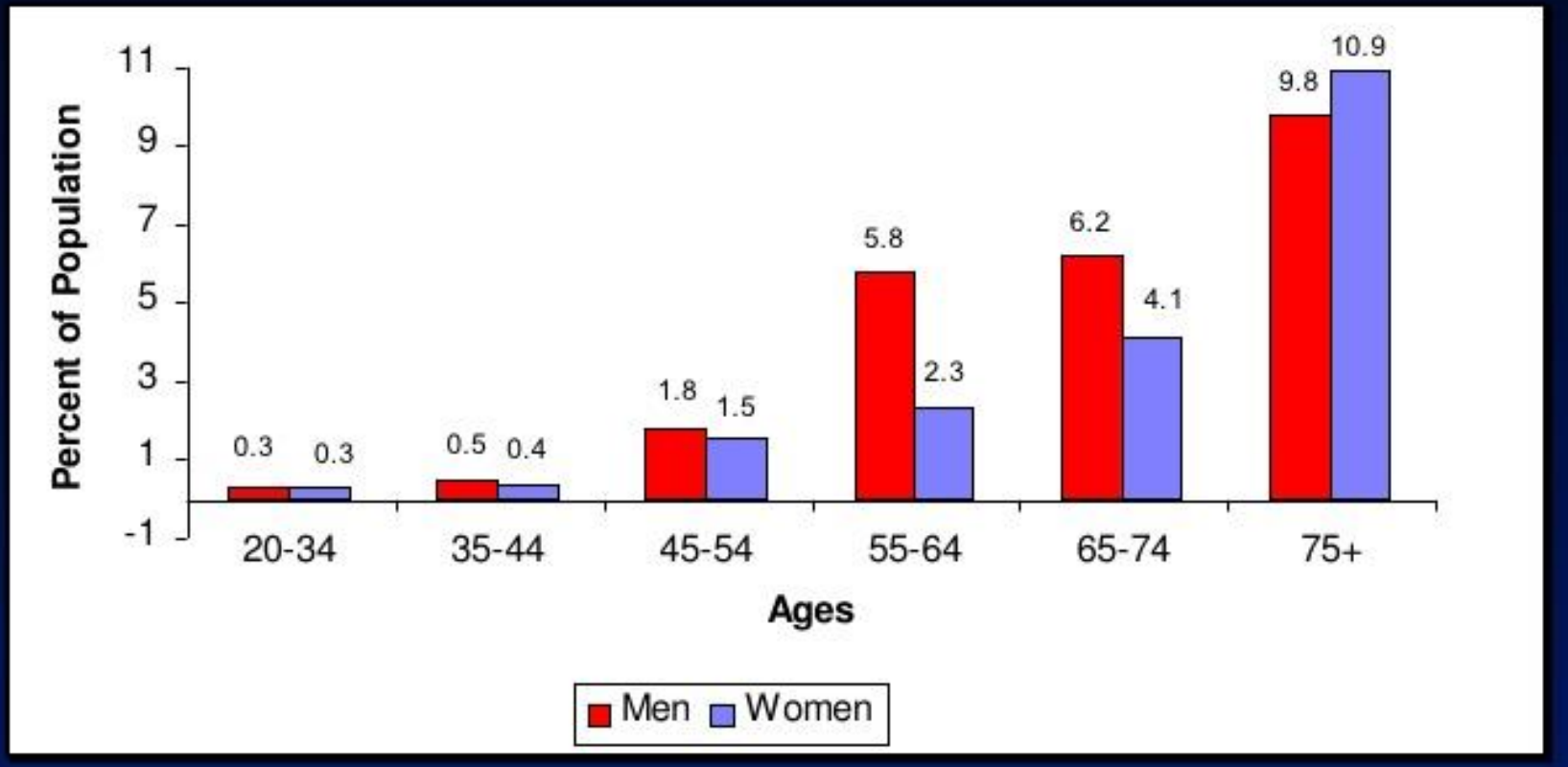
Incidencia de IC por Edad y Sexo



Fuente: CDC/NCHS and NHLBI. AHA Stats 2006

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Prevalence and Incidence of Heart Failure

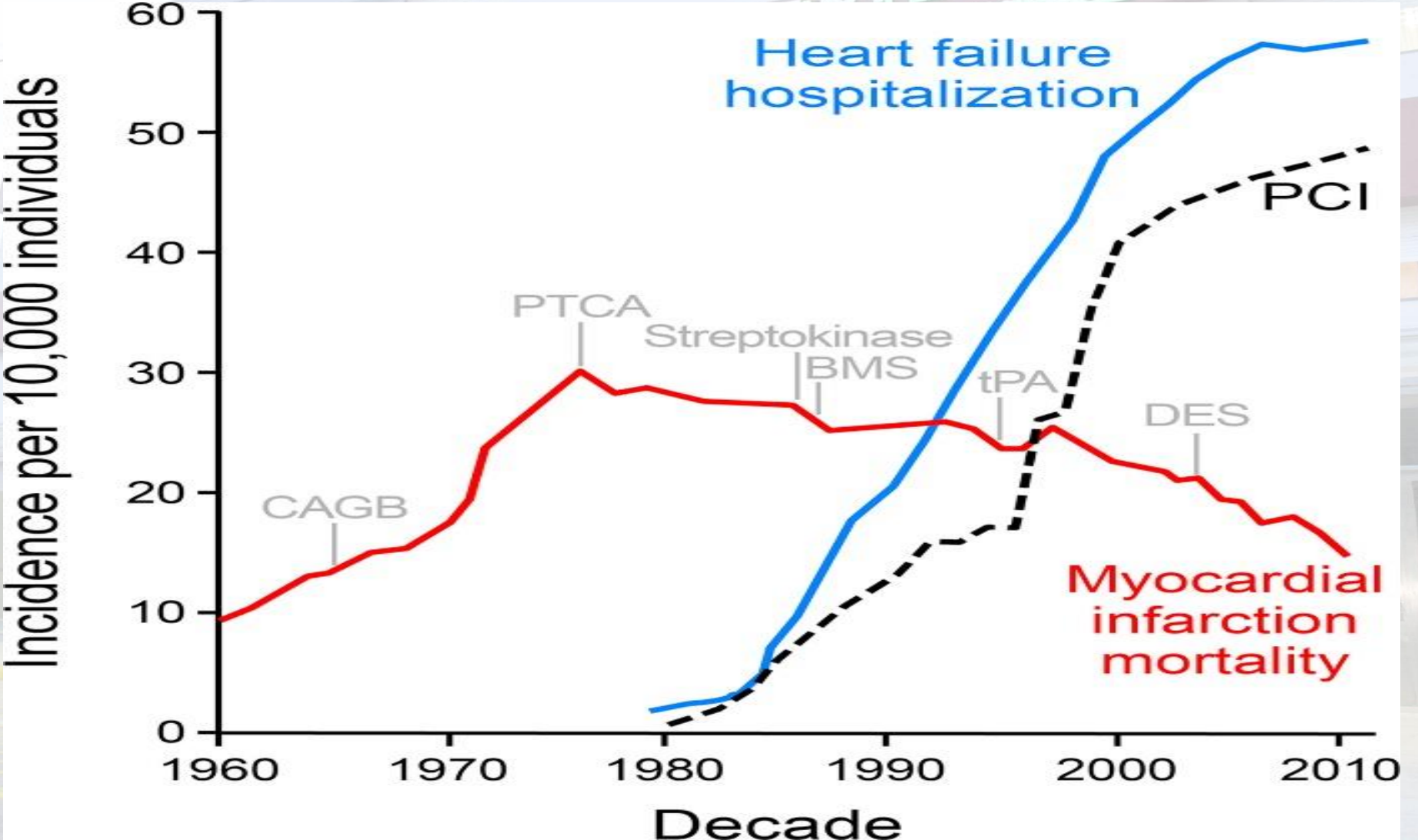
Prevalence : 22 millions HF pts in the world
Incidence : 2 millions new cases diagnosed per year

	Prevalence	Incidence	Mortality
USA	**4.9 Millions**	**500 000**	**250 000**
Europe	**6.6 Millions**	**580 000**	**300 000**

Second cause of mortality in the world

World Health Statistics, World Health Organization, 2005.
American Heart Association, 2006 Heart and Stroke Statistical Update.

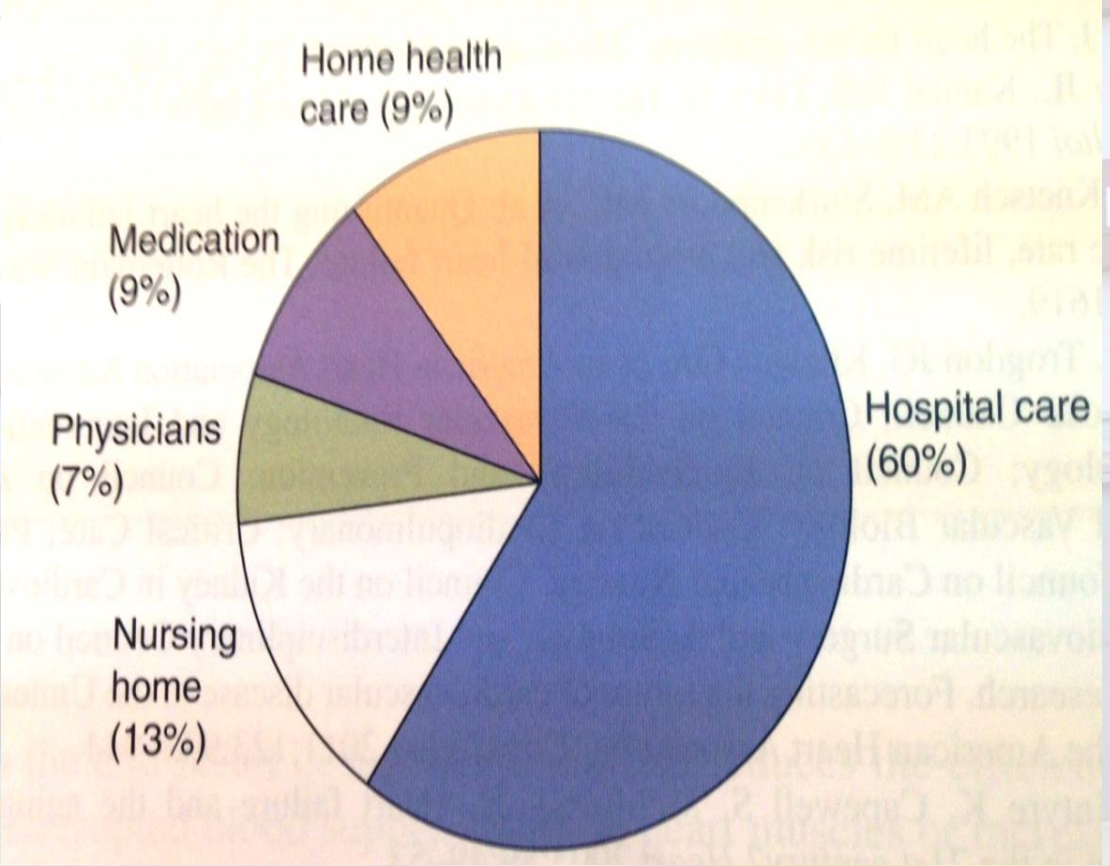
Aumento de incidencia y prevalencia de icc en los últimos 50 años



Impacto en Salud Pública

- 250,000 pacientes mueren al año como consecuencia de IC.
  - Mortalidad a 5 años: 50%
- El costo annual por IC en los EU se estima entre 20 - 40 billones.
- Mortalidad 51,546 / yr

COSTOS ASISTENCIA



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CHF - GLOBAL MARKET SIZING

Fig 6

Global CHF Drugs Market

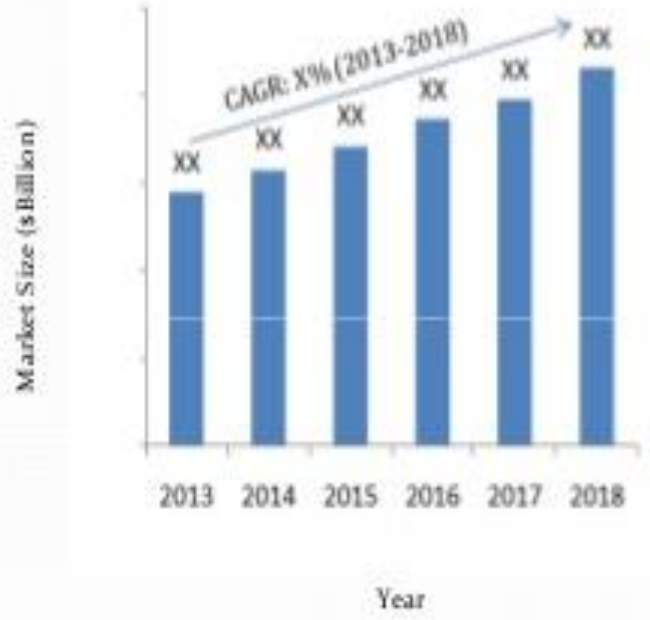
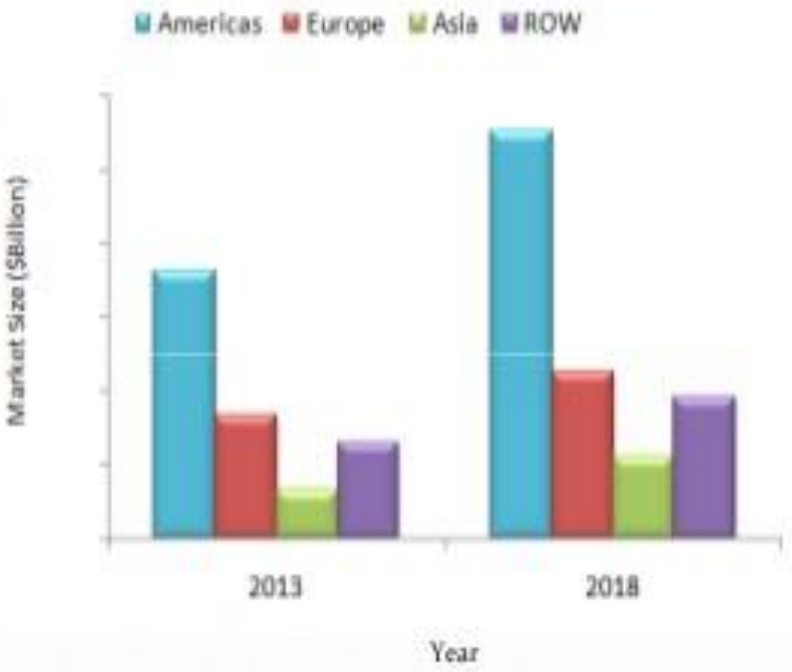


Fig 7

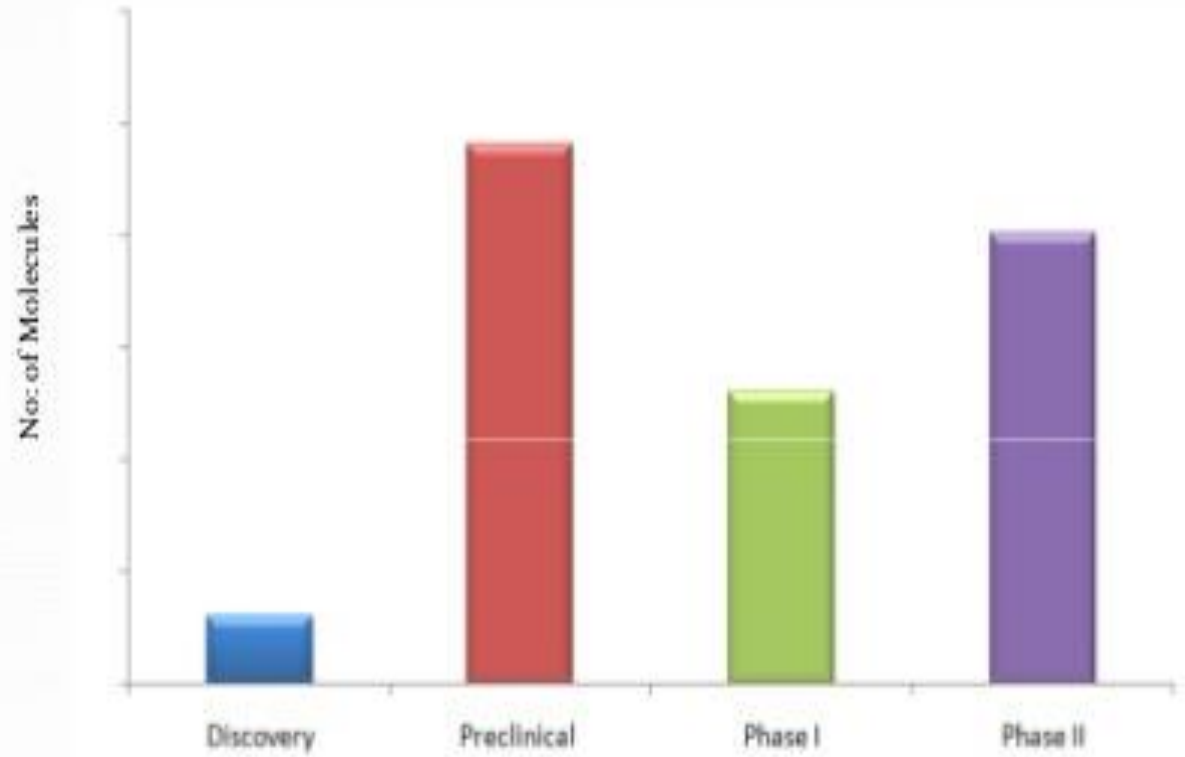
Global CHF Drugs Market by Region



- The global CHF market is estimated to be $XX billion in 2013 and is expected to grow at a CAGR of XX% from 2013 to 2018 to reach $XX billion by 2018
- The market growth is attributed to technological advancements, which led to emergence of novel therapeutics, expansion in number of heart centres, increasing incidence of cardiovascular diseases, alteration in lifestyle and high unmet needs

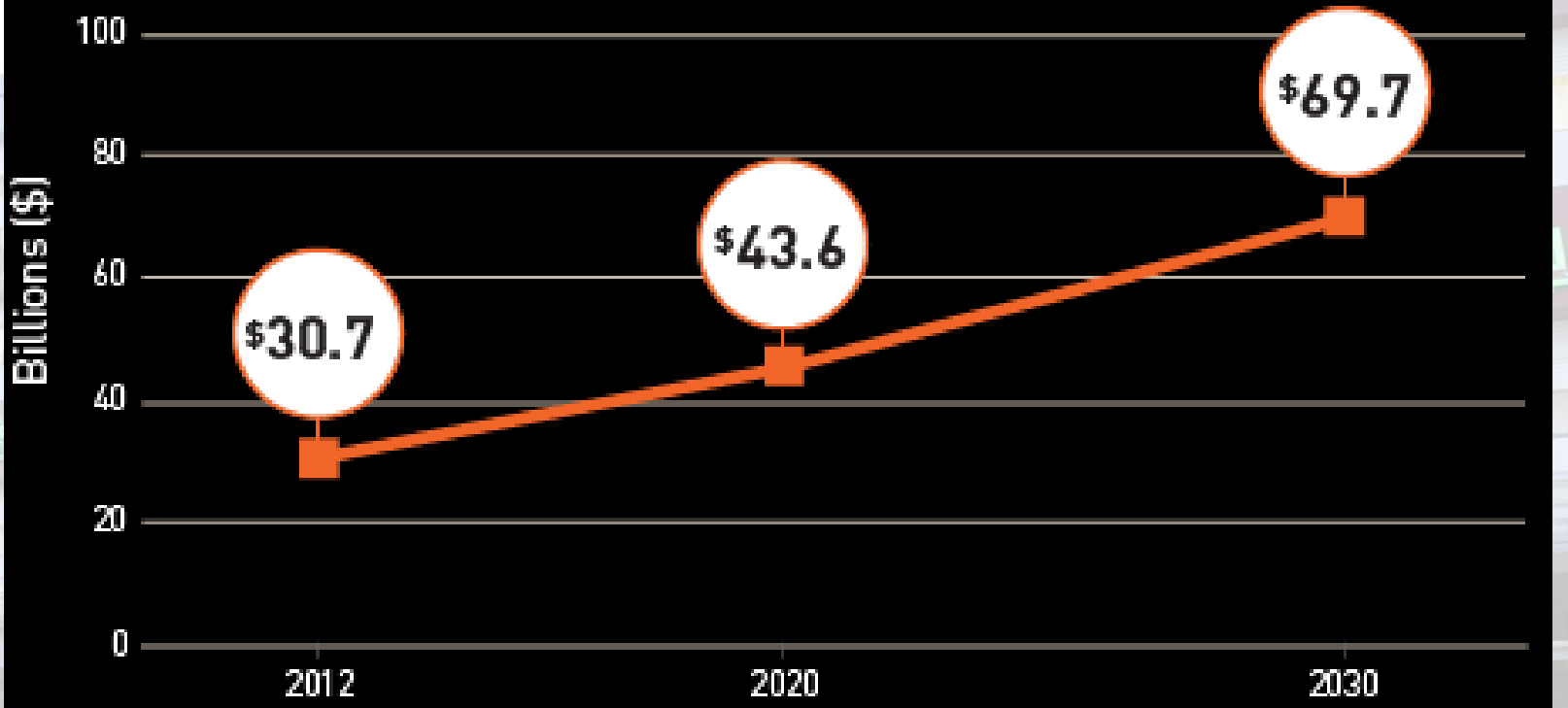
CHF - PIPELINE BY DEVELOPMENT STAGE

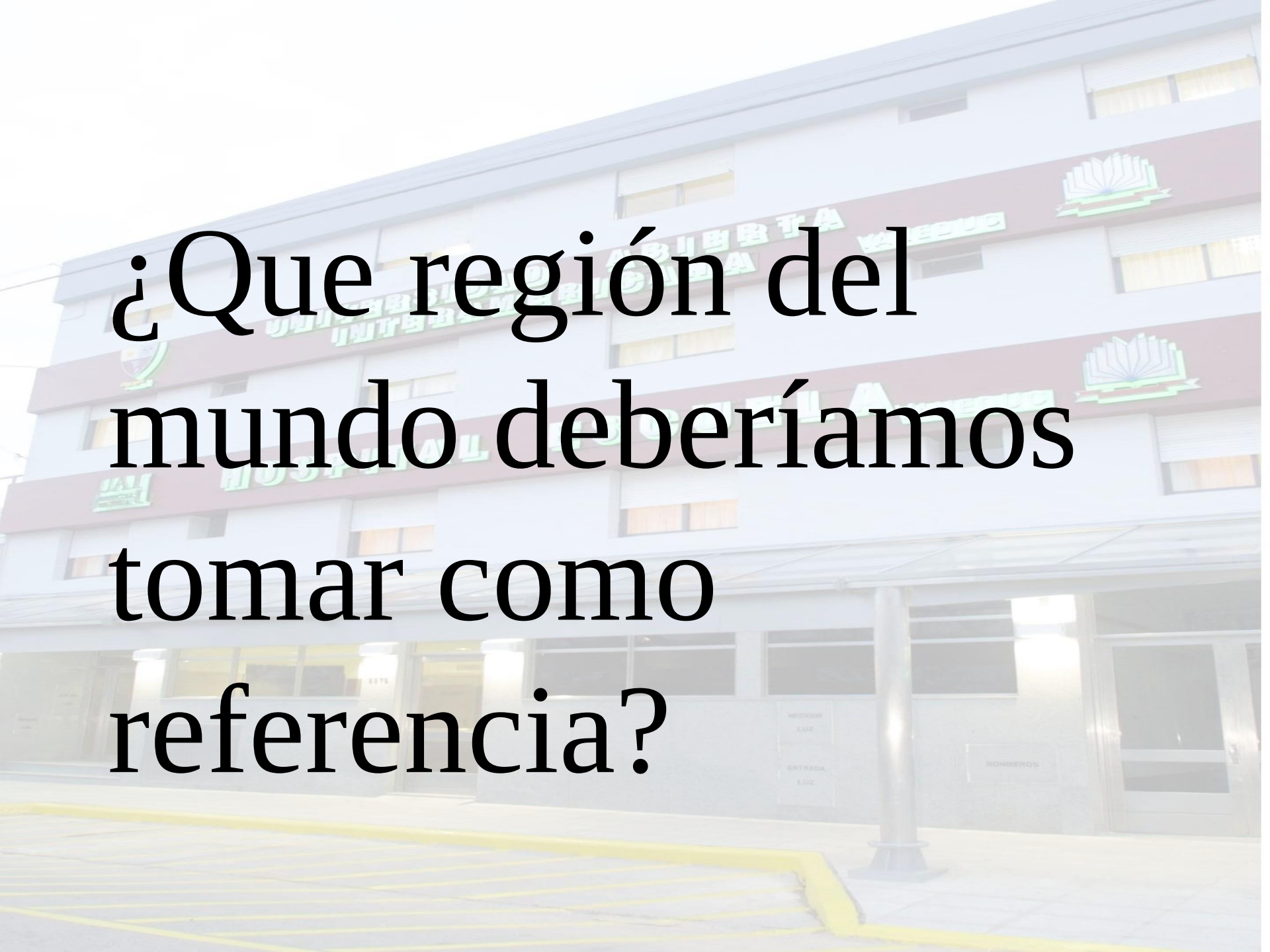
Fig 9



- Pipeline analysis reveals that there are XX molecules in various stages of pipeline (focused only on Discovery, Pre-clinical, Phase I & Phase II candidates)
- The preclinical stage commanded the largest share with around XX molecules, followed by phase II with around XX molecules

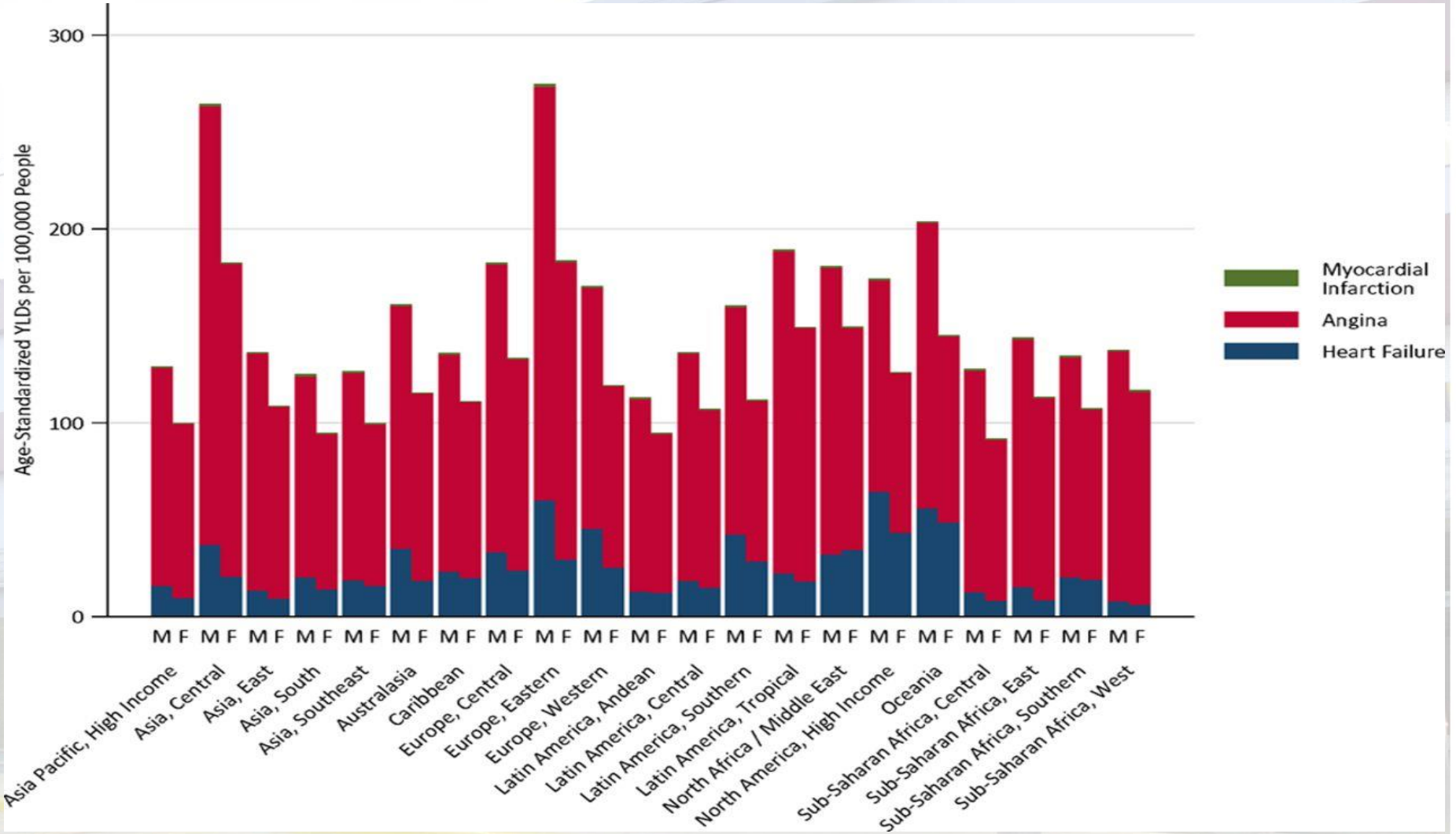
By 2030, total overall costs* are expected to more than double to nearly $70 billion in the United States[12]





¿Que región del mundo deberíamos tomar como referencia?

Contributions of AMI, angina, and ischemic heart failure to years lived with ischemic heart disease disability in 2010, by sex, in 21 Global Burden of Disease Study regions.



Andrew E. Moran et al. Circulation. 2014;129:1493-1501

American Heart Association.

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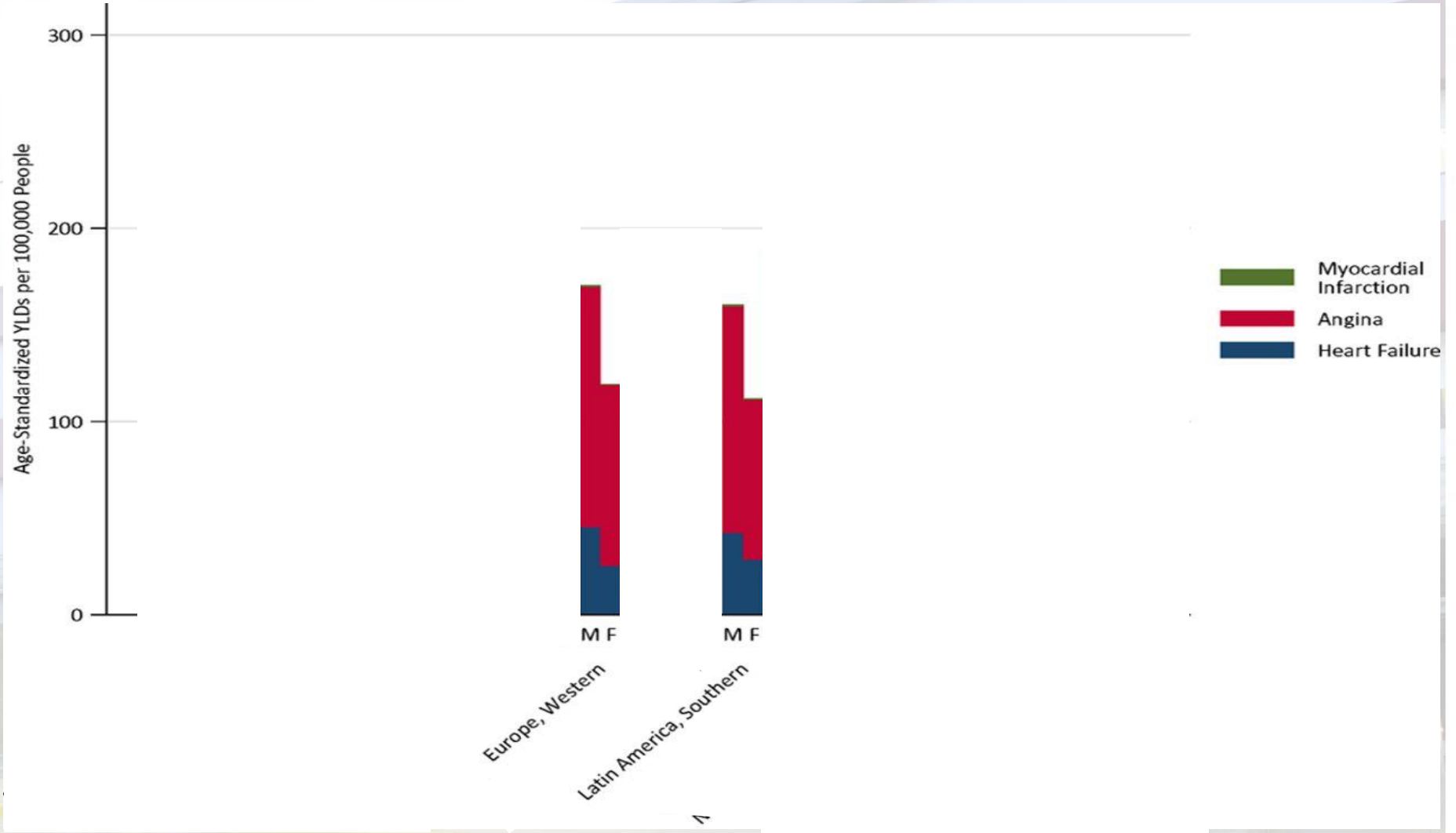

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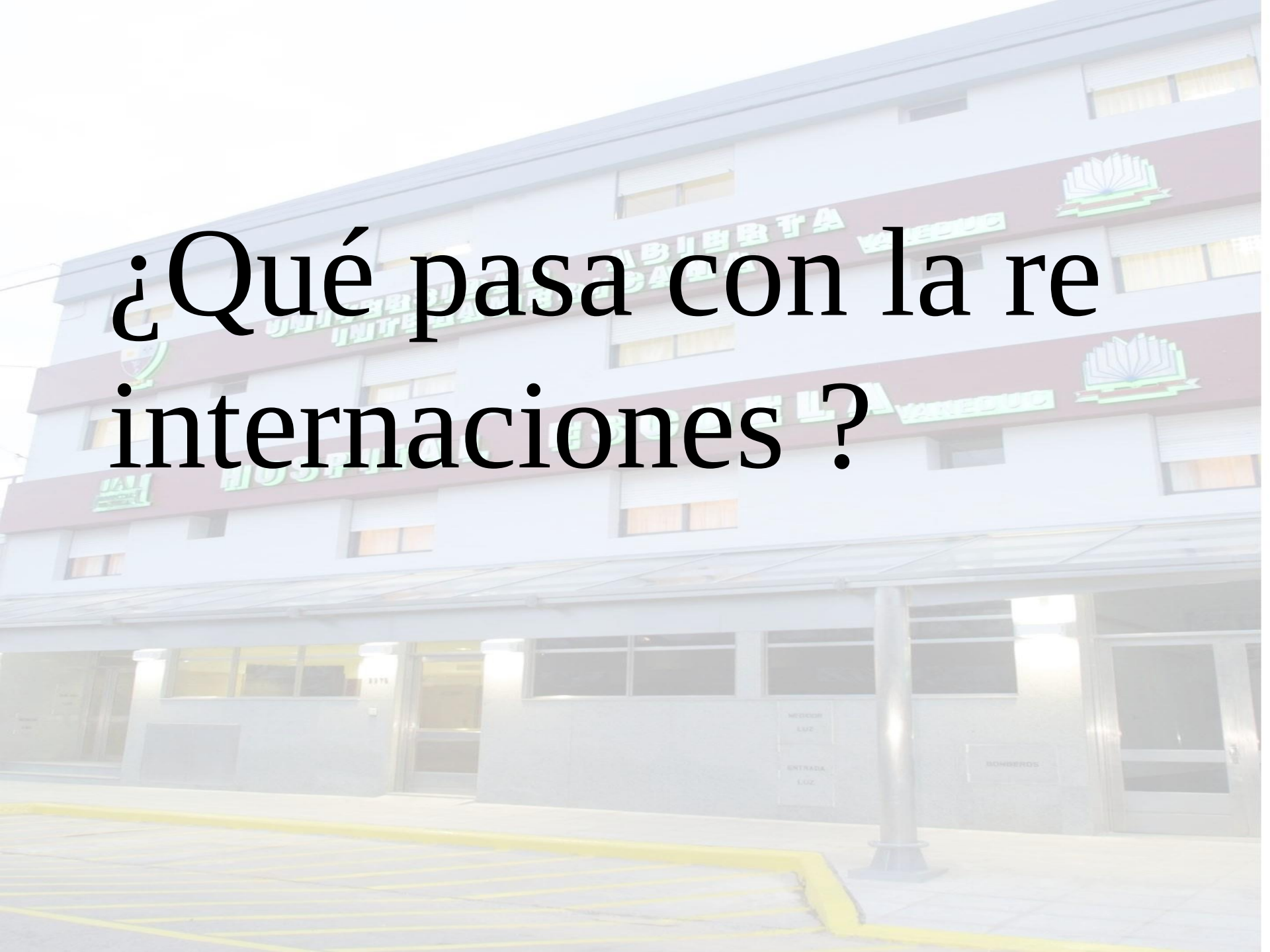
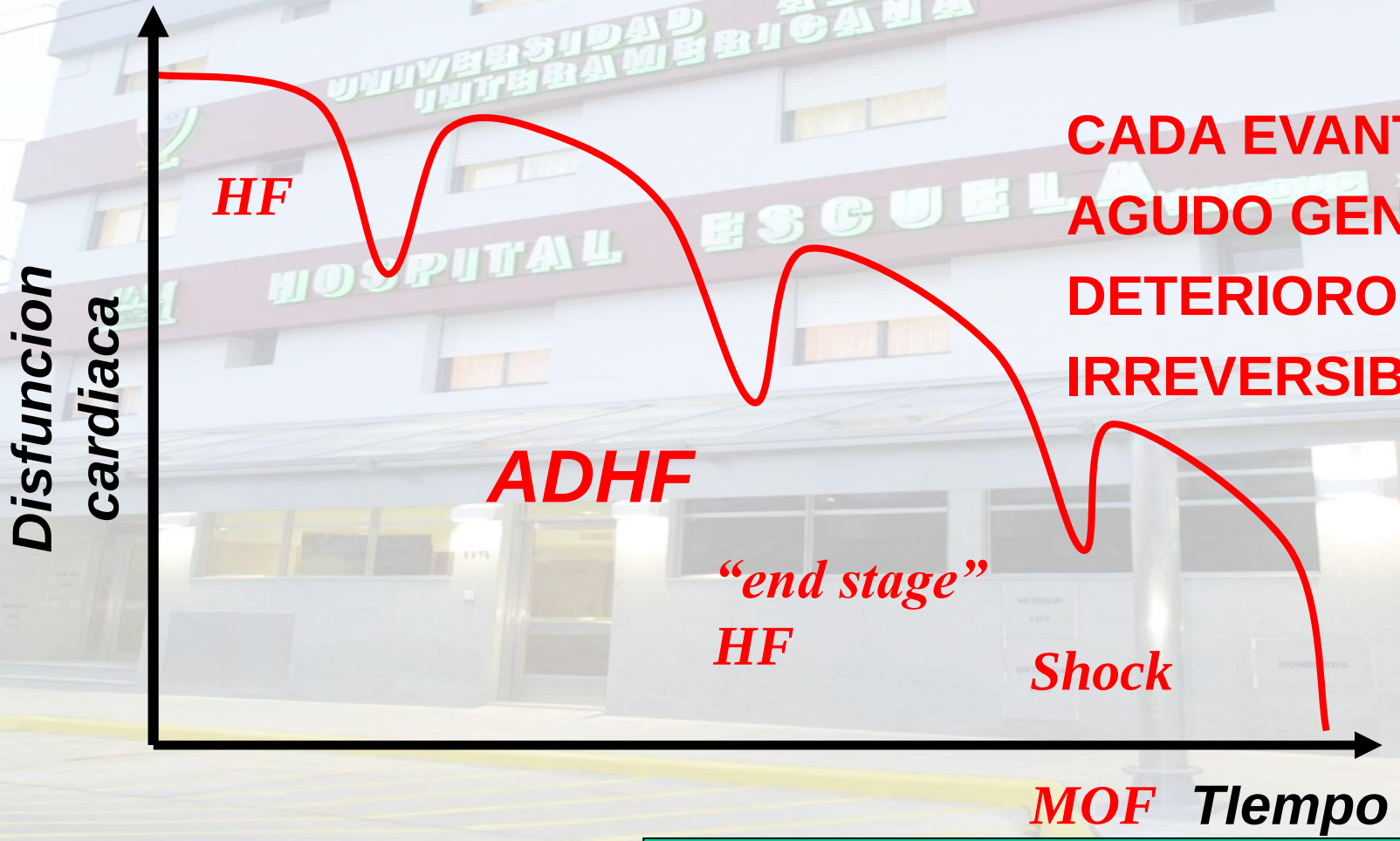


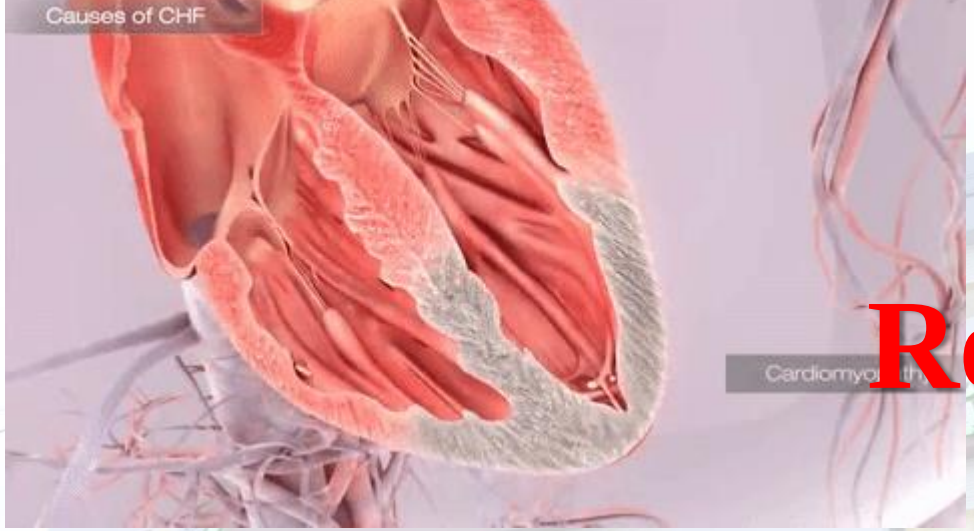
¿Qué pasa con la re internaciones ?

EVOLUCIÓN DE LA ICC AVANZADA



CADA EVANTO AGUDO GENERA UN DETERIORO IRREVERSIBLE .

da Gheorghiades : HF 2007



Re hospitalización

- 2% de las causas de admisión en hospitales generales
- Primera causa de internación en pacientes mayores de 65 años
- 40 % de los pacientes re hospitalizados han muerto 12 meses después

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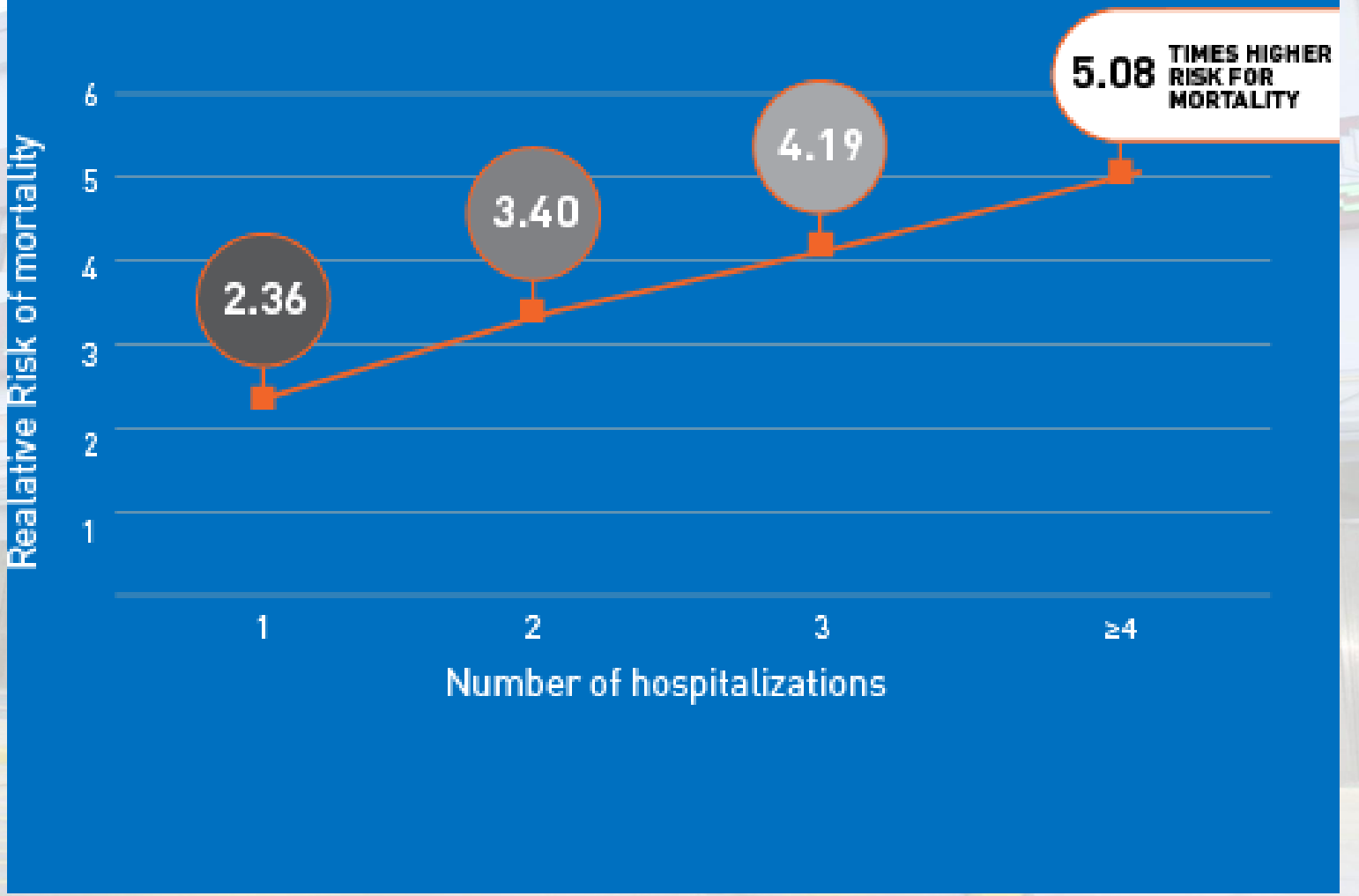
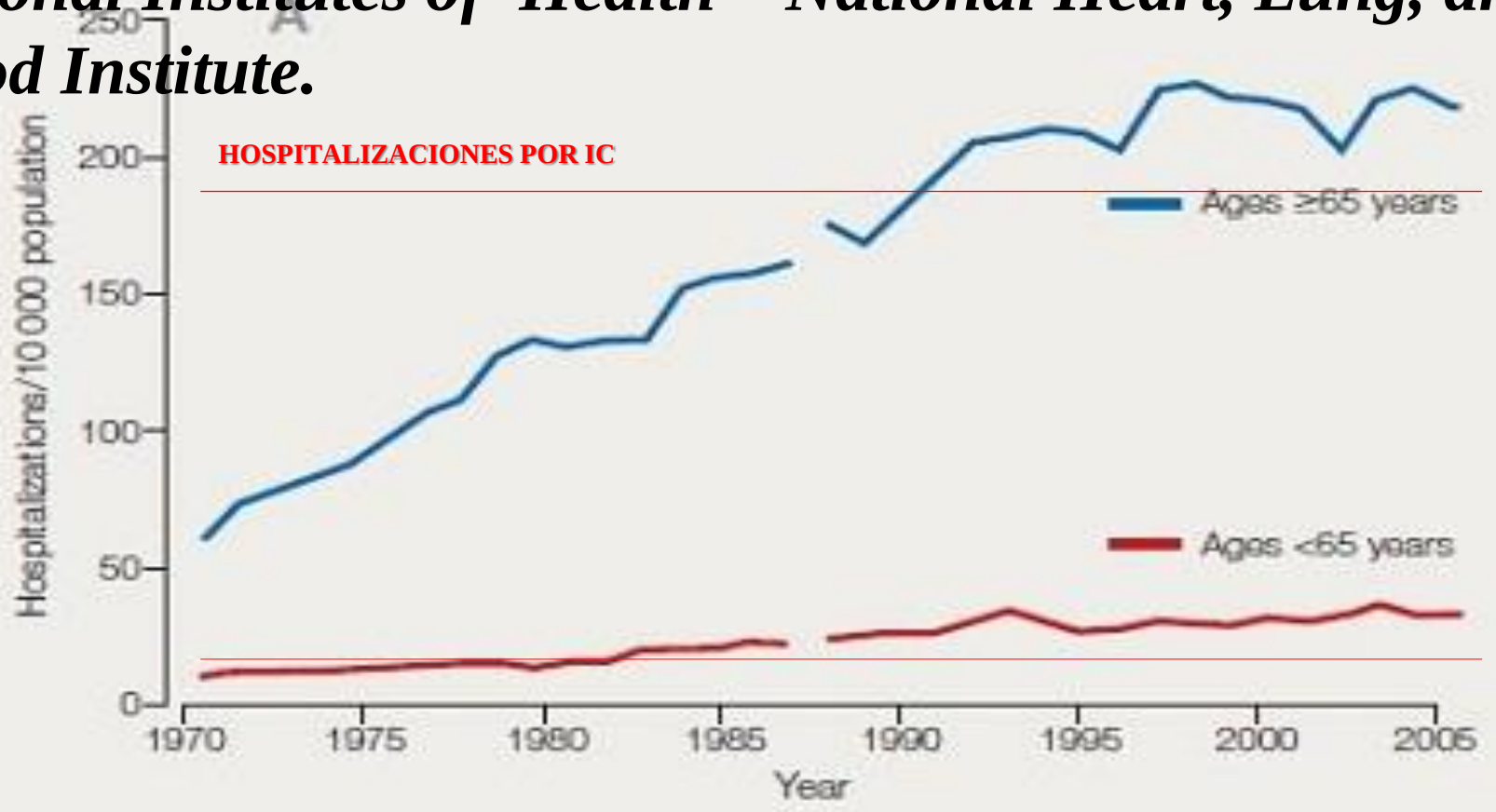
Relative risk of mortality with repeat hospitalization vs without hospitalization[4]



National Institutes of Health—National Heart, Lung, and Blood Institute. Morbidity and Mortality: 2009 Chart Book on Cardiovascular, Lung and Blood Diseases. © 2009, National Institutes of Health—National Heart, Lung, and Blood Institute.



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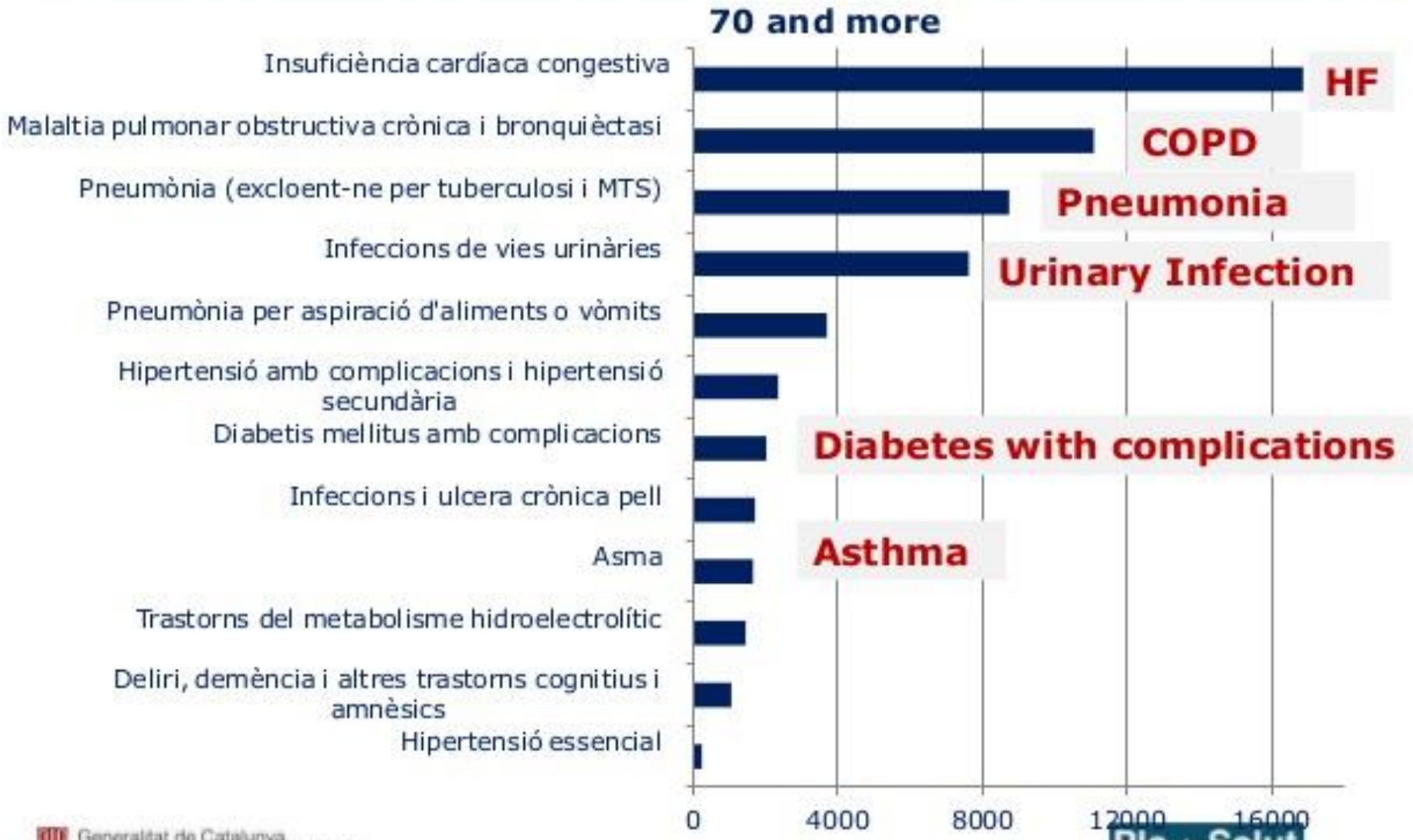
Hospital admission by diagnostic groups > 70 y.



Generalitat de Catalunya
Programa de prevenció i atenció a la cronicitat

Pla de Salut 2011-2015

Source: DGPRS. Dep Salut, 2013

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ACUTE HEART FAILURE (AHF) MORTALITY RATES

~4%

IN-HOSPITAL MORTALITY OF PATIENTS WITH AHF[2]

10%

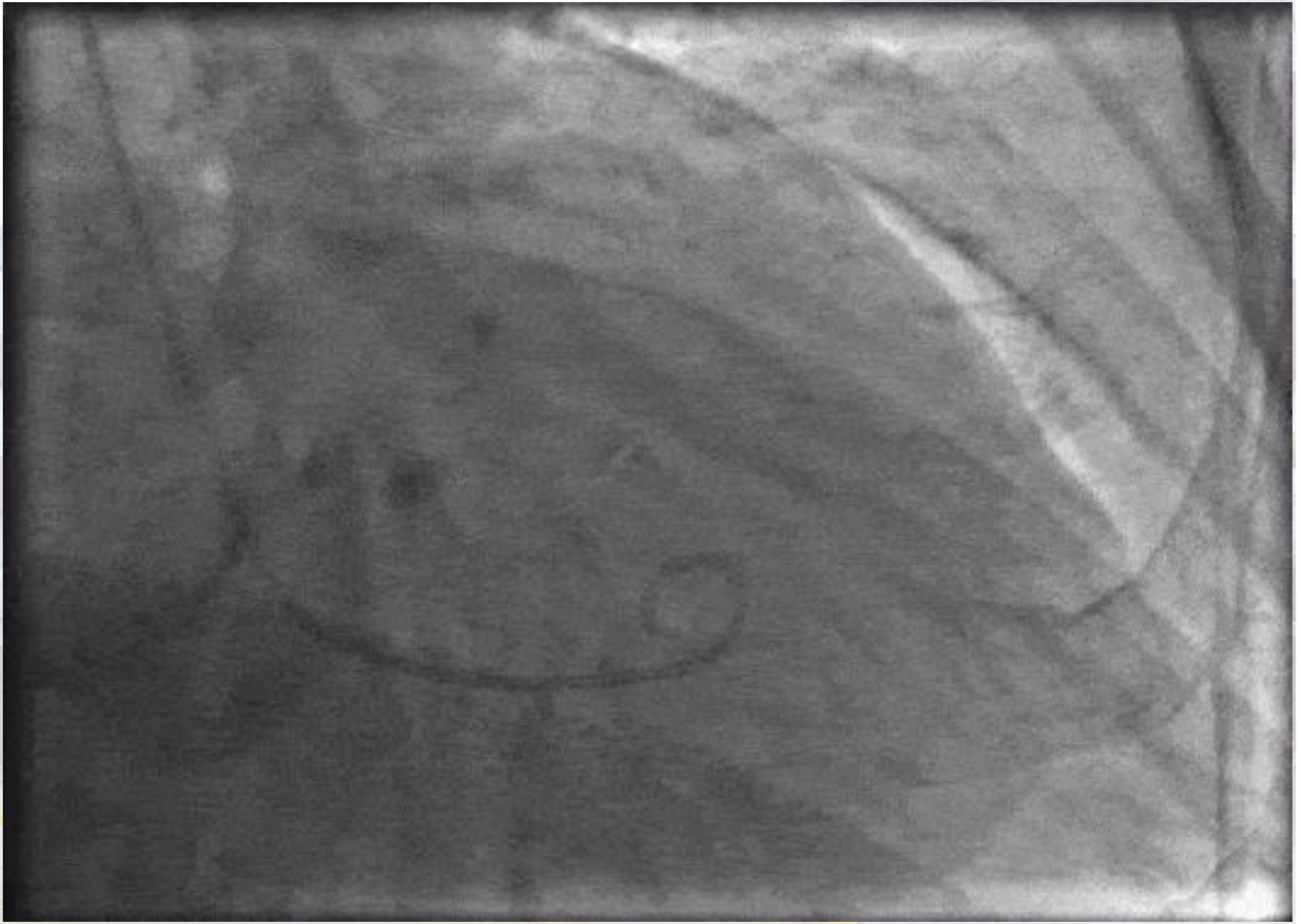
PATIENTS WHO DIE WITHIN 30 DAYS FOLLOWING HOSPITALIZATION FOR AHF[1]

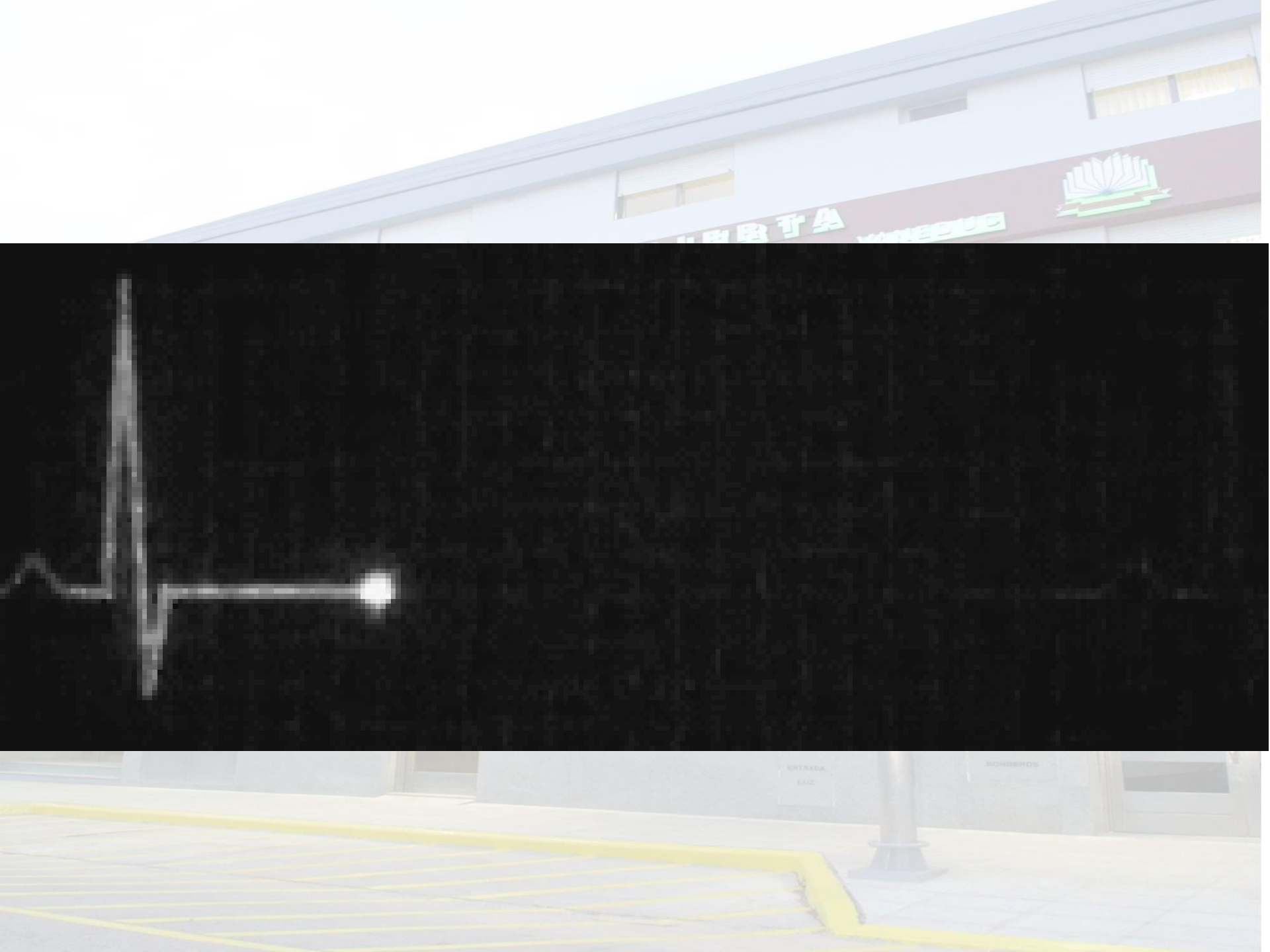
22%

PATIENTS WHO DIE WITHIN 1 YEAR OF HOSPITALIZATION FOR AHF[1]

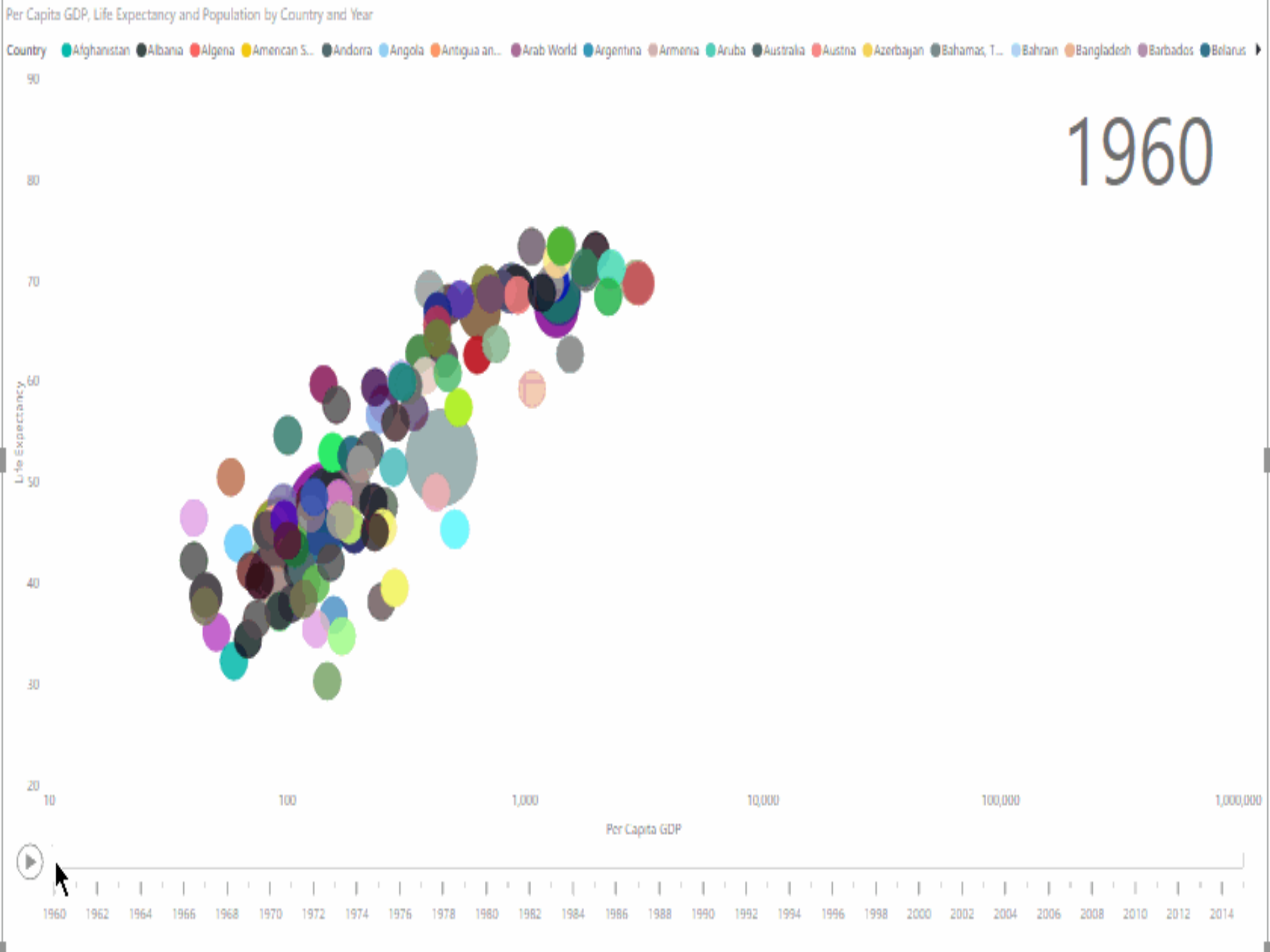
42%

PATIENTS WHO DIE WITHIN 5 YEARS OF HOSPITALIZATION FOR AHF[1]






¿Mortalidad?


Per Capita GDP, Life Expectancy and Population by Country and Year
Country
Afghanistan
Albania
Algeria
American S...
Andorra
Angola
Antigua an...
Arab World
Argentina
Armenia
Aruba
Australia
Austria
Azerbaijan
Bahamas, T...
Bahrain
Bangladesh
Barbados
Belarus
1960
Life Expectancy
90
80
70
60
50
40
30
20
10
100
1,000
10,000
100,000
1,000,000
Per Capita GDP
1960
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
1984
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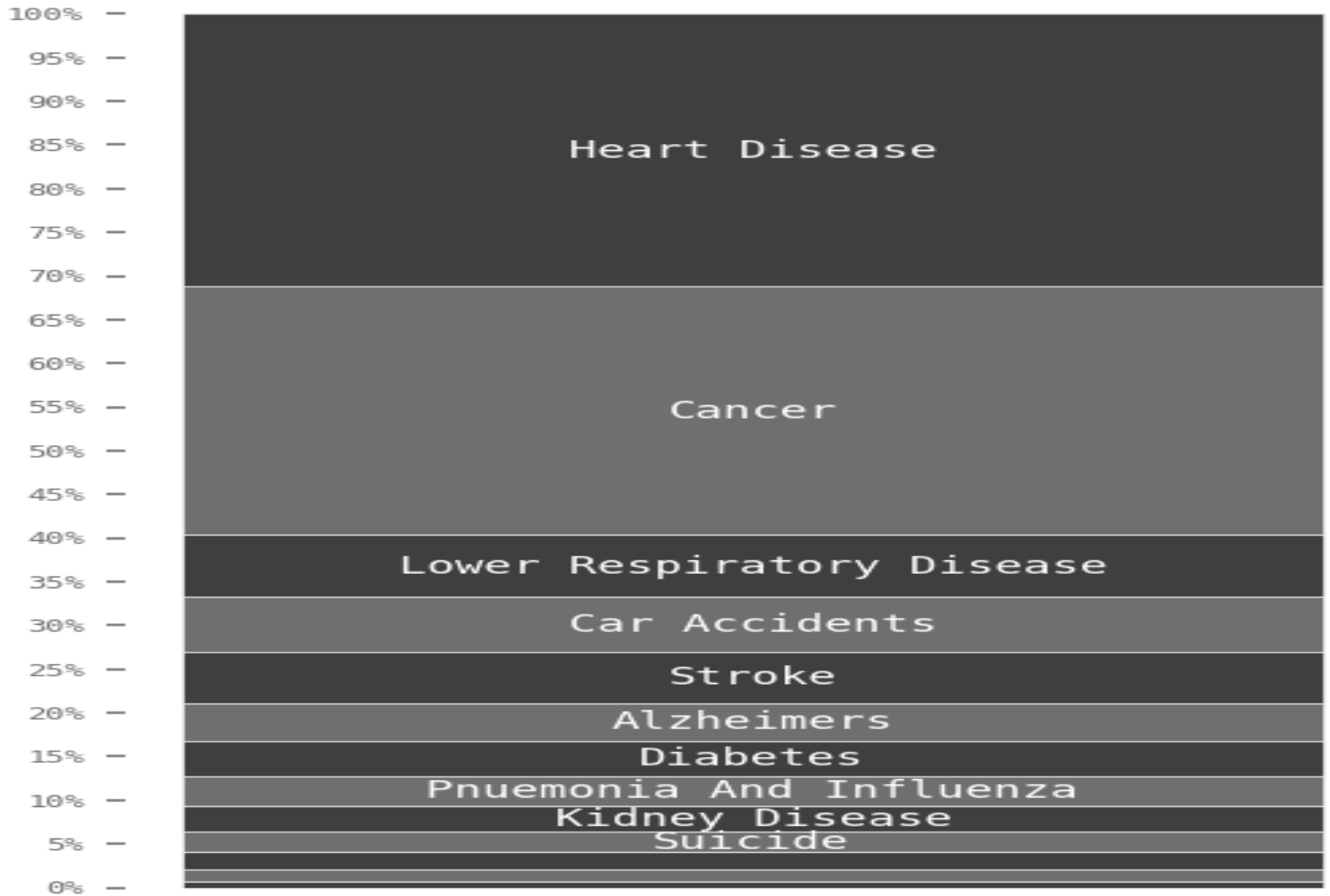
2010
2012
2014

CDC Cause of Death in USA

"What actually causes death?"

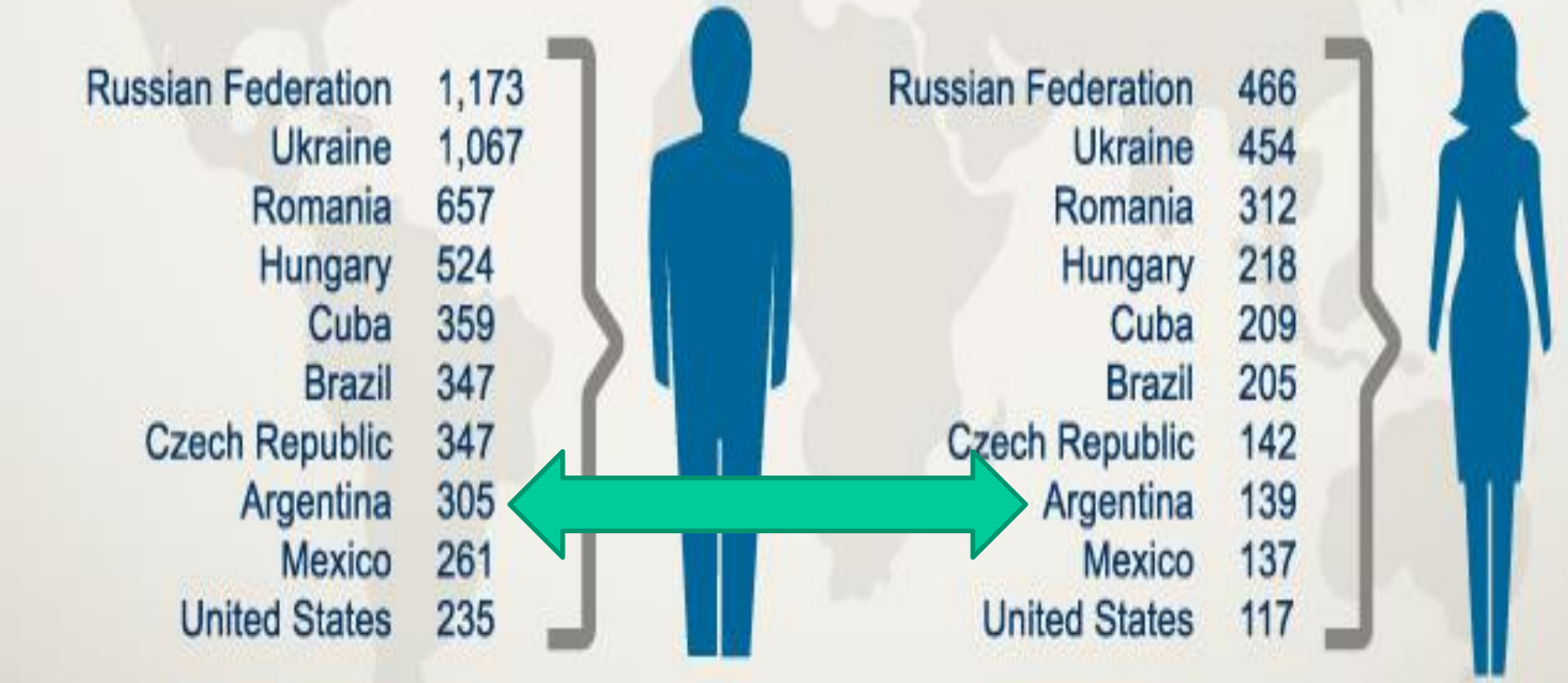


Data: CDC, Google, New York Times, The Guardian
Code: www.github.com\aaronpenne
Twitter: @aaronpenne

Based on in-depth analysis by H. Al-Jamaly, M. Siemers, O. Shen, and N. Stone at owenshen24.github.io/charting-death

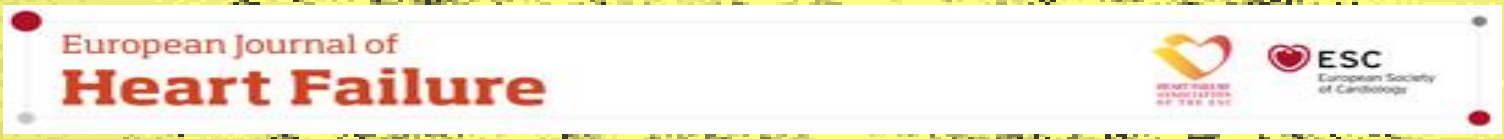
Highest Cardiovascular Disease Death Rates

Here's a look at the top 10 countries with the highest death rates for heart disease, stroke and high blood pressure per 100,000 men and women, ages 35 to 74.



Sources: World Health Organization, National Center for Health Statistics and National Heart, Lung, and Blood Institute

Do patients have worse outcomes in heart failure than in cancer? A primary care-based cohort study with 10-year follow-up in Scotland 3 May 2017Full

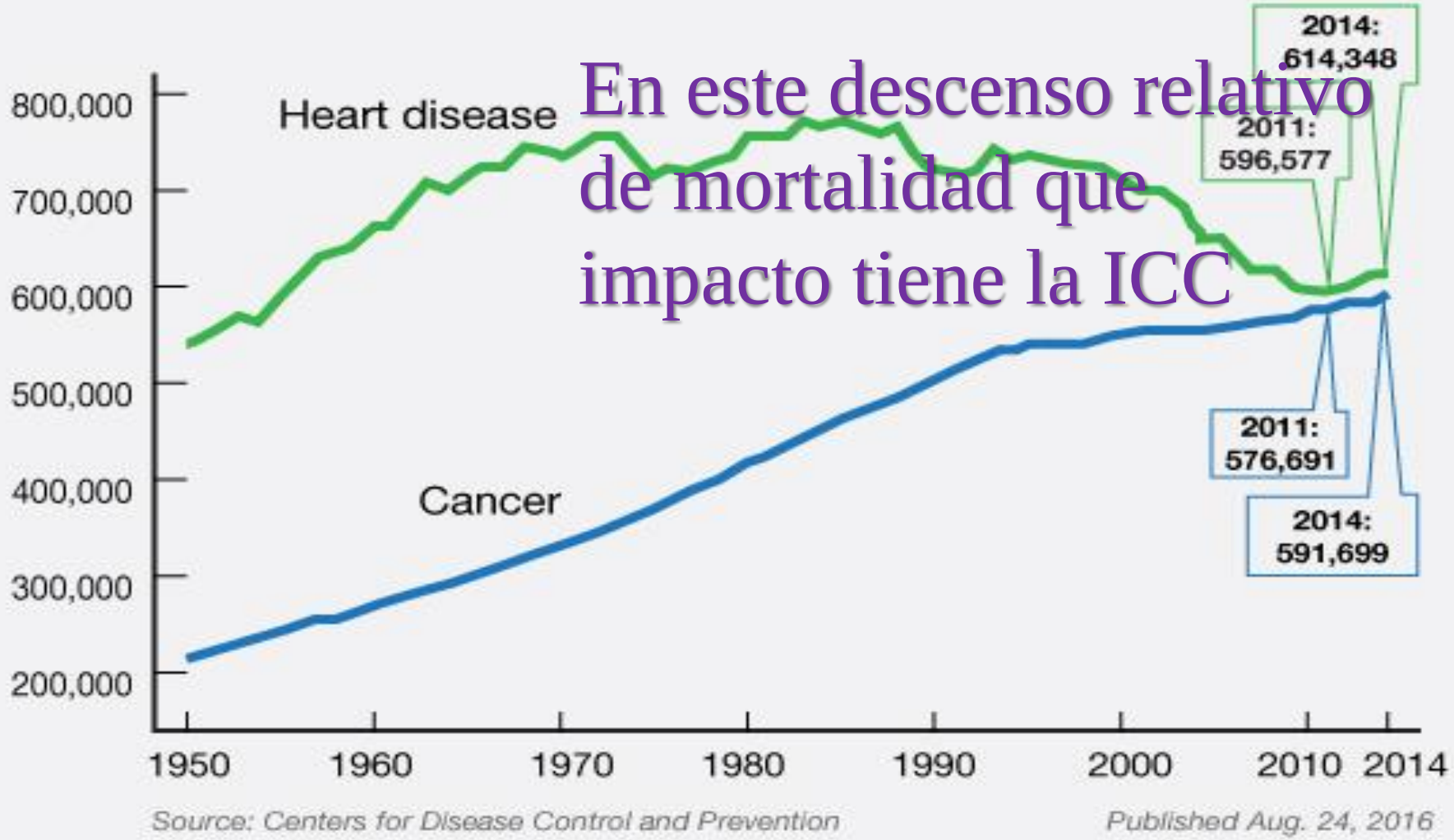


In men, HF (reference group; 5-year survival: 55.8%) had worse mortality outcomes than prostate cancer [hazard ratio (HR) 0.61, 95% confidence interval (CI) 0.57–0.65; 5-year survival: 68.3%], and bladder cancer (HR 0.88, 95% CI 0.81–0.96; 5-year survival: 57.3%),

TOP TWO KILLERS

By AMERICAN HEART ASSOCIATION NEWS

The total number of Americans dying from heart disease rose in recent years following decades in decline. Cancer deaths have nearly tripled since 1950 and continue to climb.

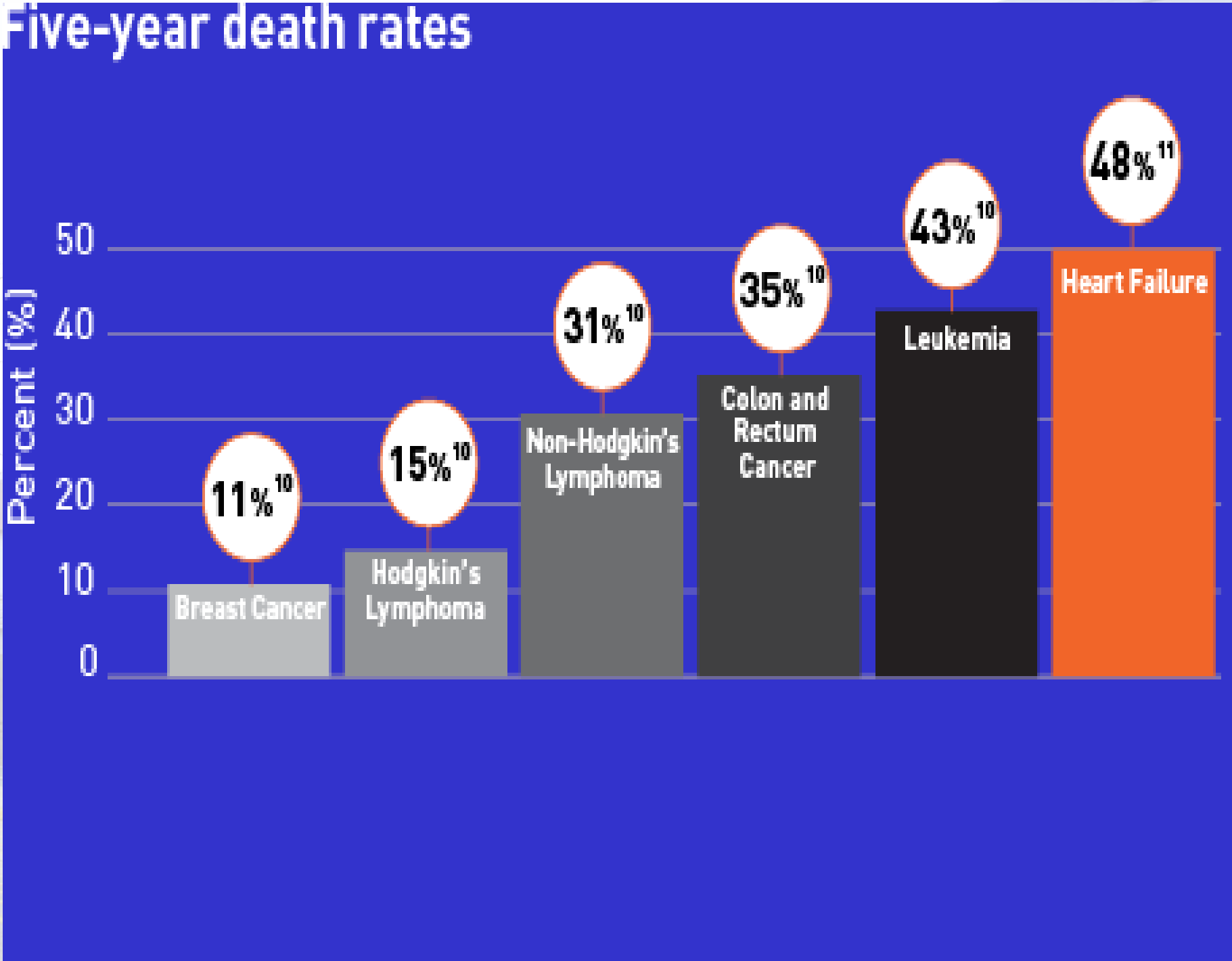


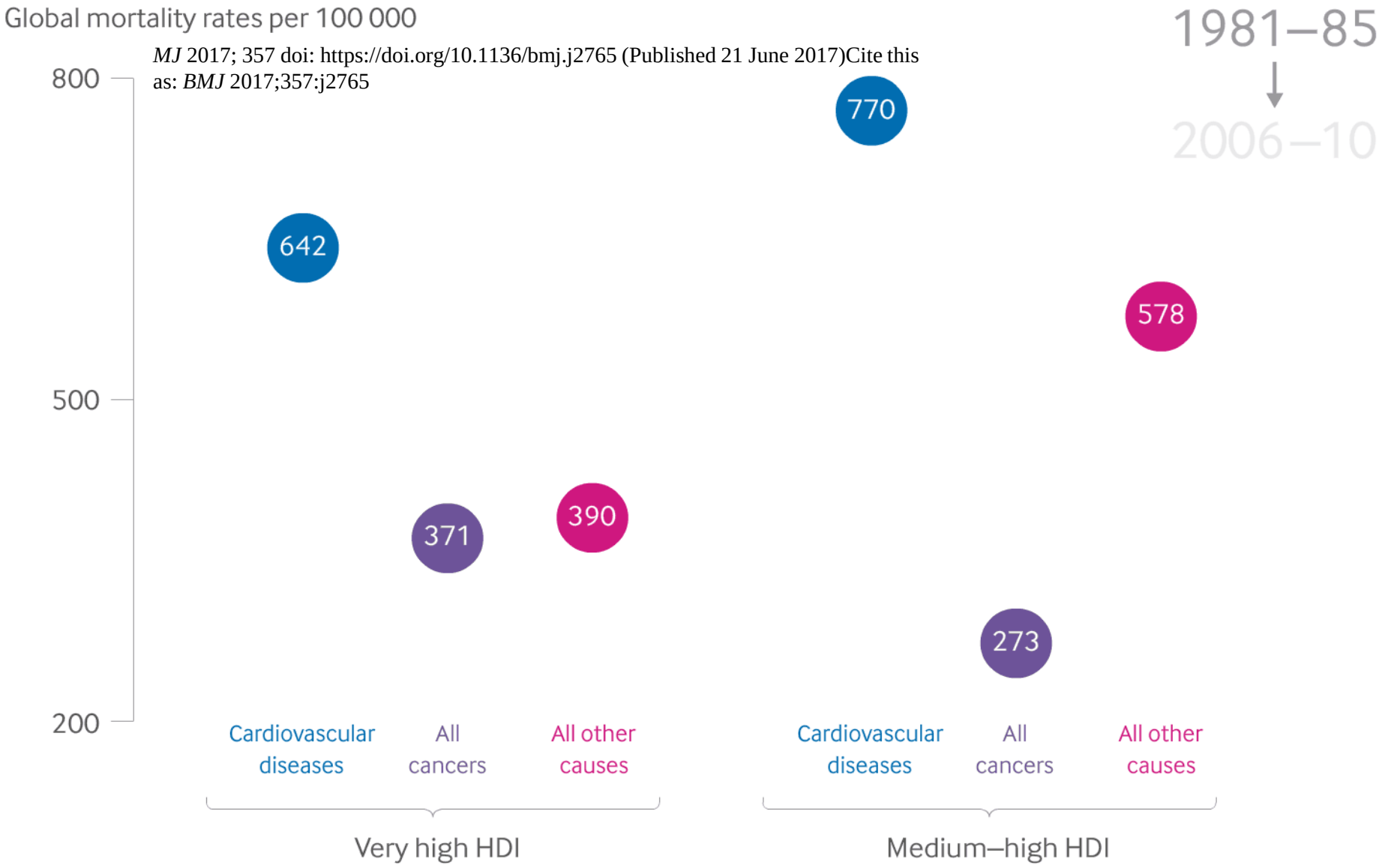
En este descenso relativo de mortalidad que impacto tiene la ICC

Source: Centers for Disease Control and Prevention

Published Aug. 24, 2016

Five-year death rates

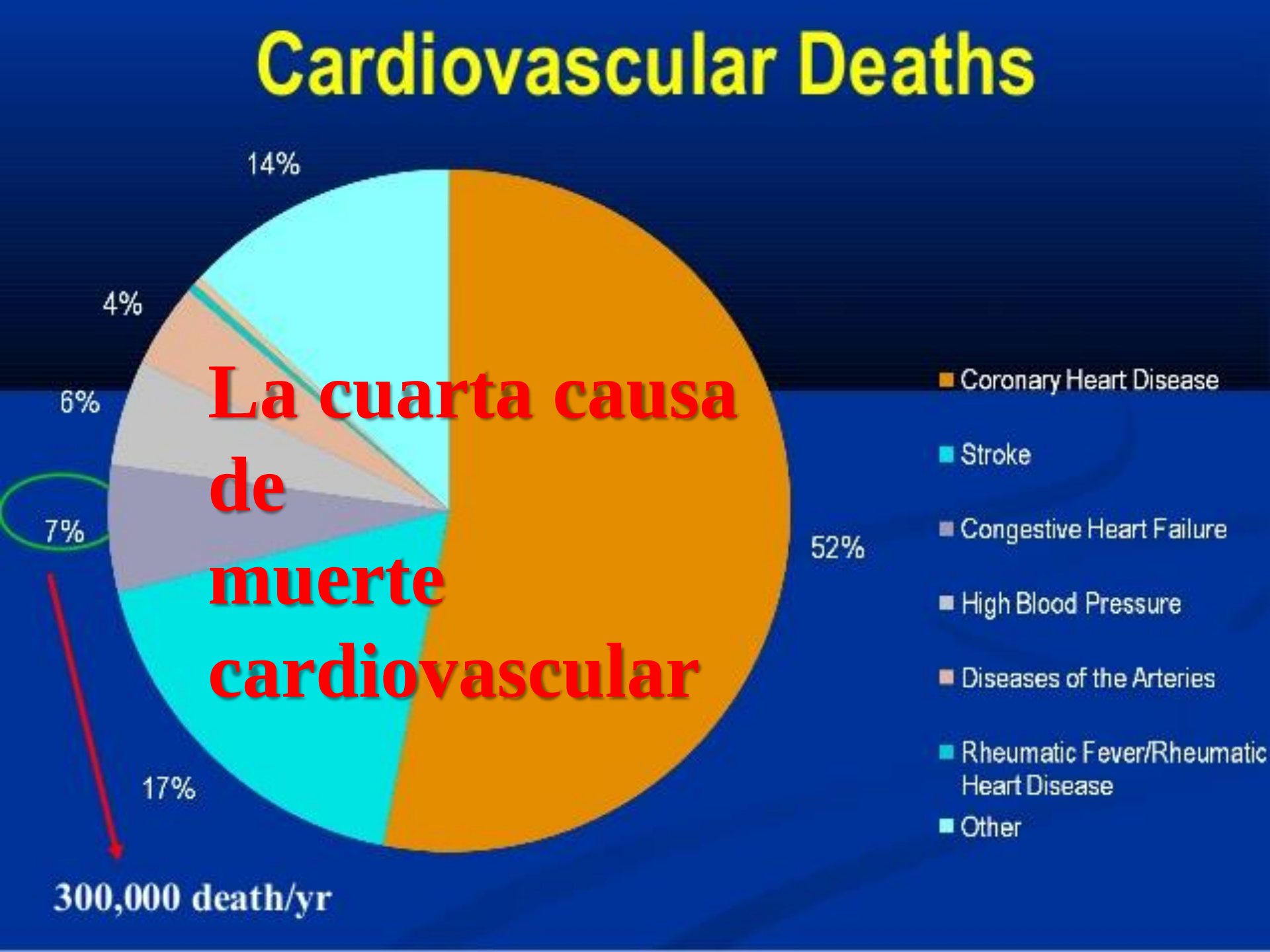




MJ 2017; 357 doi: https://doi.org/10.1136/bmj.j2765 (Published 21 June 2017)Cite this as: *BMJ* 2017;357:j2765

Changes in age standardized mortality rates in ages 40-84 years between 1981-85 and 2006-10 due to cardiovascular disease (CVD), all cancers, and all other causes of death in men and women combined. HDI=Human Development Index

Cardiovascular Deaths



La cuarta causa de muerte cardiovascular

1,3 años promedio de menor sobrevida respecto de cáncer de mama, próstata y vejiga

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Mortalidad de la insuficiencia cardíaca no tratada

Mortalidad

50 % a los 5 años de aparecidos los síntomas

90% a los 10 años de aparecidos los síntomas

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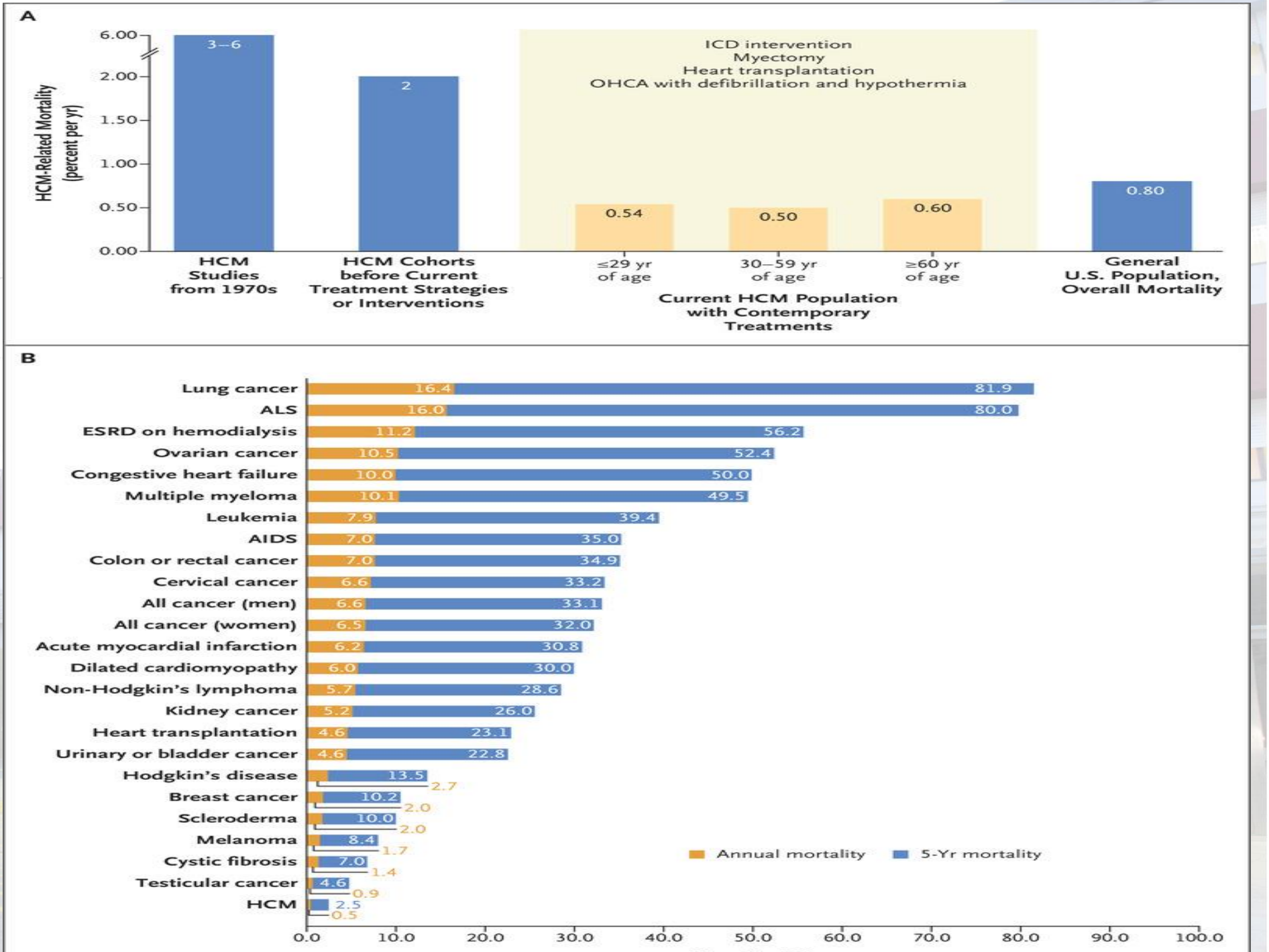
A
HCM-Related Mortality (percent per yr)
6.00
2.00
1.50
1.00
0.50
0.00
3–6
2
ICD intervention
Myectomy
Heart transplantation
OHCA with defibrillation and hypothermia
0.54
0.50
0.60
0.80
HCM Studies from 1970s
HCM Cohorts before Current Treatment Strategies or Interventions
≤29 yr of age
30–59 yr of age
≥60 yr of age
Current HCM Population with Contemporary Treatments
General U.S. Population, Overall Mortality
B
Lung cancer 16.4 81.9
ALS 16.0 80.0
ESRD on hemodialysis 11.2 56.2
Ovarian cancer 10.5 52.4
Congestive heart failure 10.0 50.0
Multiple myeloma 10.1 49.5
Leukemia 7.9 39.4
AIDS 7.0 35.0
Colon or rectal cancer 7.0 34.9
Cervical cancer 6.6 33.2
All cancer (men) 6.6 33.1
All cancer (women) 6.5 32.0
Acute myocardial infarction 6.2 30.8
Dilated cardiomyopathy 6.0 30.0
Non-Hodgkin's lymphoma 5.7 28.6
Kidney cancer 5.2 26.0
Heart transplantation 4.6 23.1
Urinary or bladder cancer 4.6 22.8
Hodgkin's disease 13.5 2.7
Breast cancer 10.2 2.0
Scleroderma 10.0 2.0
Melanoma 8.4 1.7
Cystic fibrosis 7.0 1.4
Testicular cancer 4.6 0.9
HCM 2.5 0.5
Annual mortality
5-Yr mortality
0.0 10.0 20.0 30.0 40.0 50.0 60.0 70.0 80.0 90.0 100.0

¿Cómo nos fue con la mortalidad en los últimos 30 años con la mortalidad ?

Evolución histórica de la mortalidad y morbilidad en insuficiencia cardíaca

National Institutes of Health—National Heart, Lung, and Blood Institute. Morbidity and Mortality: 2009 Chart Book on Cardiovascular, Lung and Blood Diseases. © 2009, National Institutes of Health—National Heart, Lung, and Blood Institute.

HOSPITALIZACIONES POR IC

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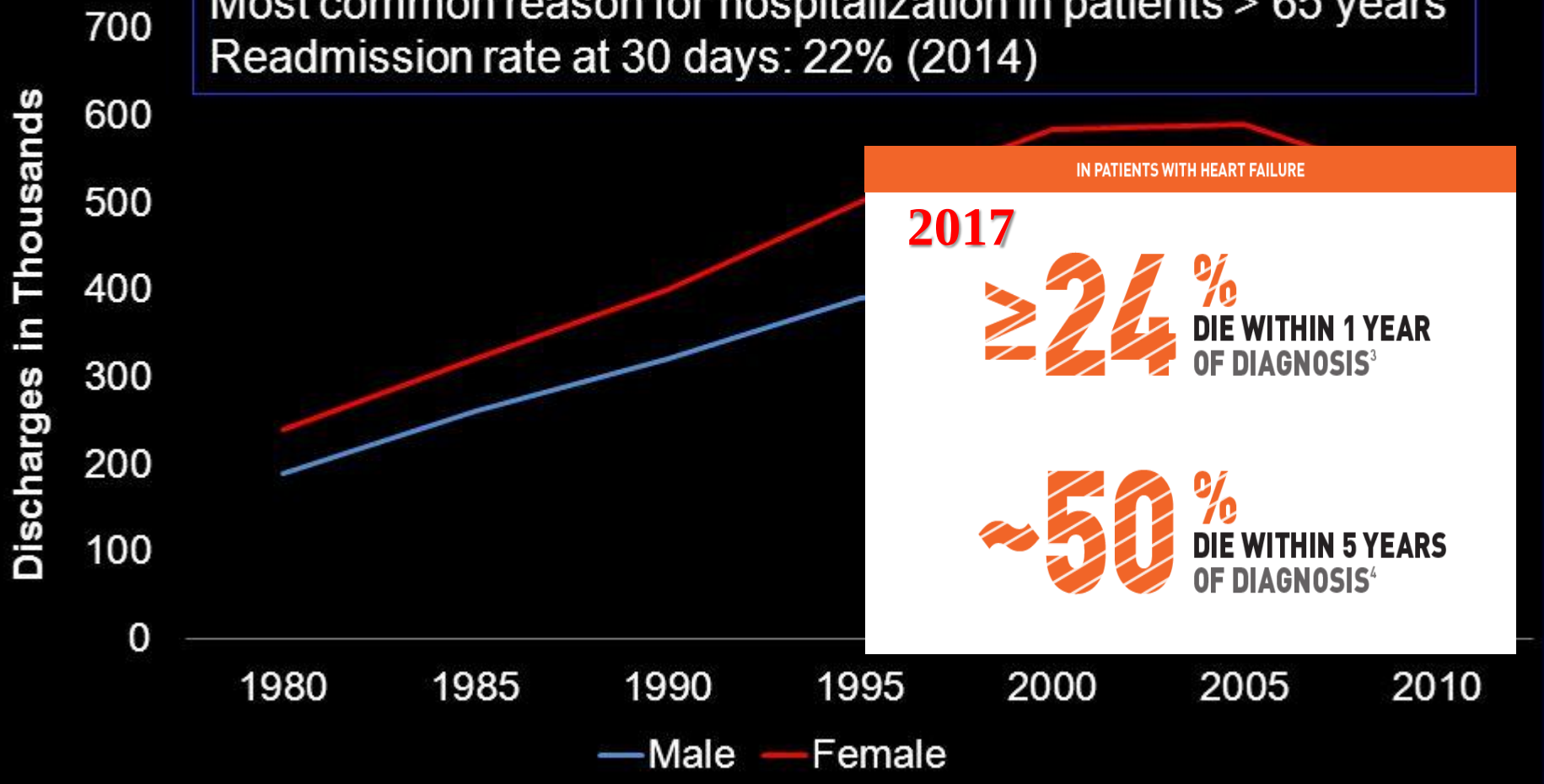
Heart Failure Mortality

Most common reason for hospitalization in patients > 65 years
Readmission rate at 30 days: 22% (2014)



IN PATIENTS WITH HEART FAILURE

2017

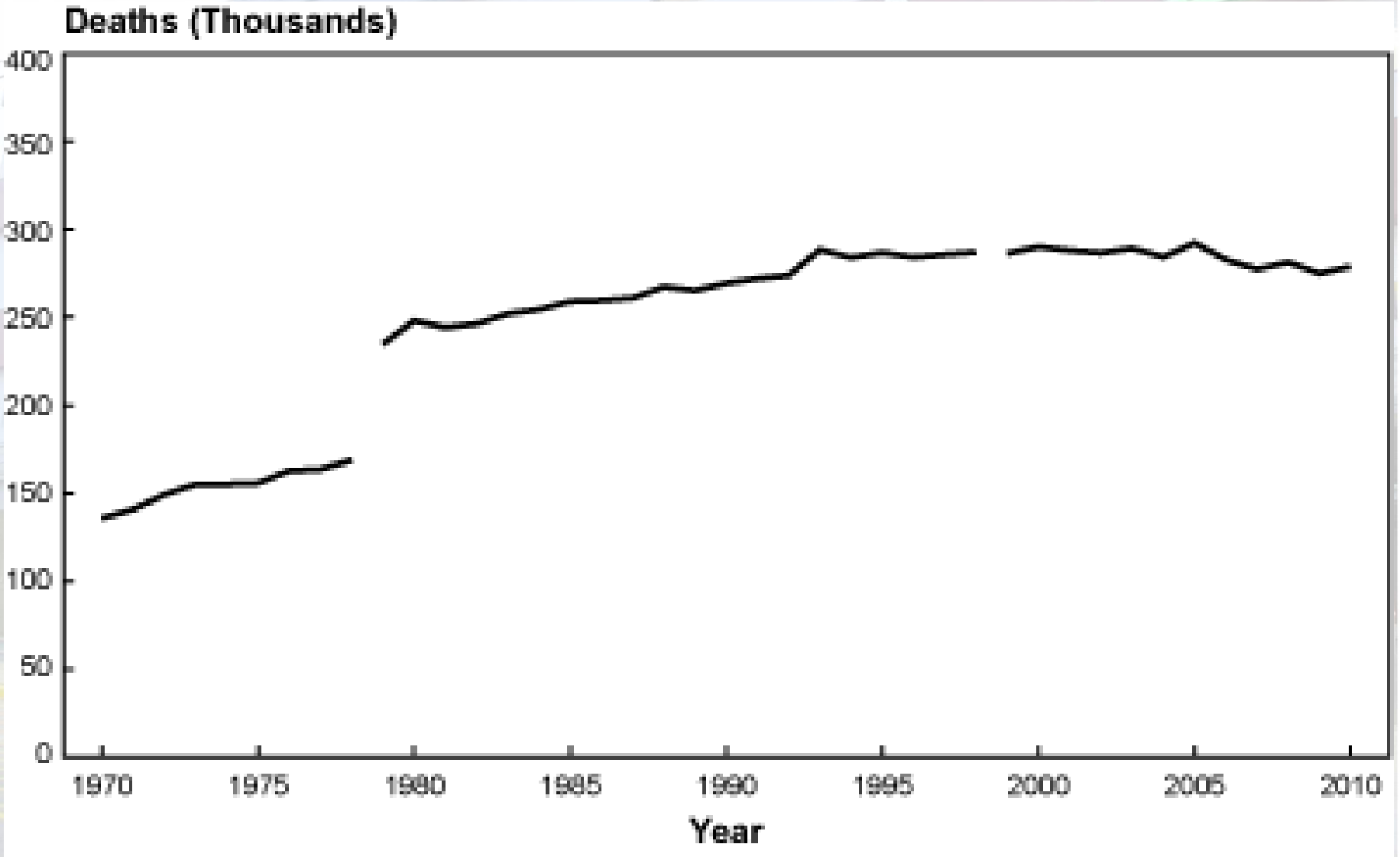
≥24% DIE WITHIN 1 YEAR OF DIAGNOSIS[3]

~50% DIE WITHIN 5 YEARS OF DIAGNOSIS[4]

Circulation 2015; 131: e29-e322.

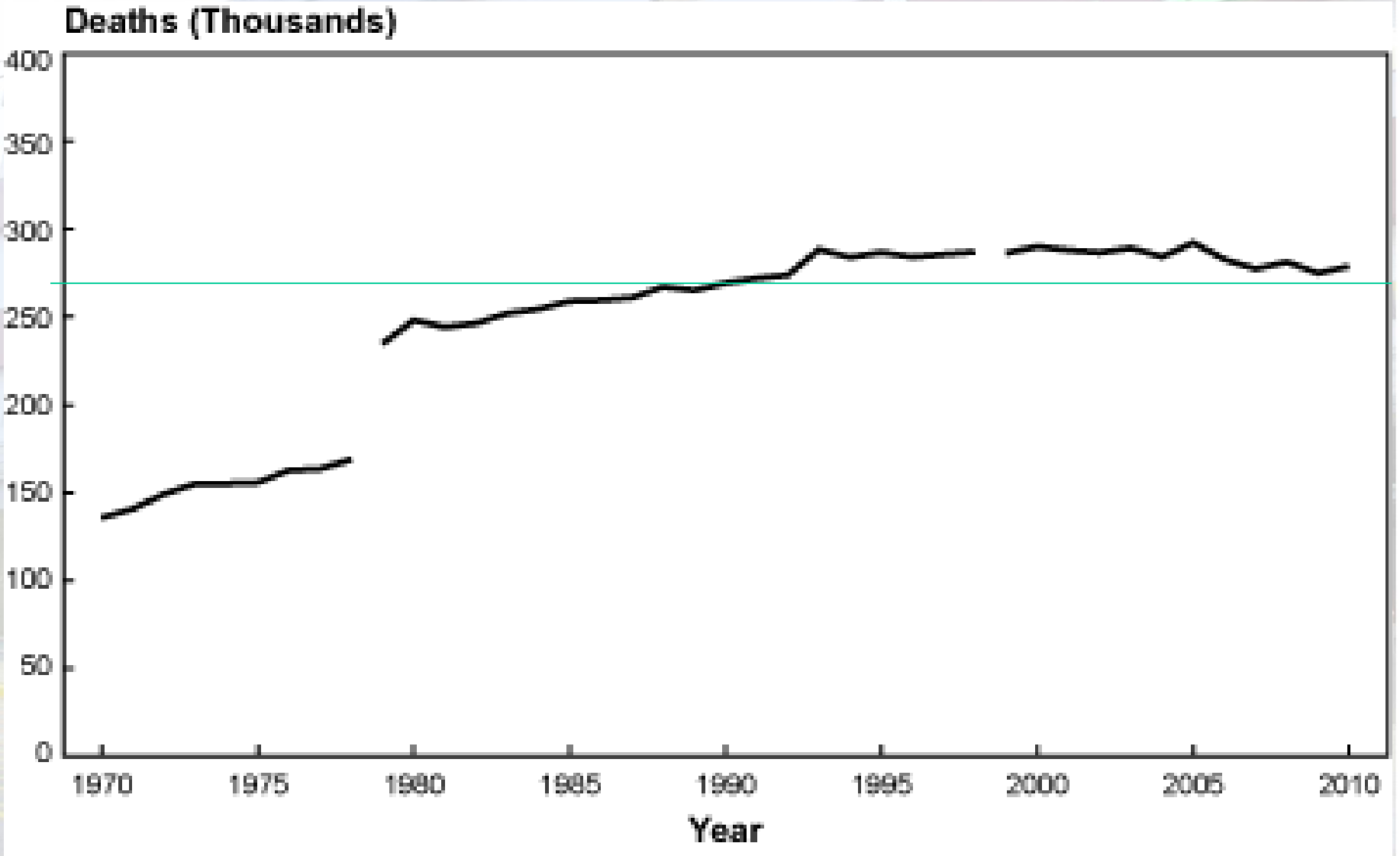
Deaths Attributed to Heart Failure,U.S., 1970-2010

Source: Vital Statistics of the United States, NCHS



Deaths Attributed to Heart Failure,U.S., 1970-2010

Source: Vital Statistics of the United States, NCHS



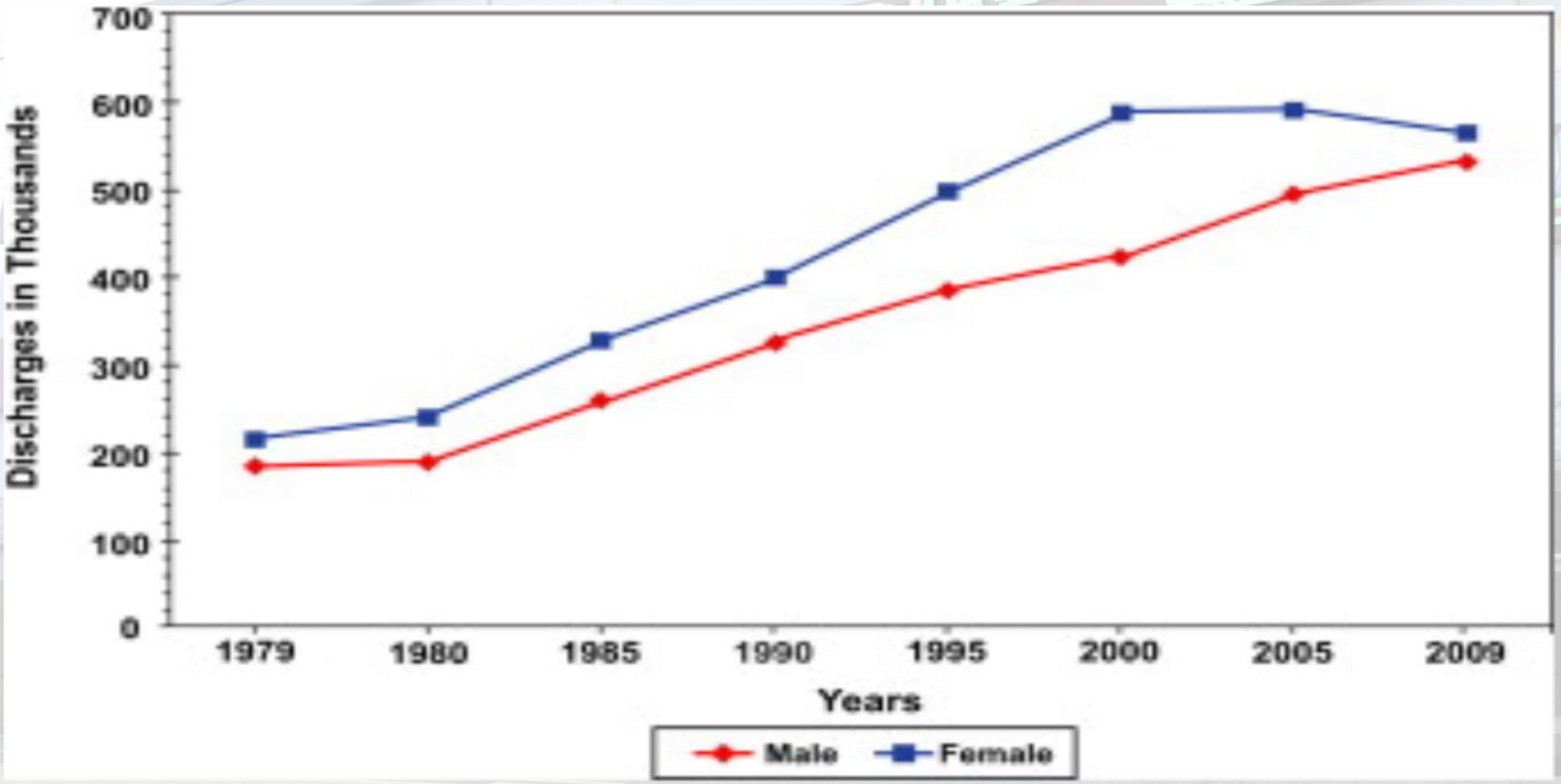
Trends in ADHF Morbidity/Mortality

Chen et al., JAMA 2011;306:1669

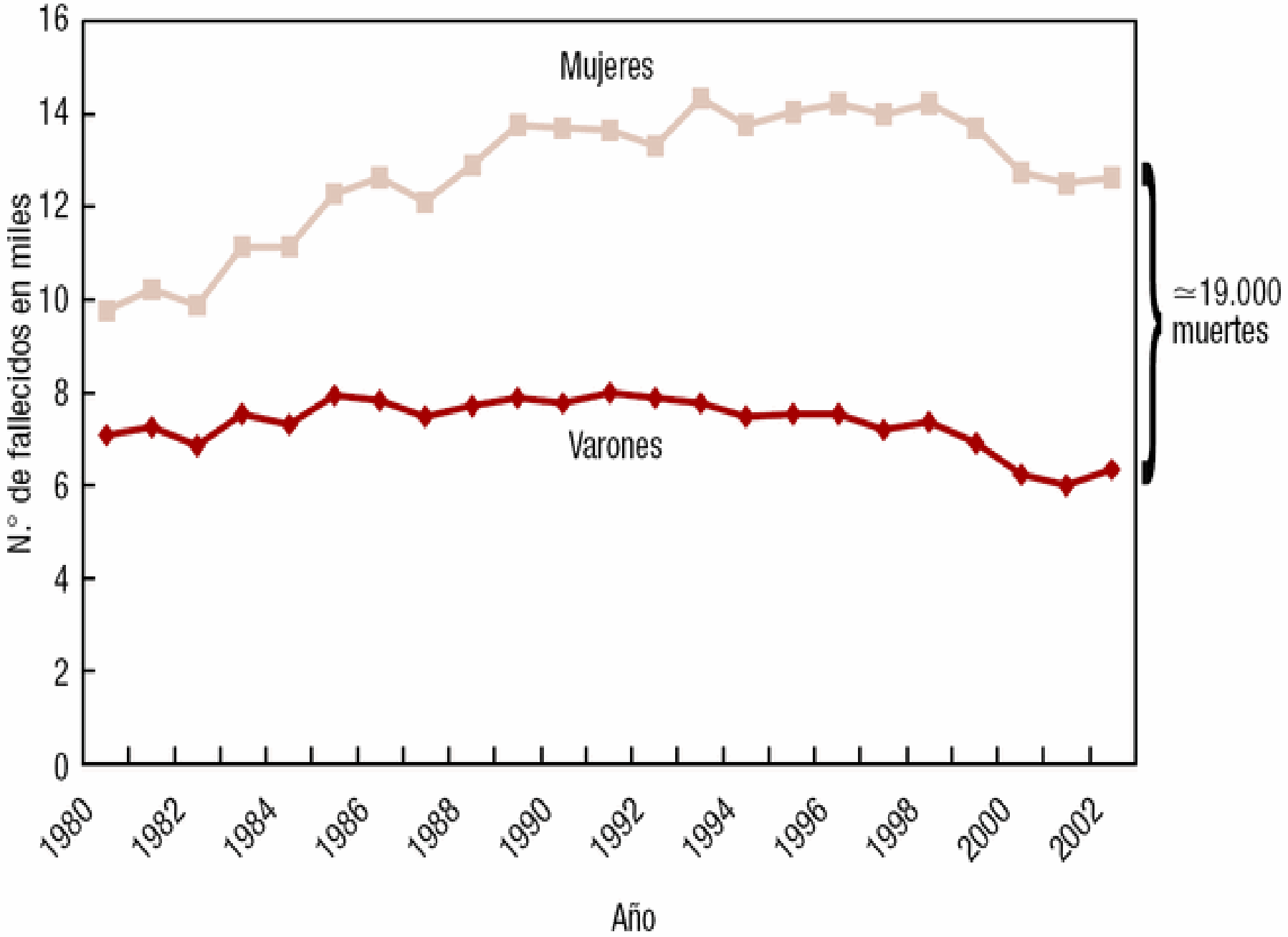
JACC Journals

From: **Heart Failure**

JCHF. 2013;1(1):1-20. doi:10.1016/j.jchf.2012.10.002



Discharges From Hospitalization Due to Heart Failure, by Sex (United States, 1979–2009)


16
14
12
10
8
6
4
2
0
N.° de fallecidos en miles
Mujeres
Varones
≃19.000
muertes
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
Año

The heart failure-related mortality rate analysis revealed that the in-hospital death rate increased from **6.58%, in 2001, to 9.5%, in 2012** - an increase of 46.1%

Universidade do Estado do Rio de Janeiro - Hospital Universitário Pedro Ernesto - Serviço de Cardiologia - Rio de Janeiro, RJ - Brazil

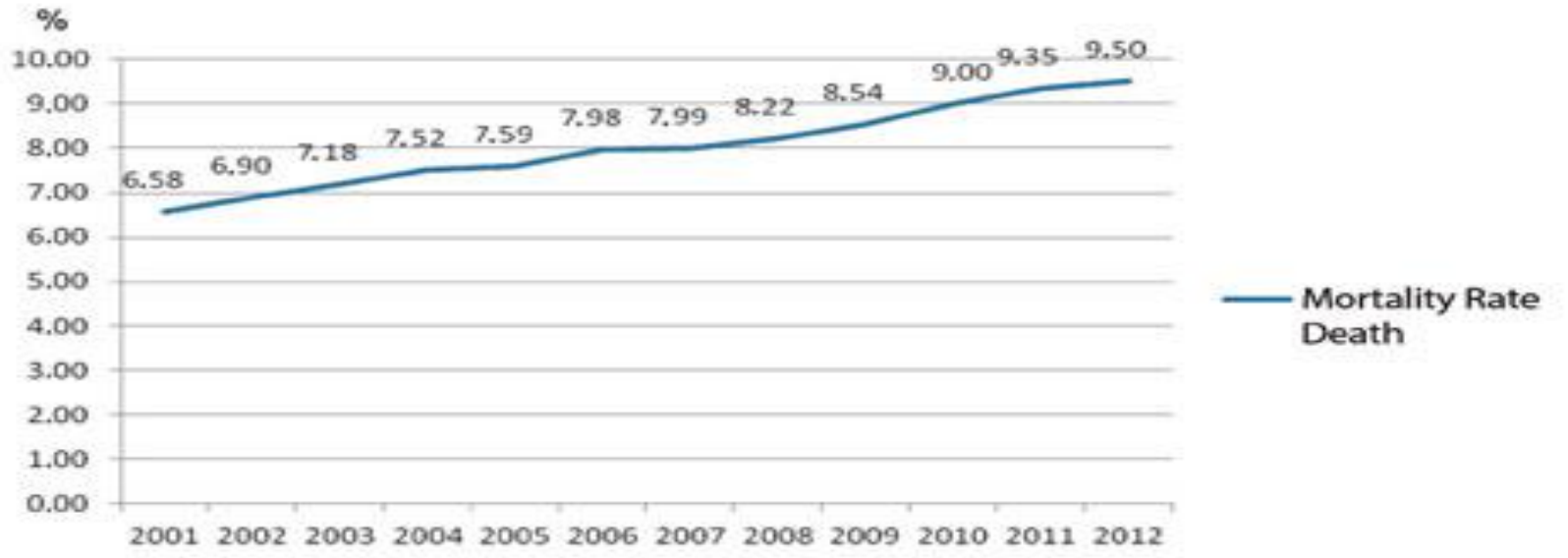
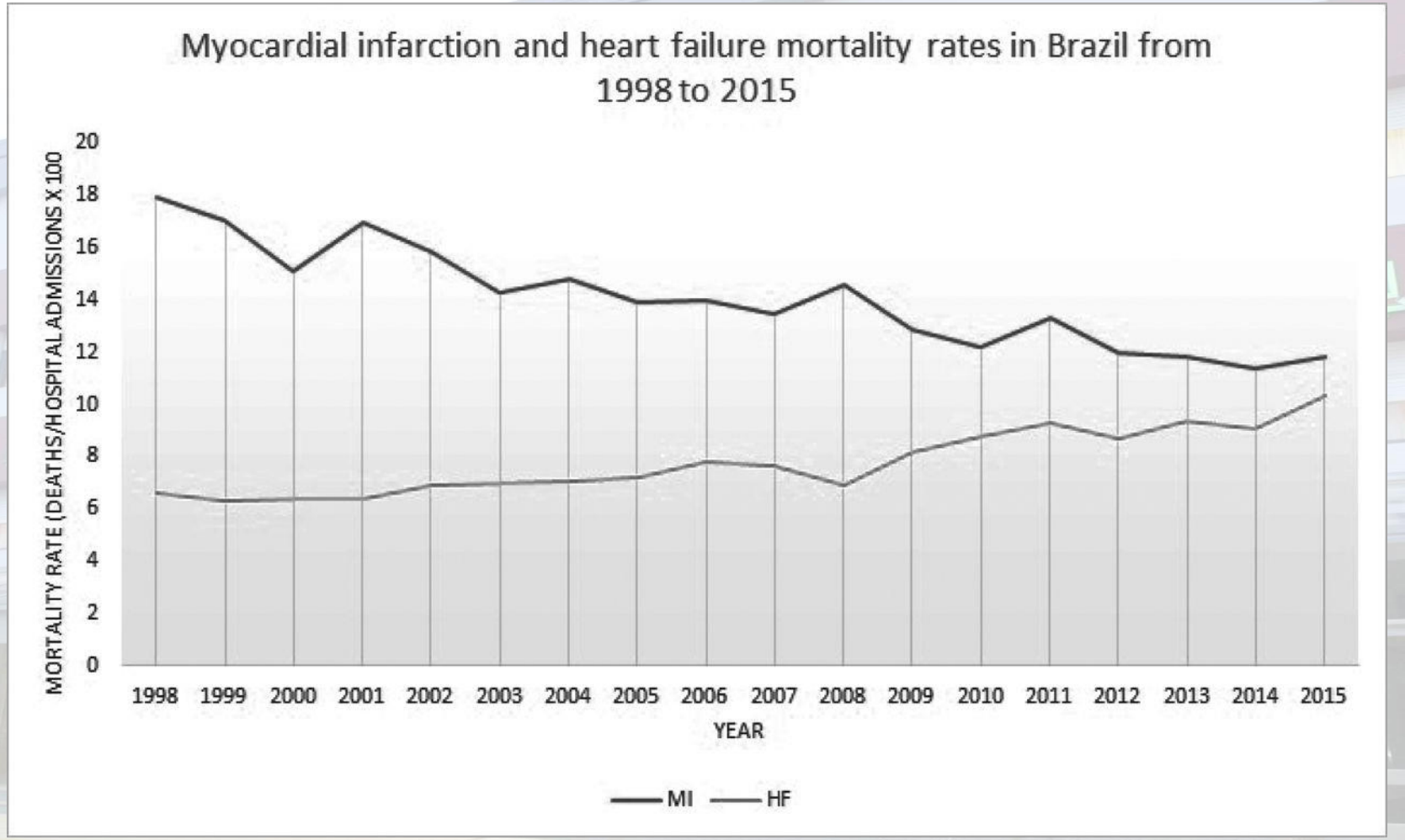


Figure 3
Average mortality rate of patients with heart failure, from 2001 to 2012.

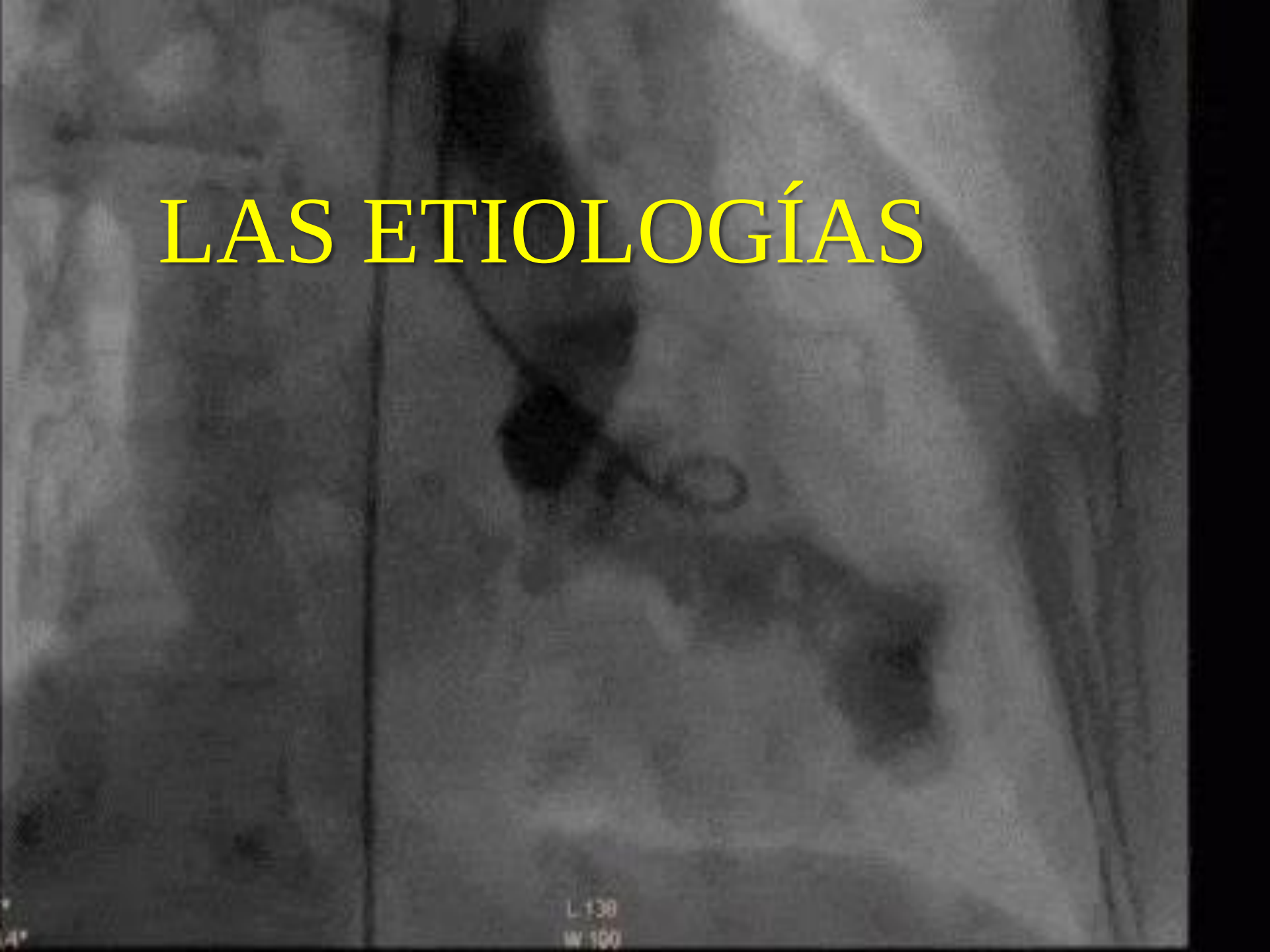
Evolution of heart failure-related hospital admissions and mortality rates: a 12-year analysis

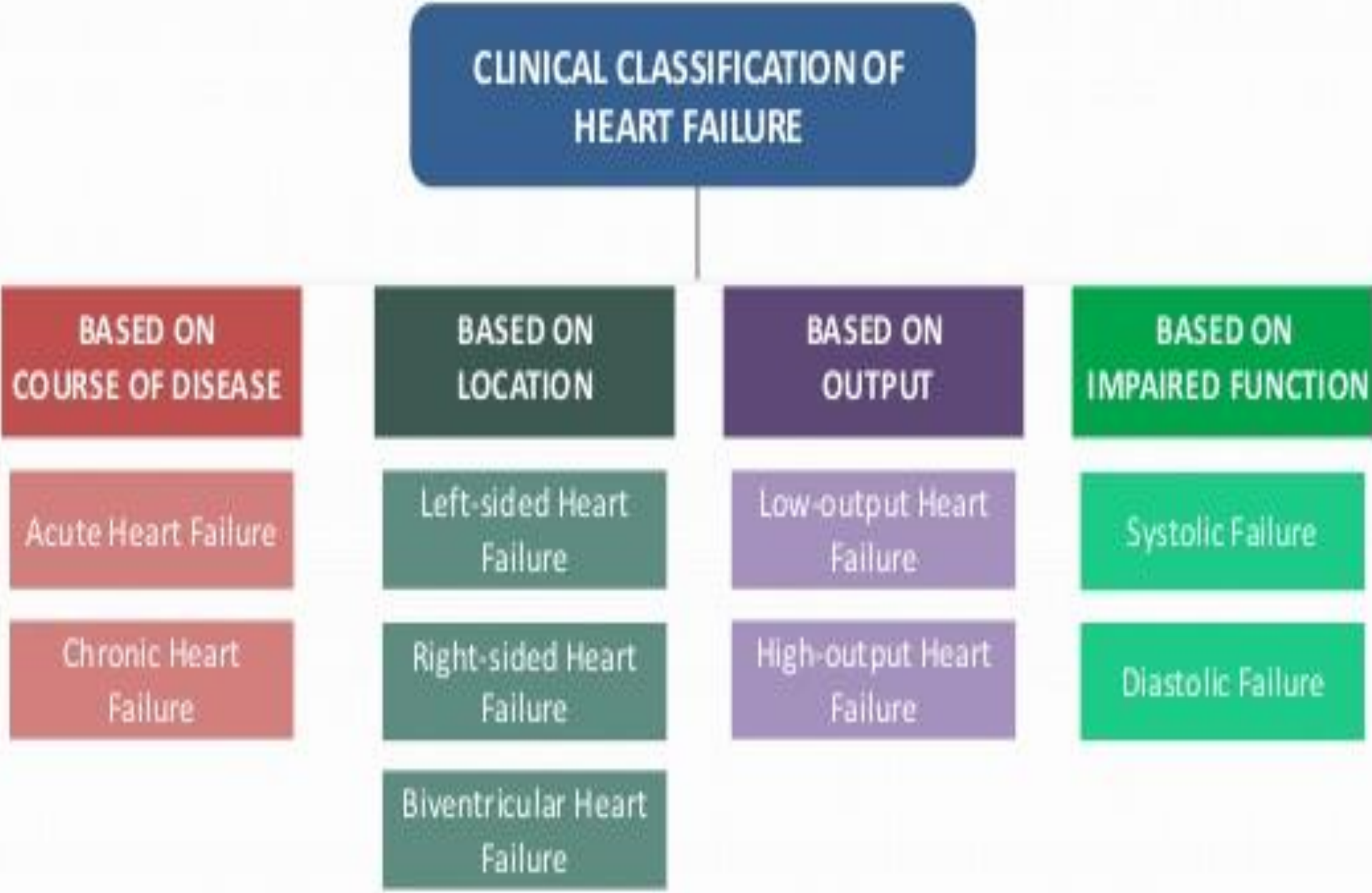
Evolution of mortality rates in Brazil for myocardial infarction and heart failure from 1998 to 2015.



Vinicius Oliveira Rocha Rodrigues et al. Heart 2016;102:A8

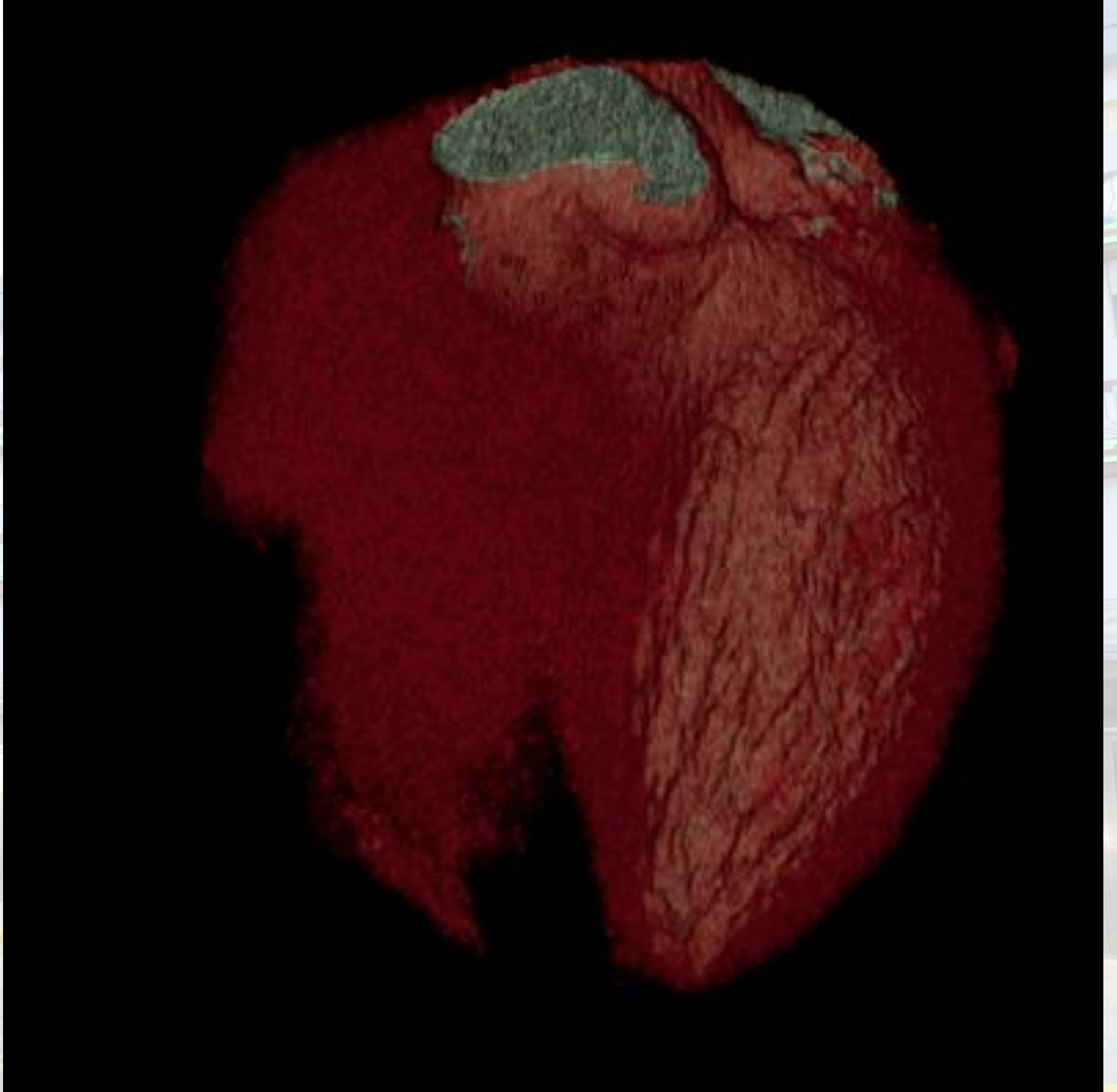

CINCO MINUTOS…


LAS ETIOLOGÍAS

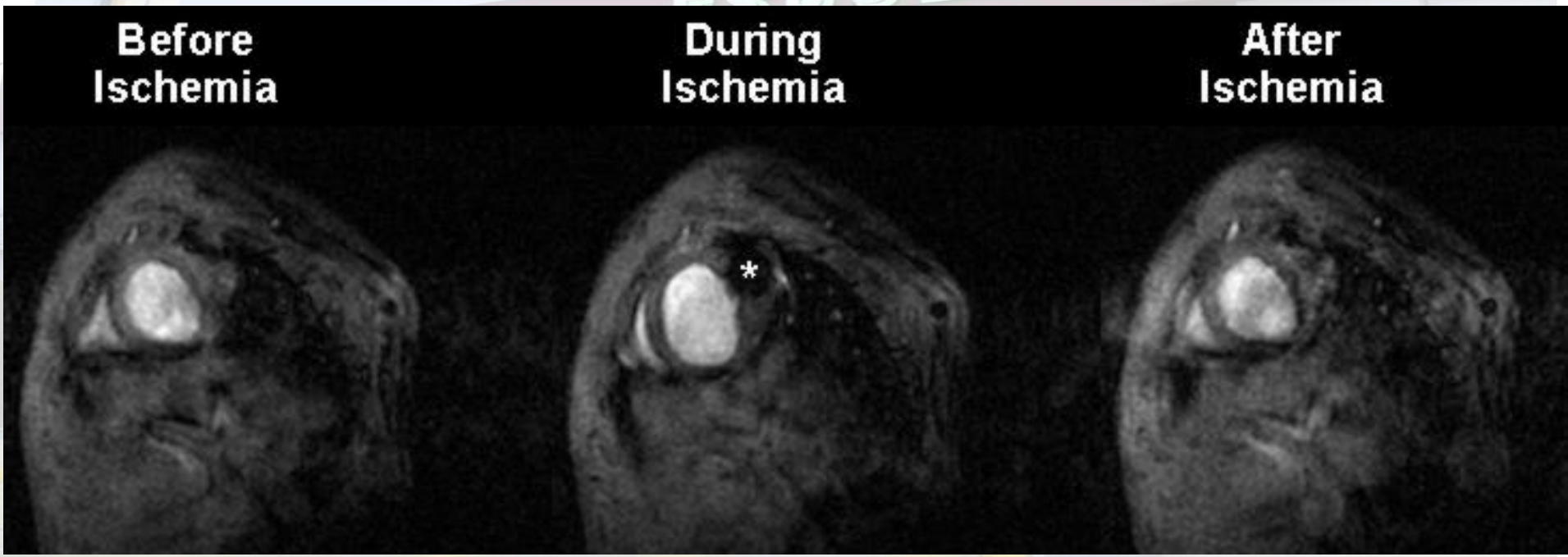

CLINICAL CLASSIFICATION OF HEART FAILURE
BASED ON COURSE OF DISEASE
Acute Heart Failure
Chronic Heart Failure
BASED ON LOCATION
Left-sided Heart Failure
Right-sided Heart Failure
Biventricular Heart Failure
BASED ON OUTPUT
Low-output Heart Failure
High-output Heart Failure
BASED ON IMPAIRED FUNCTION
Systolic Failure
Diastolic Failure

DISEASED MYOCARDIUM		
Ischaemic heart disease	Myocardial scar	
	Myocardial stunning/hibernation	
	Epicardial coronary artery disease	
	Abnormal coronary microcirculation	
	Endothelial dysfunction	
Toxic damage	Recreational substance abuse	Alcohol, cocaine, amphetamine, anabolic steroids.
	Heavy metals	Copper, iron, lead, cobalt.
	Medications	Cytostatic drugs (e.g. anthracyclines), immunomodulating drugs (e.g. interferons monoclonal antibodies such as trastuzumab, cetuximab), antidepressant drugs, antiarrhythmics, non-steroidal anti-Inflammatory drugs, anaesthetics.
	Radiation	
Immune-mediated and inflammatory damage	Related to infection	Bacteria, spirochaetes, fungi, protozoa, parasites (Chagas disease), rickettsiae, viruses (HIV/AIDS).
	Not related to infection	Lymphocytic/giant cell myocarditis, autoimmune diseases (e.g. Graves' disease, rheumatoid arthritis, connective tissue disorders, mainly systemic lupus erythematosus), hypersensitivity and eosinophilic myocarditis (Churg–Strauss).
Infiltration	Related to malignancy	Direct infiltrations and metastases.
	Not related to malignancy	Amyloidosis, sarcoidosis, haemochromatosis (iron), glycogen storage diseases (e.g. Pompe disease), lysosomal storage diseases (e.g. Fabry disease).
Metabolic derangements	Hormonal	Thyroid diseases, parathyroid diseases, acromegaly, GH deficiency, hypercortisolaemia, Conn's disease, Addison disease, diabetes, metabolic syndrome, phaeochromocytoma, pathologies related to pregnancy and peripartum.
	Nutritional	Deficiencies in thiamine, L-carnitine, selenium, iron, phosphates, calcium, complex malnutrition (e.g. malignancy, AIDS, anorexia nervosa), obesity.
Genetic abnormalities	Diverse forms	HCM, DCM, LV non-compaction, ARVC, restrictive cardiomyopathy (for details see respective expert documents), muscular dystrophies and laminopathies.
ABNORMAL LOADING CONDITIONS		
Hypertension		
Valve and myocardium structural defects	Acquired	Mitral, aortic, tricuspid and pulmonary valve diseases.
	Congenital	Atrial and ventricular septum defects and others (for details see a respective expert document).
Pericardial and endomyocardial pathologies	Pericardial	Constrictive pericarditis Pericardial effusion
	Endomyocardial	HES, EMF, endocardial fibroelastosis.
High output states		Severe anaemia, sepsis, thyrotoxicosis, Paget's disease, arteriovenous fistula, pregnancy.
Volume overload		Renal failure, iatrogenic fluid overload.
ARRHYTHMIAS		
Tachyarrhythmias		Atrial, ventricular arrhythmias.
Bradyarrhythmias		Sinus node dysfunctions, conduction disorders.

DISEASED MYOCARDIUM	
Ischaemic heart disease	Myocardial scar
	Myocardial stunning/hibernati
	Epicardial coronary artery di
	Abnormal coronary microcir
	Endothelial dysfunction
Toxic damage	Recreational substance abuse
	Heavy metals
	Medications
	Radiation
Immune-mediated and inflammatory damage	Related to infection
	Not related to infection
Infiltration	Related to malignancy
	Not related to malignancy
Metabolic derangements	Hormonal
	Nutritional
Genetic abnormalities	Diverse forms
ABNORMAL LOADING CONDITIONS	
Hypertension	
Valve and myocardium structural defects	Acquired
	Congenital
Pericardial and endomyocardial pathologies	Pericardial
	Endomyocardial
High output states	
Volume overload	
ARRHYTHMIAS	
Tachyarrhythmias	
Bradyarrhythmias	



CARDIOPATÍA ISQUEMICA
PRIMER DIAGNOSTICO
ETIOLOGICO



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Anatomía patológica del corazón

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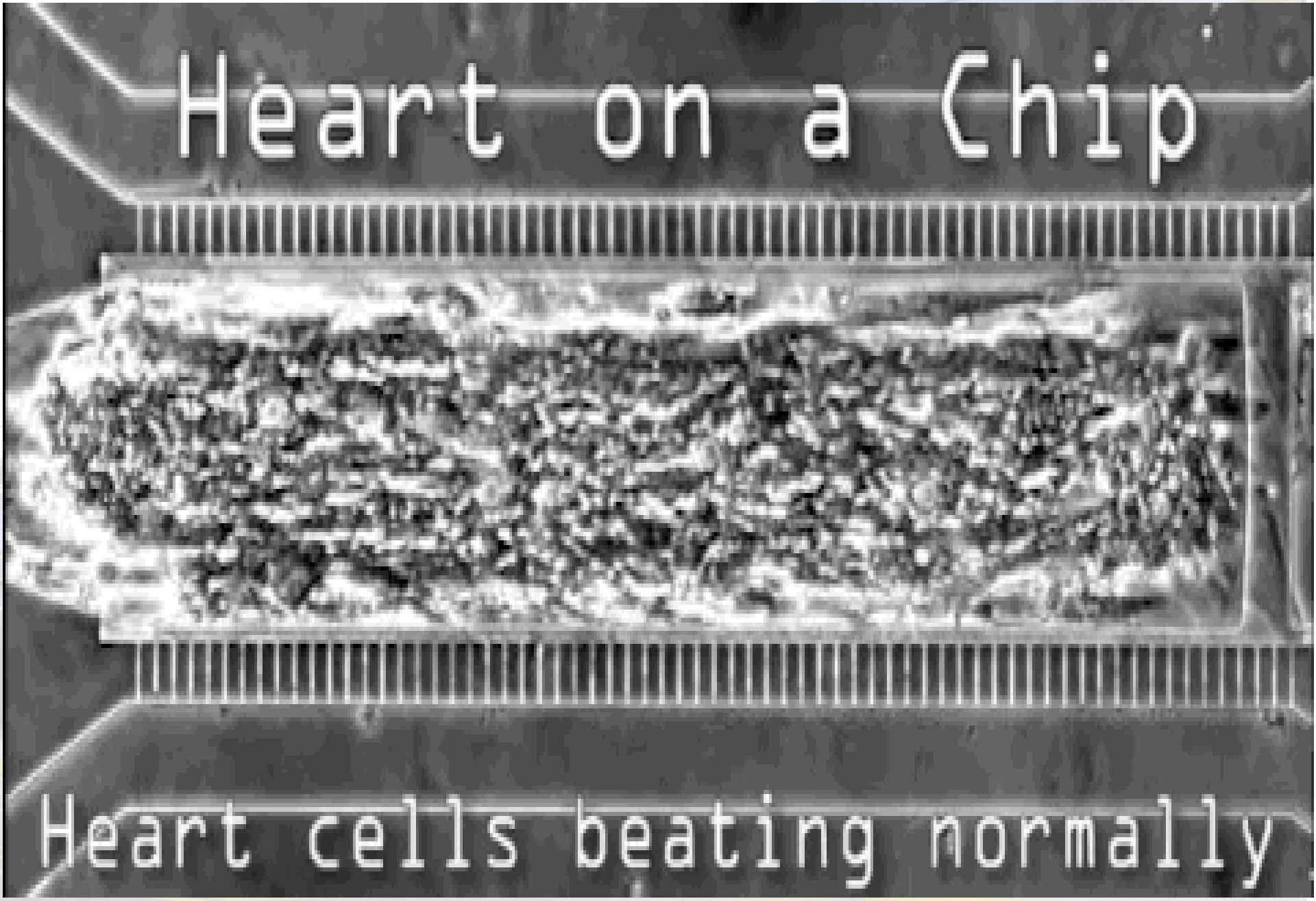
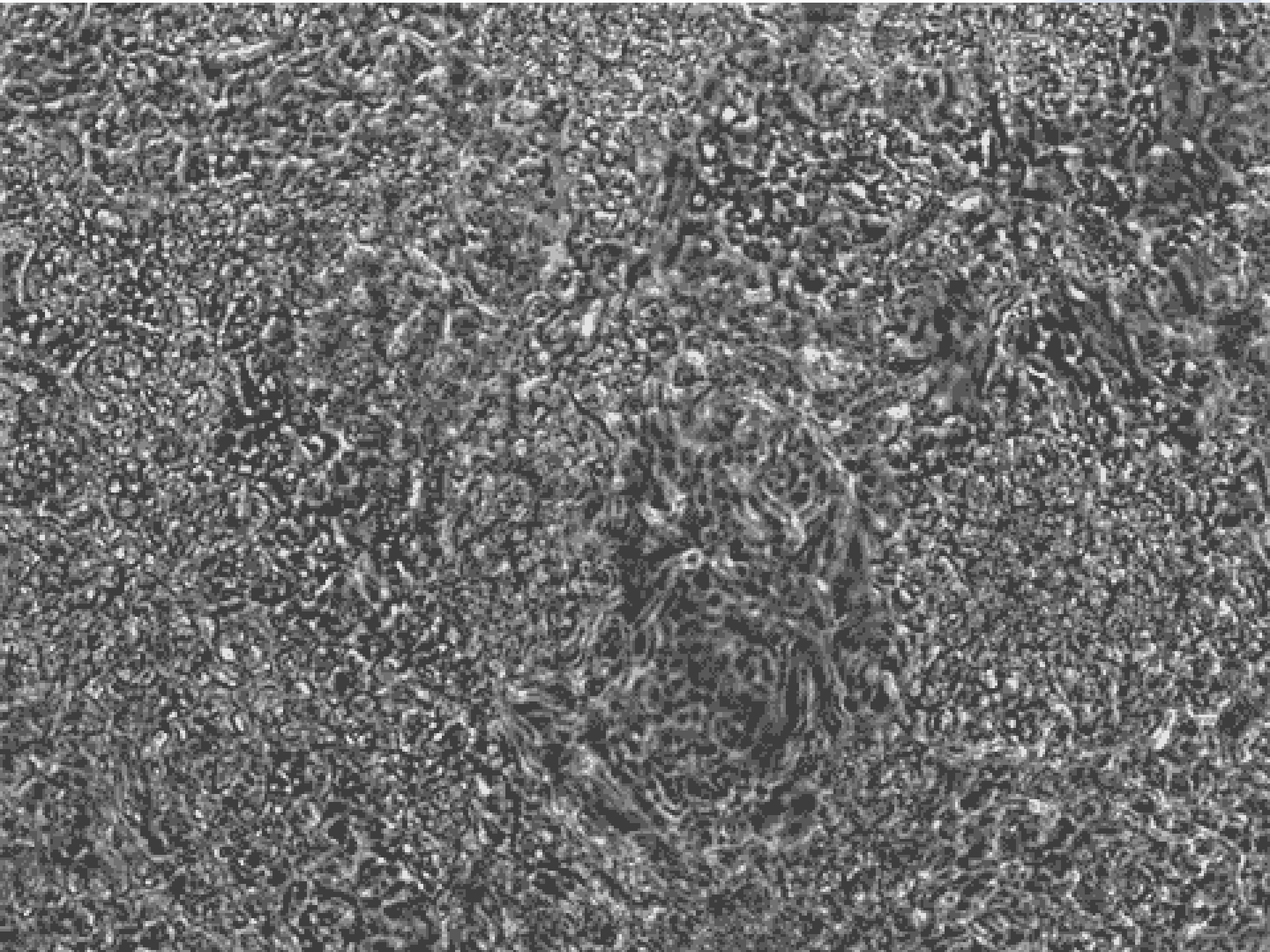
Sin deterioro de la función sistólica

Con deterioro de la función sistólica

- **Dilatada**
- **Con diámetros conservados**


Heart on a Chip
Heart cells beating normally



Miocardiopatías

	Disfunción	Ventrículo Izquierdo (cavidad)	Fracción de Eyección	Espesor Miocárdico
Dilatada	Sistólica	Dilatado	Disminuida	Normal Disminuido
Hipertrófica	Diastólica	Reducido	Normal	Aumentado
Restrictiva	Diastólica	Normal Reducido Dilatado	Normal Disminuida	Normal Aumentado

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❖ Por término medio el corazón pesa unos **325 gramos** en el **hombre** y unos **275 gramos** en **la mujer**.

HOMBRE

❖ **El tamaño y peso** del corazón **varía considerablemente** dependiendo de la edad, el sexo , la altura del sujeto , la grasa epicárdica y el estado de nutrición general.

MUJER

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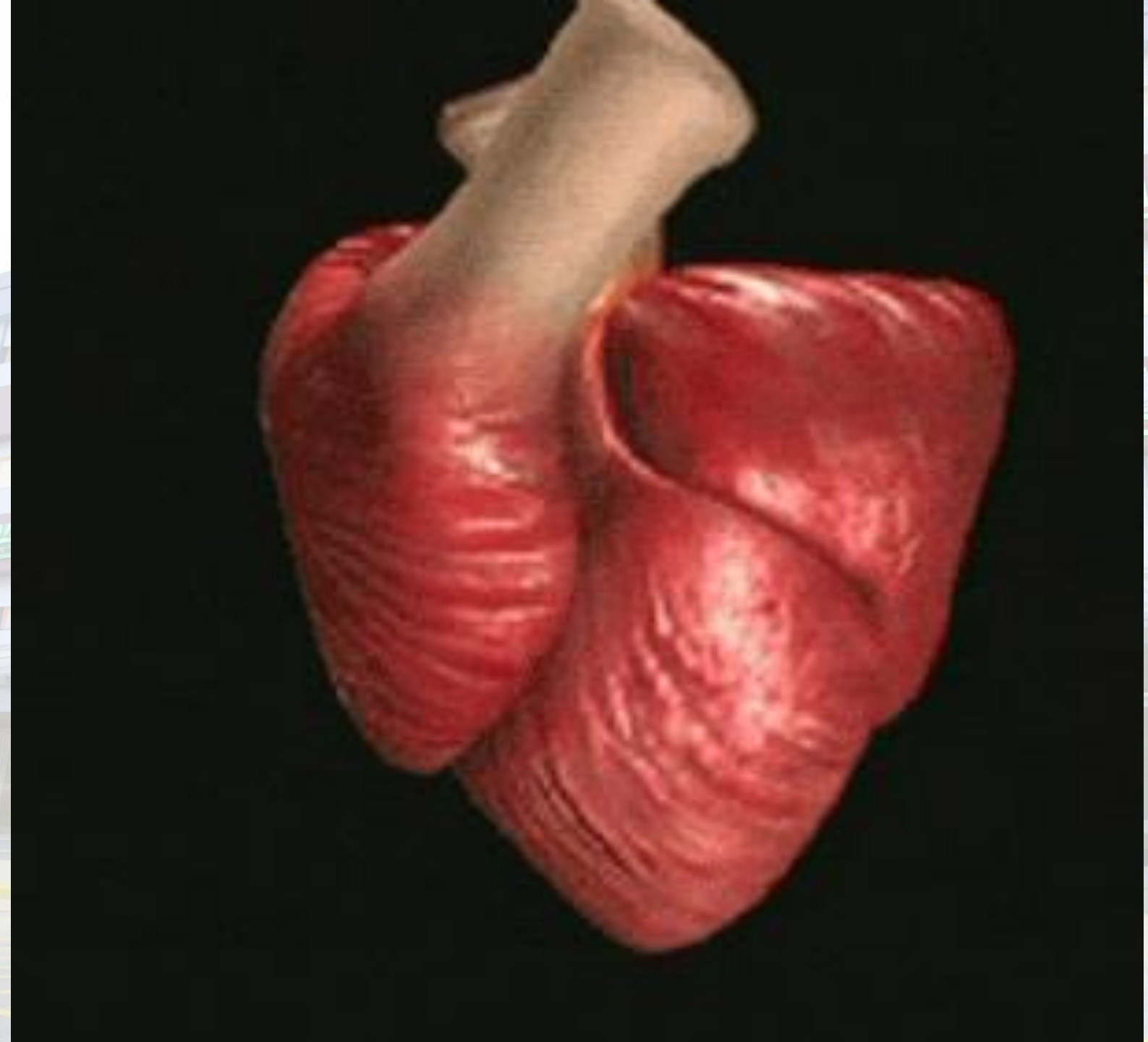
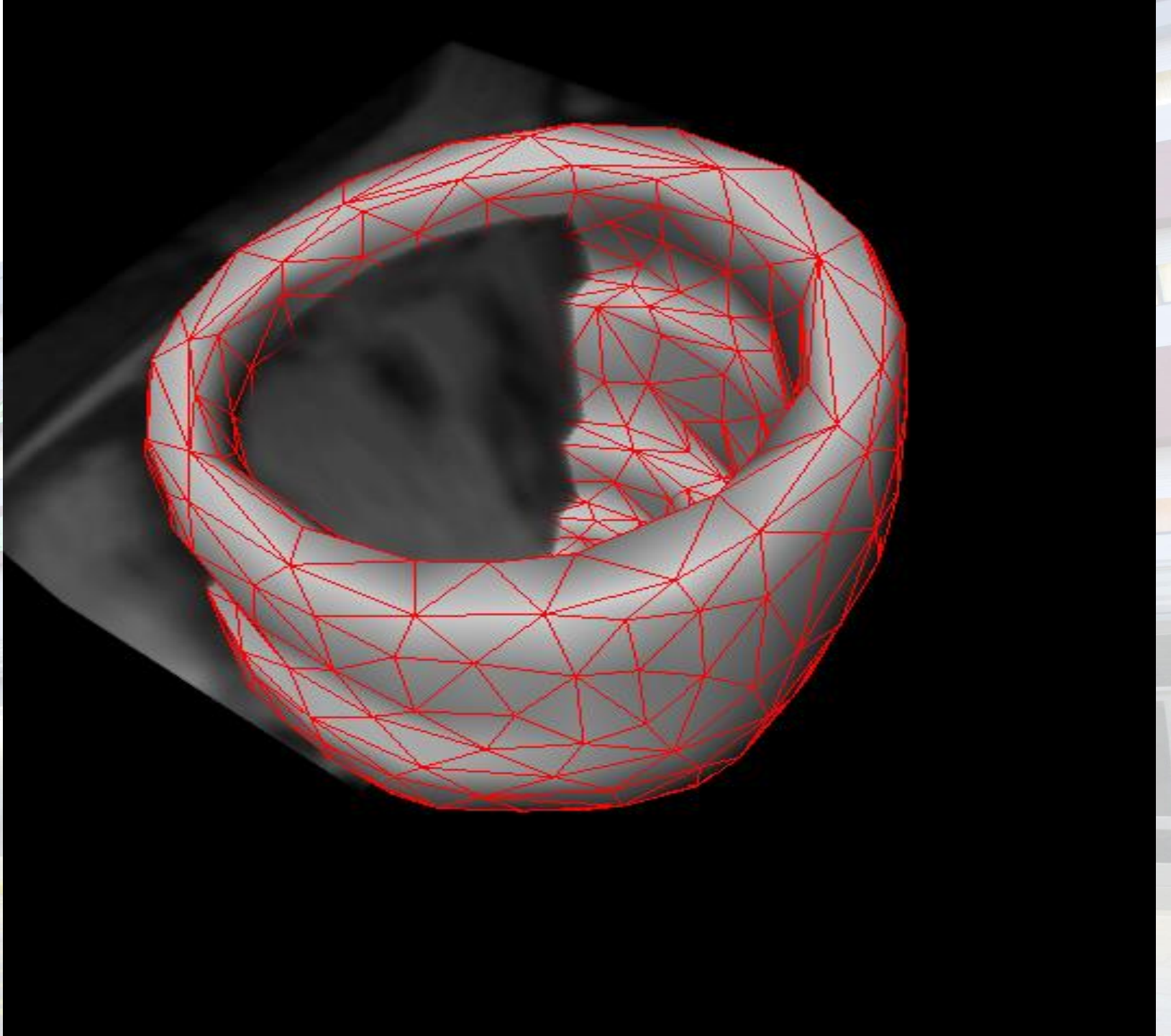
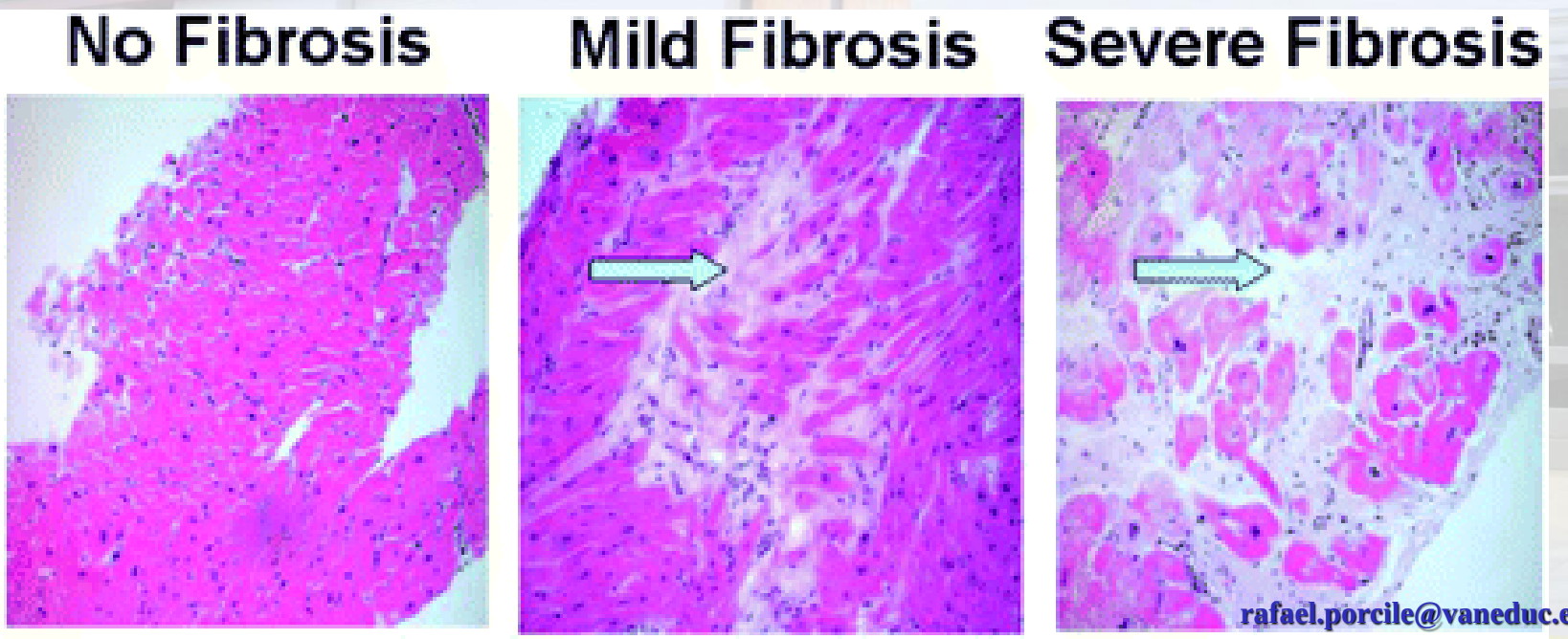



Myheart.net © 2018



Biopsia endomiocardica



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INDICACIONES DE BETP

Definitivas

a. Monitoreo del TxC
b. Monitoreo de la cardiotoxicidad por antraciclina

Posibles

c. Detección y monitoreo de miocarditis
d. Diagnóstico de miocardopatías secundarias
e. Diferenciación entre miocardiopatías restrictivas y constrictivas
f. Cardiomiopatía hipertrófica
g. Diagnóstico de endomiocardiofibrosis

Dudosas

h. Taquiarritmias ventriculares sin diagnóstico preciso y resistente al tratamiento médico
i. Síndrome de inmunodeficiencia adquirida
j. Formulación de un pronóstico en las miocardiopatías dilatadas idiopáticas

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Recommendations for Invasive Evaluation

Recommendation	COR	LOE
Monitoring with a pulmonary artery catheter should be performed in patients with respiratory distress or impaired systemic perfusion when clinical assessment is inadequate	I	C
Invasive hemodynamic monitoring can be useful for carefully selected patients with acute HF with persistent symptoms and/or when hemodynamics are uncertain	IIa	C
When coronary ischemia may be contributing to HF, coronary arteriography is reasonable	IIa	C
Endomyocardial biopsy can be useful in patients with HF when a specific diagnosis is suspected that would influence therapy	IIa	C
Routine use of invasive hemodynamic monitoring is not recommended in normotensive patients with acute HF	III: No Benefit	B
Endomyocardial biopsy should not be performed in the routine evaluation of HF	III: Harm	C

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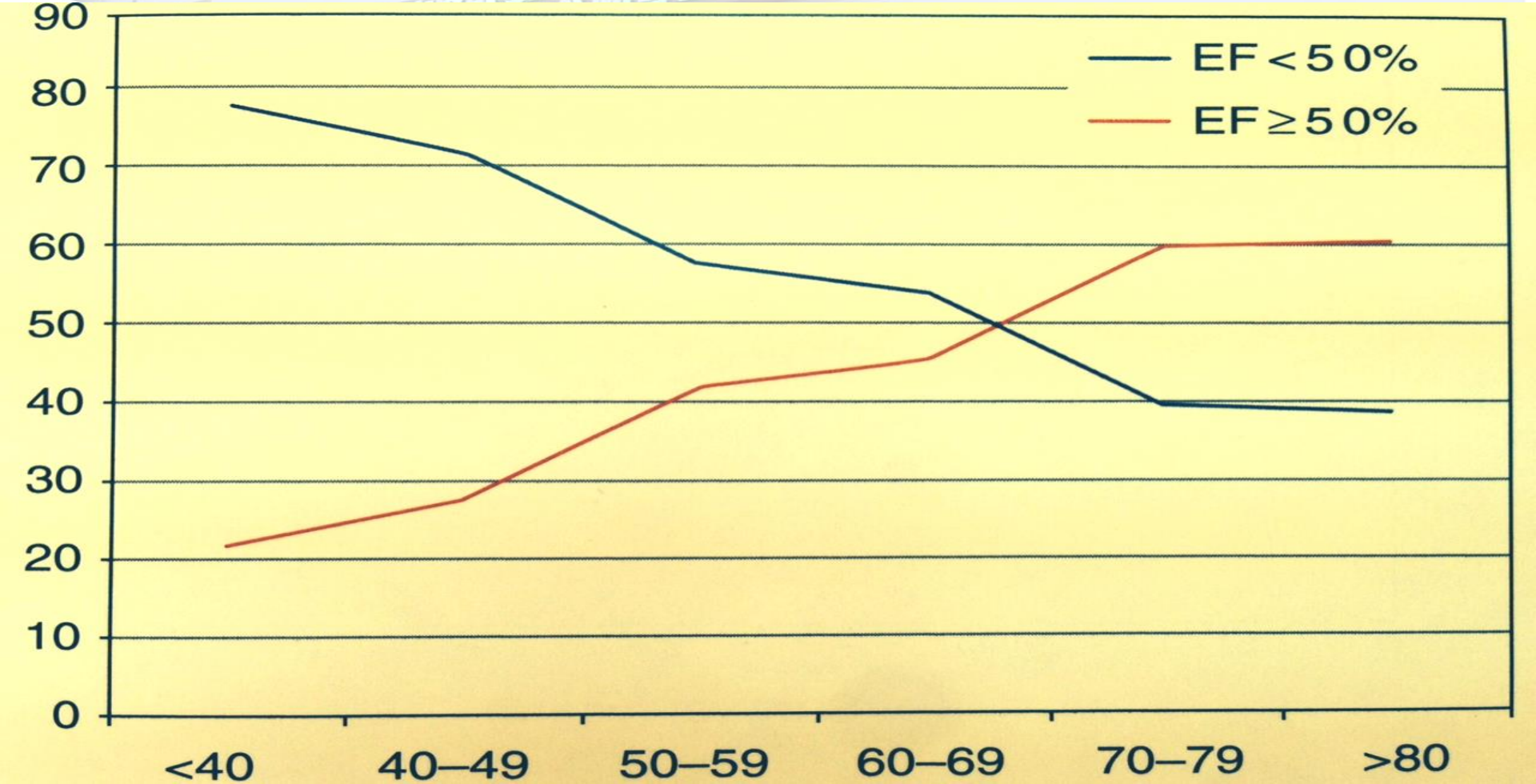
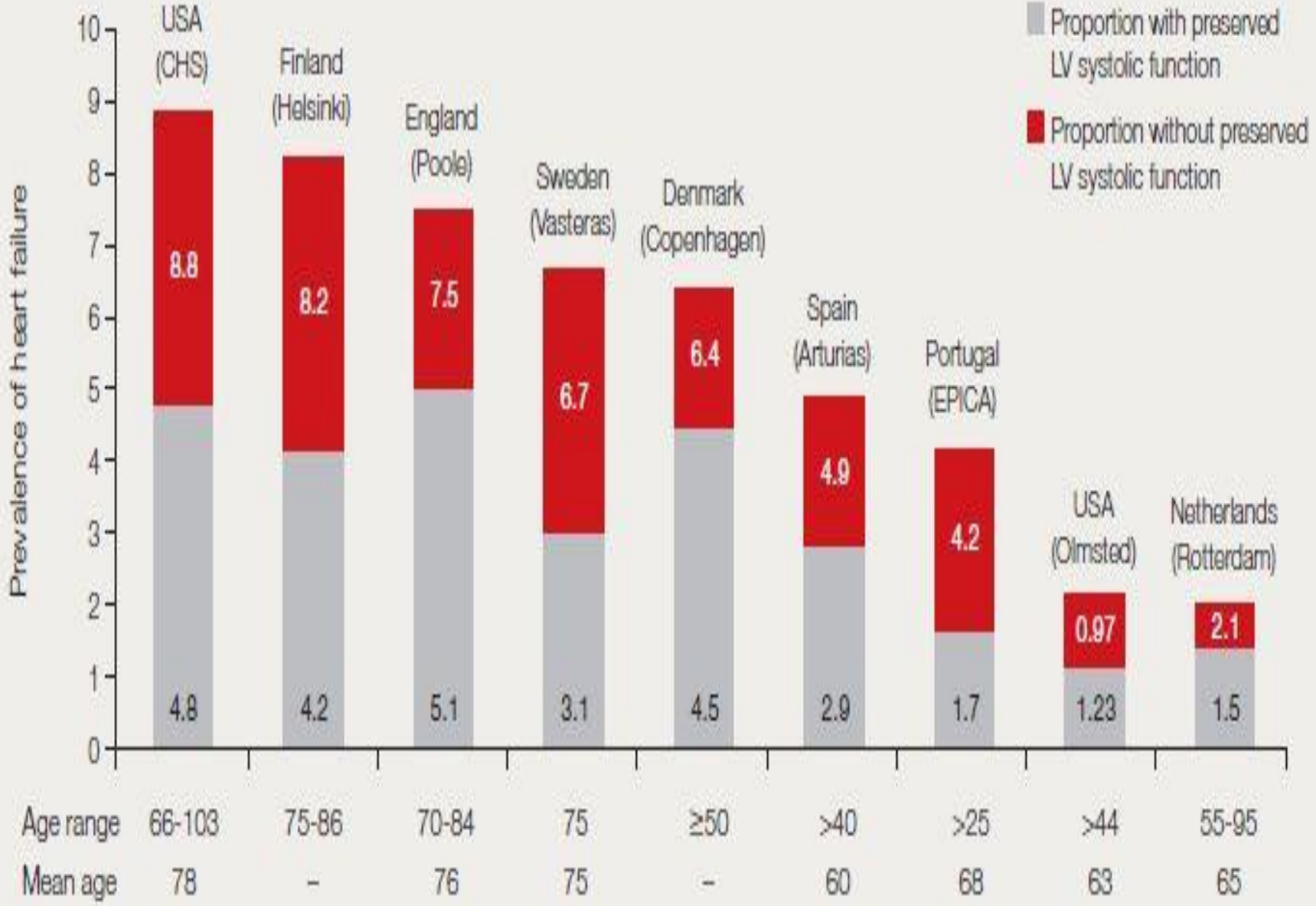
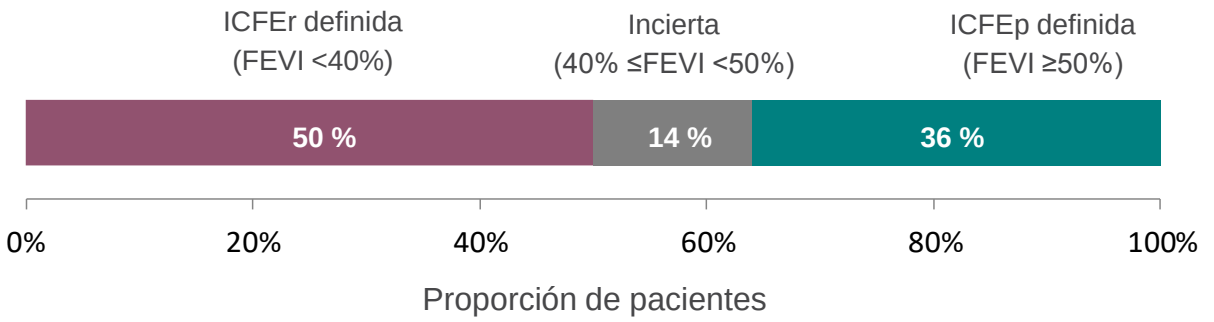
Diferencias etaria fracción de eyección preservada y deteriorada




Proportion with preserved LV systolic function
Proportion without preserved LV systolic function
Prevalence of heart failure
10
9
8
7
6
5
4
3
2
1
0
USA (CHS)
Finland (Helsinki)
England (Poole)
Sweden (Vasteras)
Denmark (Copenhagen)
Spain (Arturias)
Portugal (EPICA)
USA (Olmsted)
Netherlands (Rotterdam)
8.8
8.2
7.5
6.7
6.4
4.9
4.2
0.97
2.1
4.8
4.2
5.1
3.1
4.5
2.9
1.7
1.23
1.5
Age range
66-103
75-86
70-84
75
≥50
>40
>25
>44
55-95
Mean age
78
–
76
75
–
60
68
63
65

Definición de ICFEr e ICFEp



ICFEp: insuficiencia cardíaca con fracción de eyección preservada; ICFEr: insuficiencia cardíaca con fracción de eyección reducida; FEVI: fracción de eyección ventricular izquierda

Steinberg et al. Circulation 2012;126:65–75

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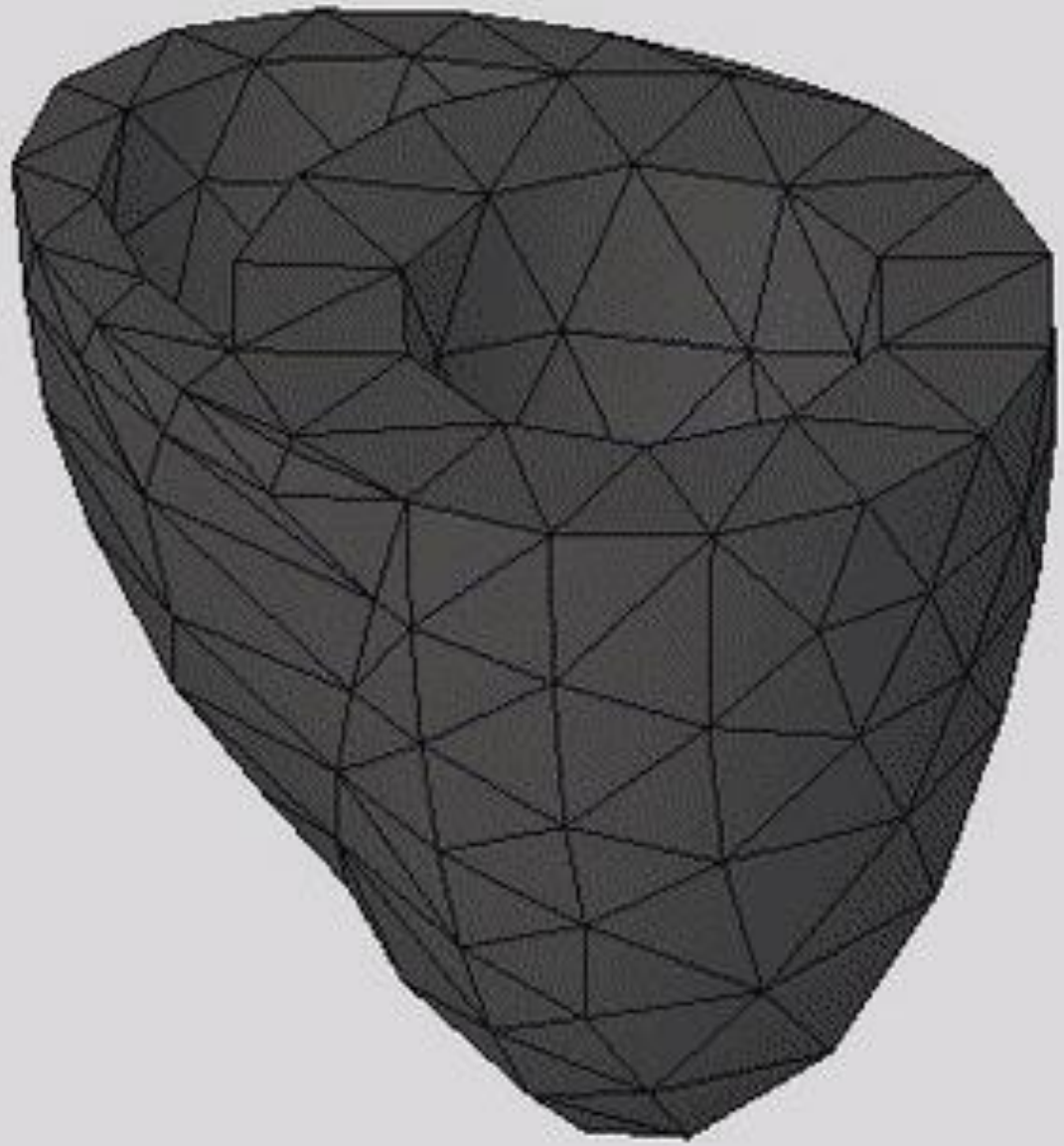
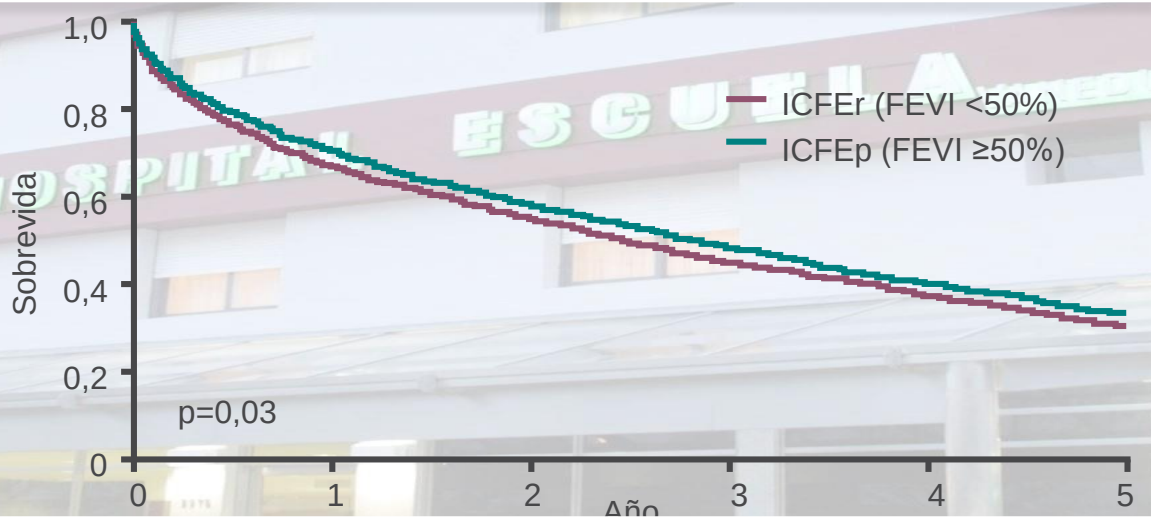


La ICFEp y la ICFEr se asocian con niveles de mortalidad similarmente altos

La tasa de sobrevida de los pacientes con diagnóstico de alta de IC en los EE. UU. fue ligeramente más alta entre los pacientes con ICFEp que entre aquellos con ICFEr entre 1987–20011Las tasas de mortalidad fueron, respectivamente, del 29% y 32% a 1 año y del 65% y 68% a 5 años

En Argentina las etiologías predominantes de IC son la isquémica (40,5%) y la hipertensiva (23,7%). Las causas de descompensación más frecuentes son infecciones, suspensión del tratamiento y transgresión alimentaria. La mediana de permanencia durante una internacion por IC aguda es de 7 (5-11) días. La mortalidad hospitalaria es del 8%. A los 90 días, la reinternación es del 24,5% y la mortalidad pos alta del 12,8%.



- La ICFEp se asocia con una morbimortalidad significativa, pese a tener una tasa de sobrevida ligeramente más alta en comparación con la ICFEr[2,3]

IC: insuficiencia cardíaca; ICFEp: insuficiencia cardíaca con fracción de eyección preservada; ICFEr: insuficiencia cardíaca con fracción de eyección reducida; FEVI: fracción de eyección ventricular izquierda; EE. UU.: Estados Unidos de América

1. Owan et al. N Engl J Med 2006;355:251–9; 2. Blanche et al. Swiss Med Wkly 2010;140:66–72;
3. Meta-analysis Global Group in Chronic Heart Failure (MAGGIC). Eur Heart J 2012;33:1750–7

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¿Que pacientes con insuficiencia cardíaca con fey preservada andan peor?

Phenomapping for Novel Classification of Heart Failure With Preserved Ejection Fraction CLINICAL PERSPECTIVE

Sanjiv J. CIRCULATIONAHA.114.010637 **Published: January 20, 2015**

Phenomapping results in novel classification of HFpEF. Statistical learning algorithms, applied to dense phenotypic data, may allow for improved classification of heterogeneous clinical syndromes, with the ultimate goal of defining therapeutically homogeneous patient subclasses.

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HOSPITAL

Survival free of cardiovascular (CV) hospitalization or death stratified by phenogroup.

Tres sub grupos fenotipicos

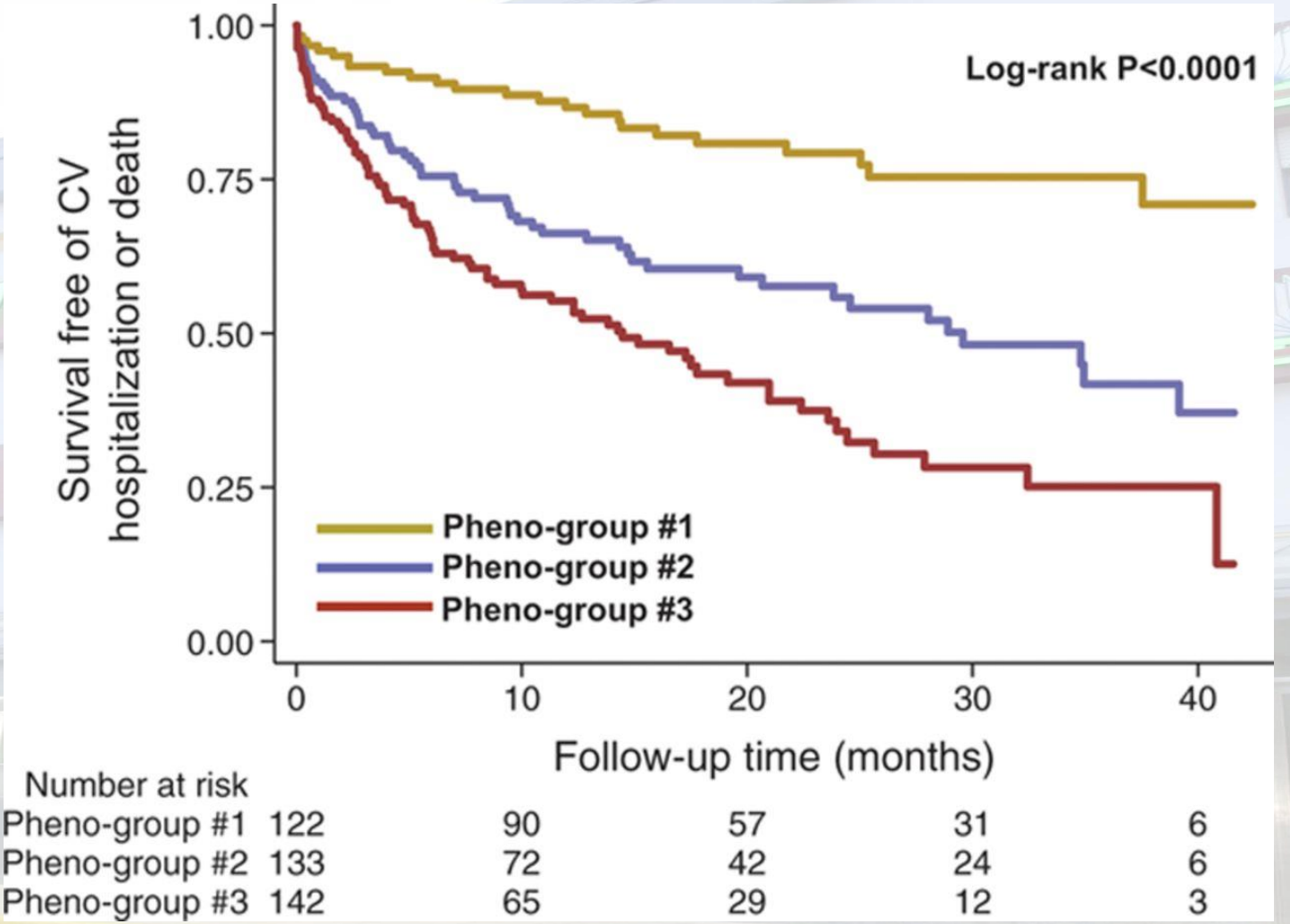
1) Menore de 65 años , bnp bajo, hipertrofia ventricular leve

2) Obesidad , congestión con w y resistencia vasculares pulmonares elevadas

3) Mayores de 65 , bnp elevado, insuficiencia renal

Sanjiv J. Shah et al. Circulation. 2015;131:269-279

Survival free of cardiovascular (CV) hospitalization or death stratified by phenogroup.



Sanjiv J. Shah et al. Circulation. 2015;131:269-279

American Heart Association.

Definición de icc
Epidemiología de la icc
Diagnostico
Etapas de la enfermedad

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Definición de icc

Epidemiología de la icc

Diagnostico

Etapas de la enfermedad

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El DIAGNOSTICO

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El DIAGNOSTICO ES CLINICO

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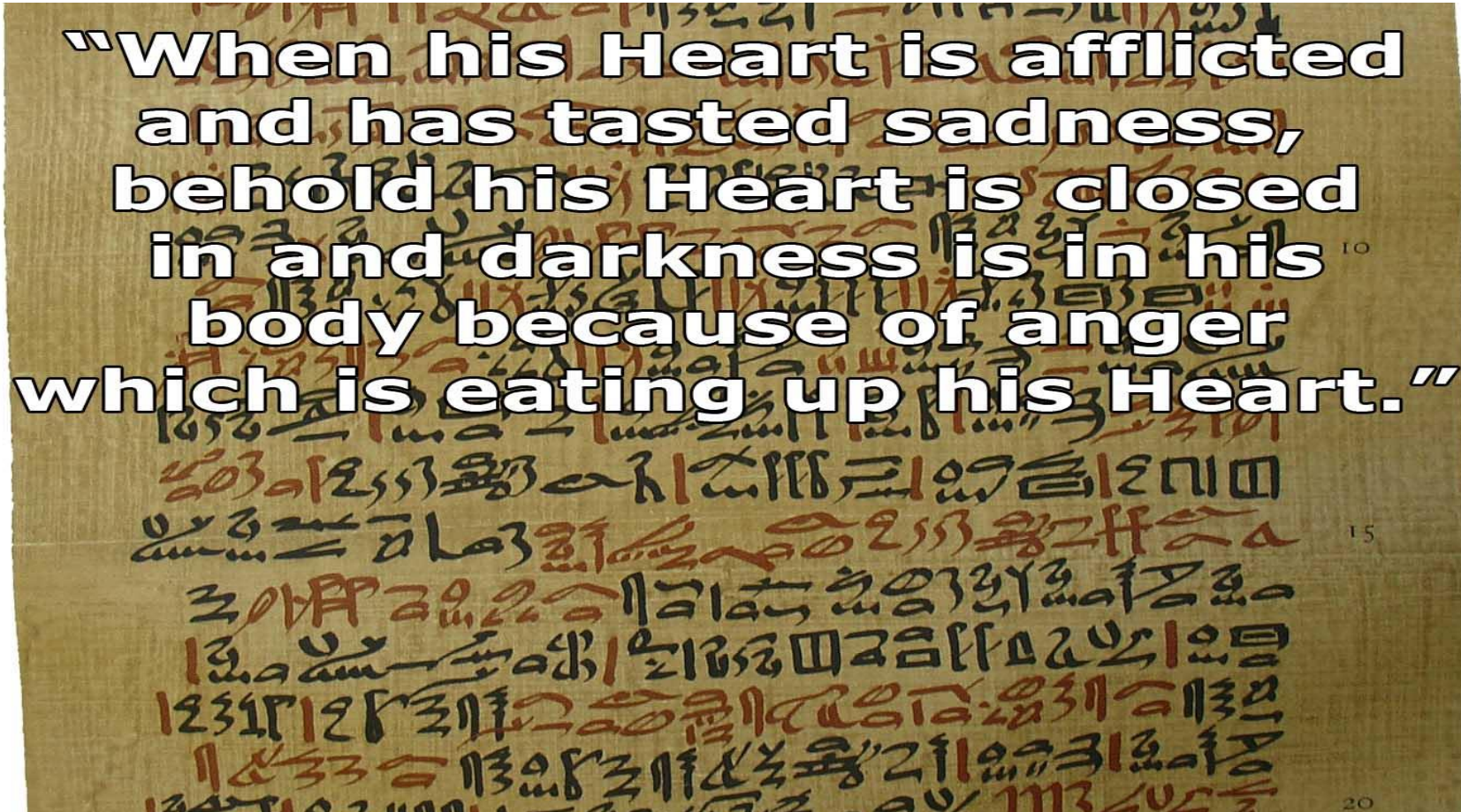
Papiro de eber

Fue redactado en el antiguo Egipto, cerca del año 1500 antes de nuestra era; está fechado en el año 8.º del reinado de Amenhotep I, de la dinastía XVIII.



CRITERIOS MAYORES

Disnea paroxística nocturna,rales, edema agudo de pulmón

Ingurgitación yugular

Presión venosa central mayor a 16

Tiempo circulatorio mayor a 25 segundos

Reflejo hepatoyugular

CRITERIOS MENORES

Edema pretibial,hepatomegalia taquicardia de mas de 120

Capacidad vital disminuida en 33 %

Derrame pleural

Dos mayores o dos menores y un mayor

Escuchando y tocando al paciente

rafael.porcile@vaneduc.edu.ar


BioDigital

Modified Framingham Criteria Diagnosis for Heart Failure

Major criteria

- Neck vein distension
- Orthopnea
- Cardiomegaly on CXR
- CVP > 12 mm Hg
- Left Ventricular dysfunction on EKG
- Weight loss
- Acute pulmonary edema

Minor criteria

- Bilateral ankle edema
- Night cough
- Dyspnea on exertion
- Hepatomegaly
- Pleural effusion
- Tachycardia (> 120 beats/min)

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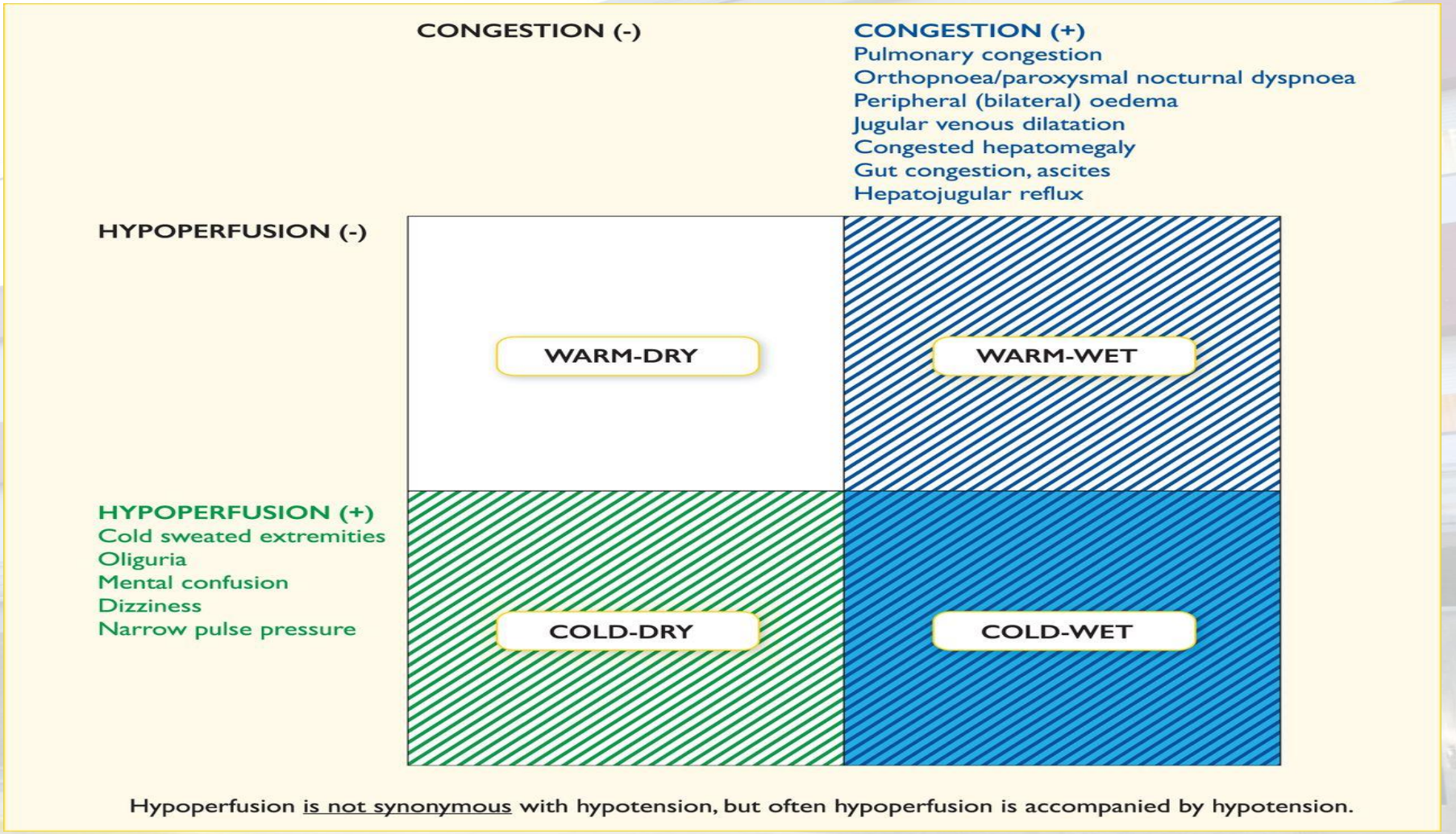
Clinical profiles of patients with heart failure based on the presence/absence of congestion and/or hypo perfusion.



Piotr Ponikowski et al. Eur Heart J 2016;37:2129-2200

European Heart Journal

1. 02
2. CONTROL TA/FC
3. CONSIDERAR PRUEBA VOL.
4. CONSIDERAR RESP A EVALUACION CON CATETER PULMONAR
5. FACTORES/CO-MORBILIDADES
6. VASOPRESORES SI PAS < 90 (NORA(DOPA)
7. INODILATADOR (DOBUTA,MILRI-NONE,LEVOSI-MENDAN

SIGNOS INSUFICIENCIA CARDIACA

CARDIOVASCULARES

- Distensión de las venas del cuello
- Reflujo hepatoyugular
- Cardiomegalia
- Choque apexiano
- Latidos torácicos
- Ritmo de galope
- Soplos (insuficiencia mitral- tricúspide- pulmonar)
- Primer y segundo ruidos disminuidos

PULMONARES

- Estertores crepitantes
- Roncus
- Frote pleural
- Sibilancias
- Derrame pleural

ABDOMINALES

- Ascitis
- Hepatomegalia/esplenomegalia
- Pulso hepático
- Ruidos abdominales disminuidos

SISTEMICO

- Acrocianosis
- Edema
- Aumento de peso (edema)
- Perdida de peso (caquexia)

NEUROLOGICO

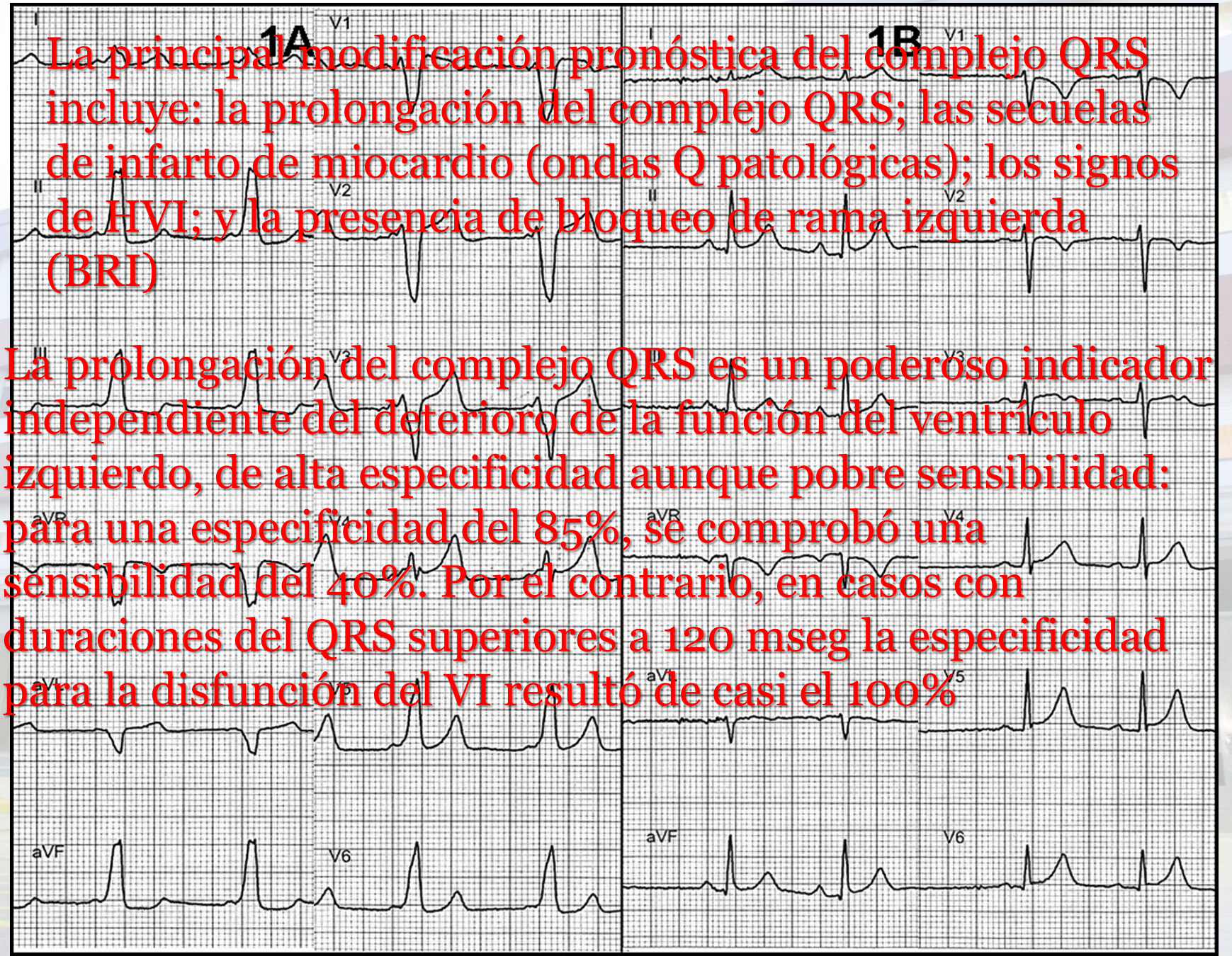
- Anomalías del estado mental

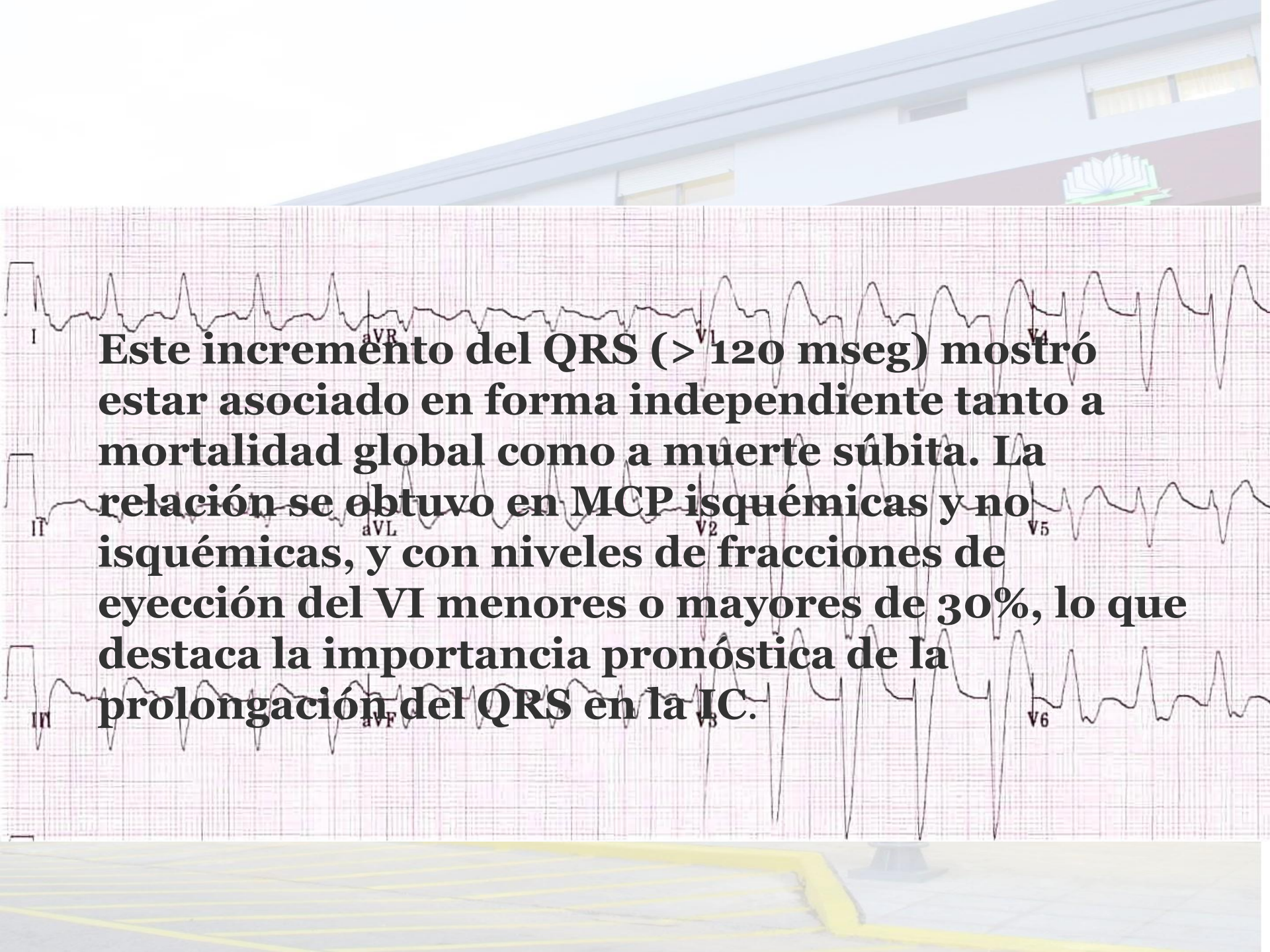
Right-sided CHF

Ecg en insuficiencia cardíaca

La principal modificación pronóstica del complejo QRS incluye: la prolongación del complejo QRS; las secuelas de infarto de miocardio (ondas Q patológicas); los signos de HVI; y la presencia de bloqueo de rama izquierda (BRI)

La prolongación del complejo QRS es un poderoso indicador independiente del deterioro de la función del ventrículo izquierdo, de alta especificidad aunque pobre sensibilidad: para una especificidad del 85%, se comprobó una sensibilidad del 40%. Por el contrario, en casos con duraciones del QRS superiores a 120 mseg la especificidad para la disfunción del VI resultó de casi el 100%





Este incremento del QRS (> 120 mseg) mostró estar asociado en forma independiente tanto a mortalidad global como a muerte súbita. La relación se obtuvo en MCP isquémicas y no isquémicas, y con niveles de fracciones de eyección del VI menores o mayores de 30%, lo que destaca la importancia pronóstica de la prolongación del QRS en la IC.

La presencia de BRI es un doble indicador de morbi-mortalidad. Se asocia a progresión de la IC, ya que produce profundos efectos hemodinámicos, entre los que se destacan:

la asincronía de la contracción ventricular;

la pérdida de la contribución septal a la mecánica sistólica ventricular;

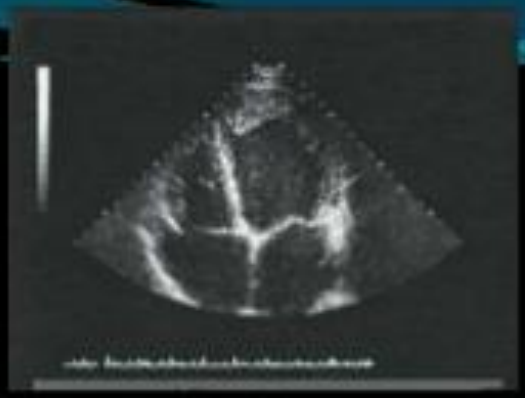
la remodelación y dilatación ventricular progresivas;
el incremento de la insuficiencia mitral;

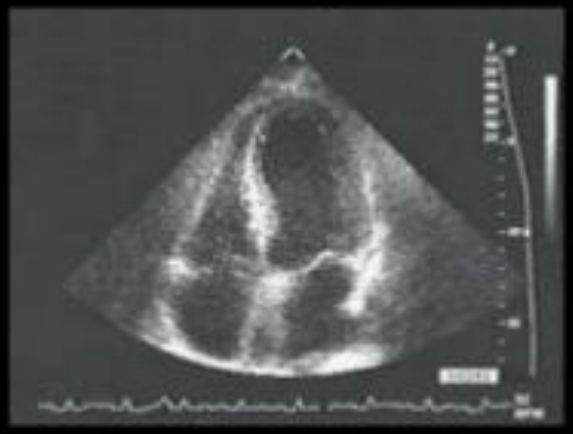
la alteración de la perfusión miocárdica detectada por estudios de medicina nuclear de etiología incierta, etc

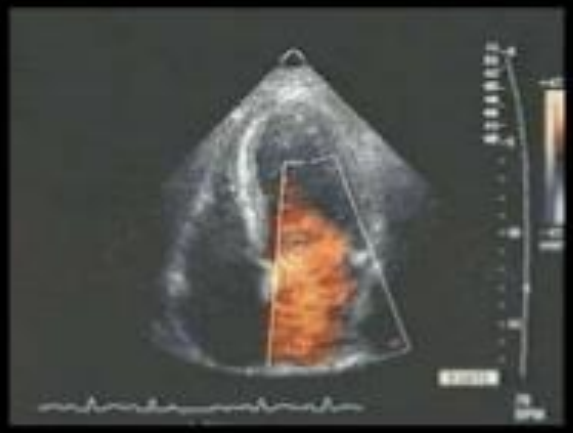
El ecocardiograma en insuficiencia cardíaca

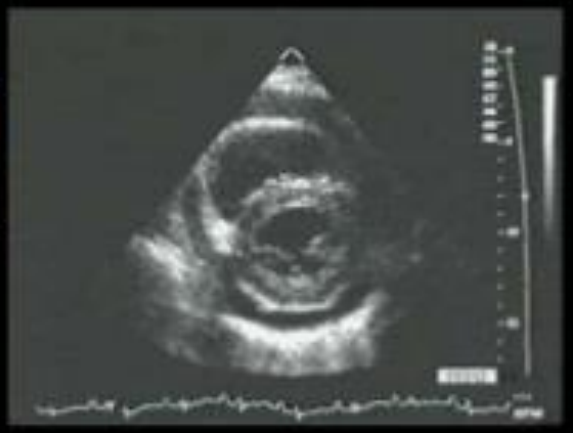
Ecocardiograma

- Confirmar o descartar diagnóstico
- Sistólica y/o diastólica
- Etiología
- Severidad
- Diagnósticos diferenciales









SYSTOLIC DYSFUNCTION

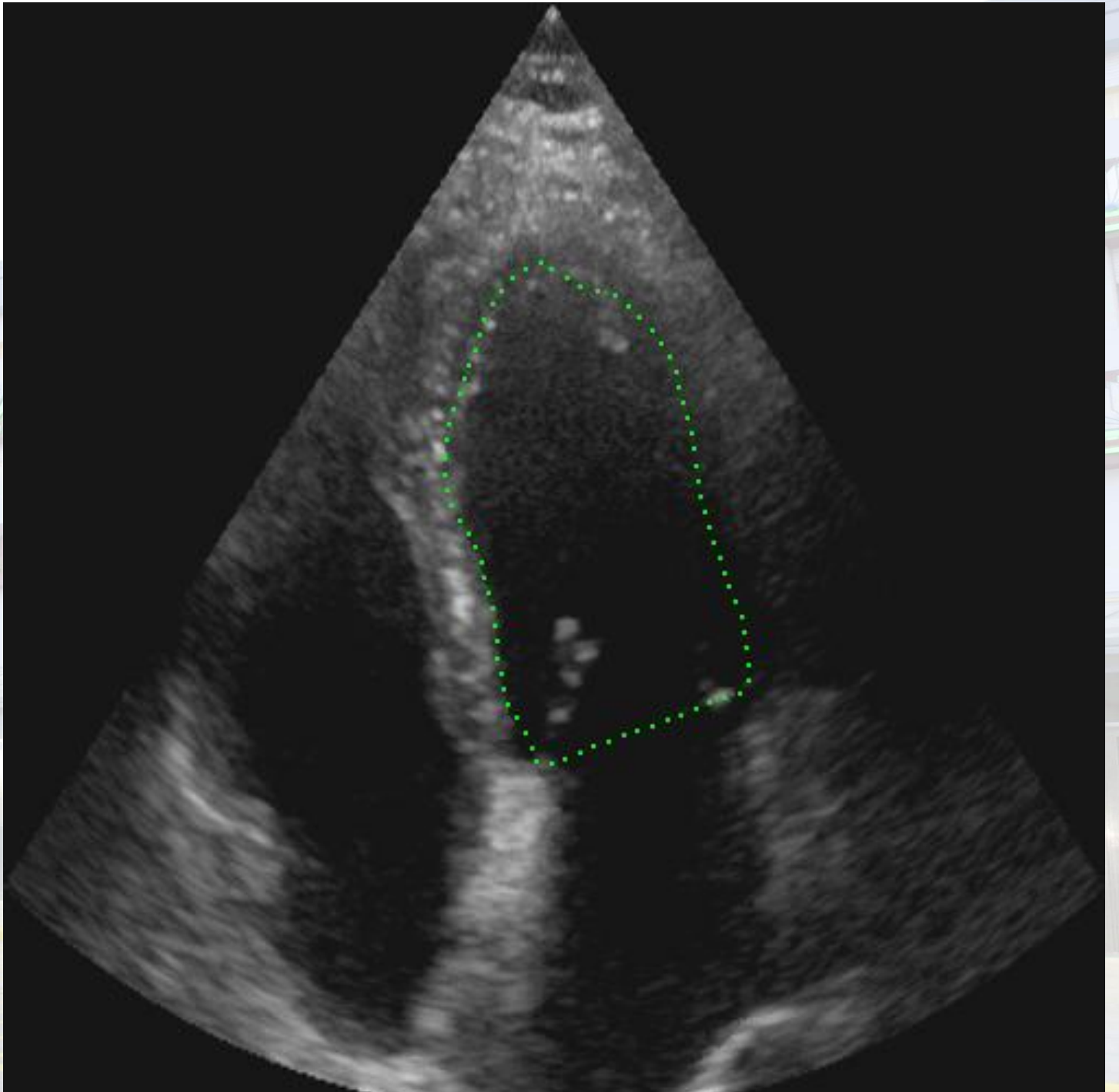
EF < 50%

Normal EF= 50-70%

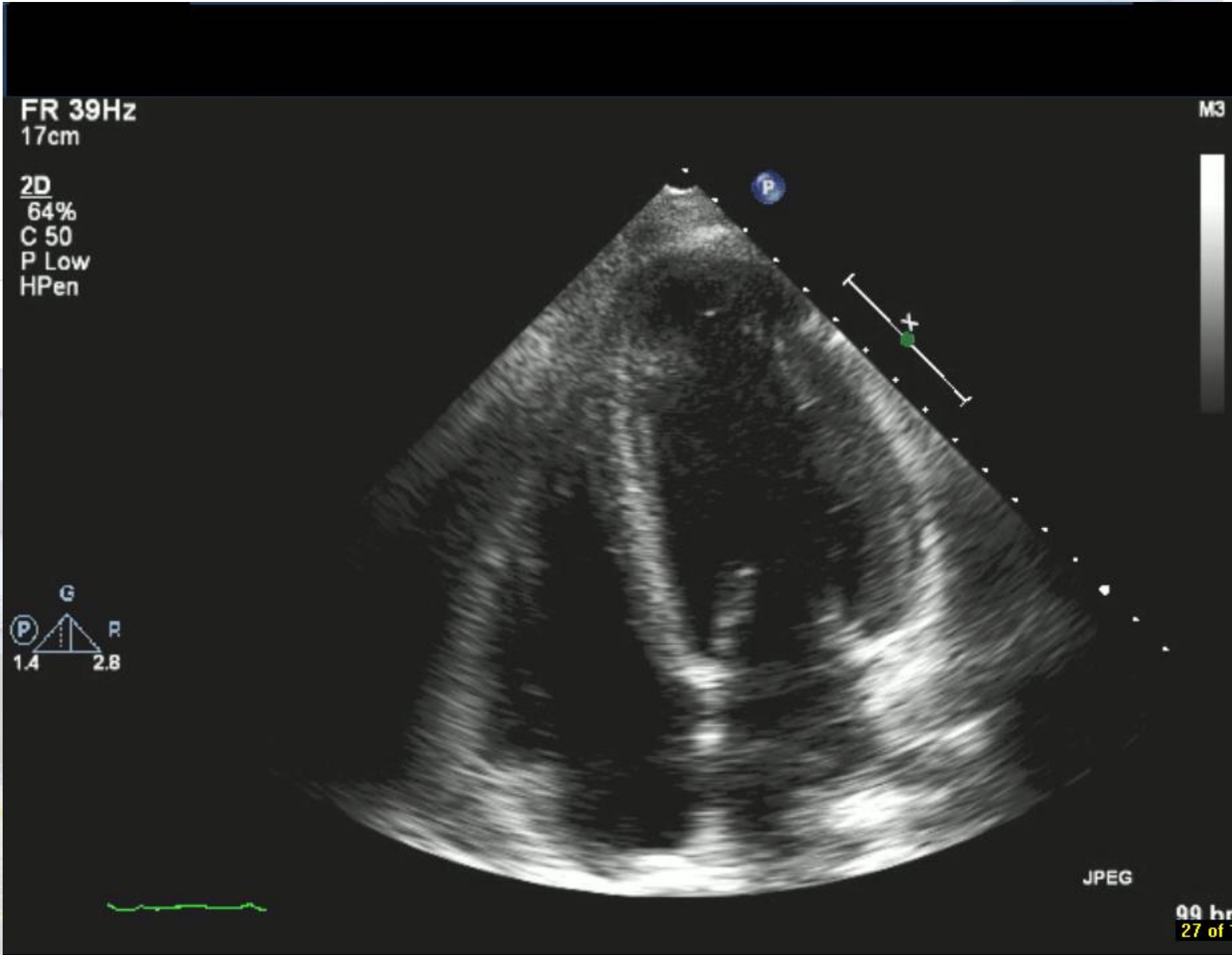
DIASTOLIC DYSFUNTION

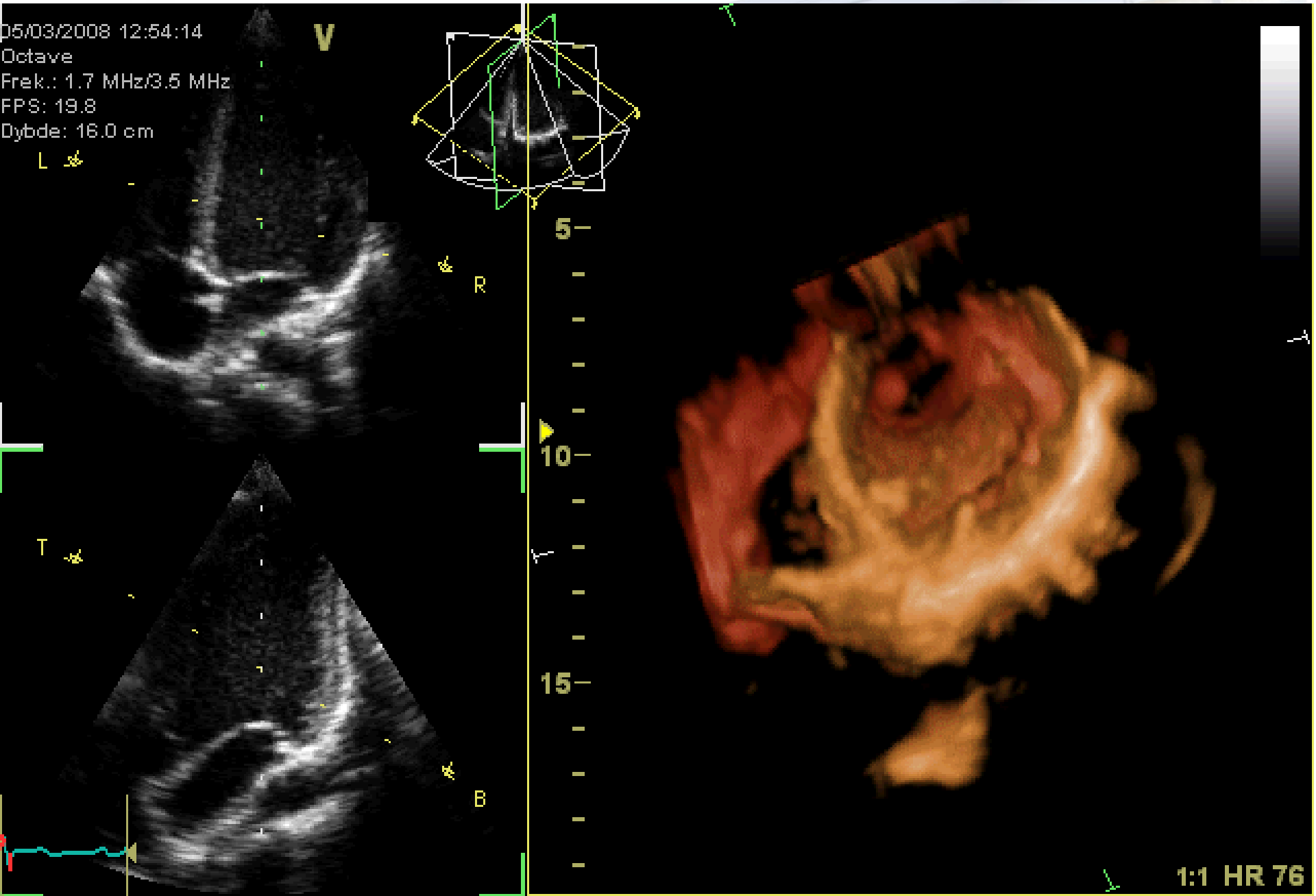
EF = Normal

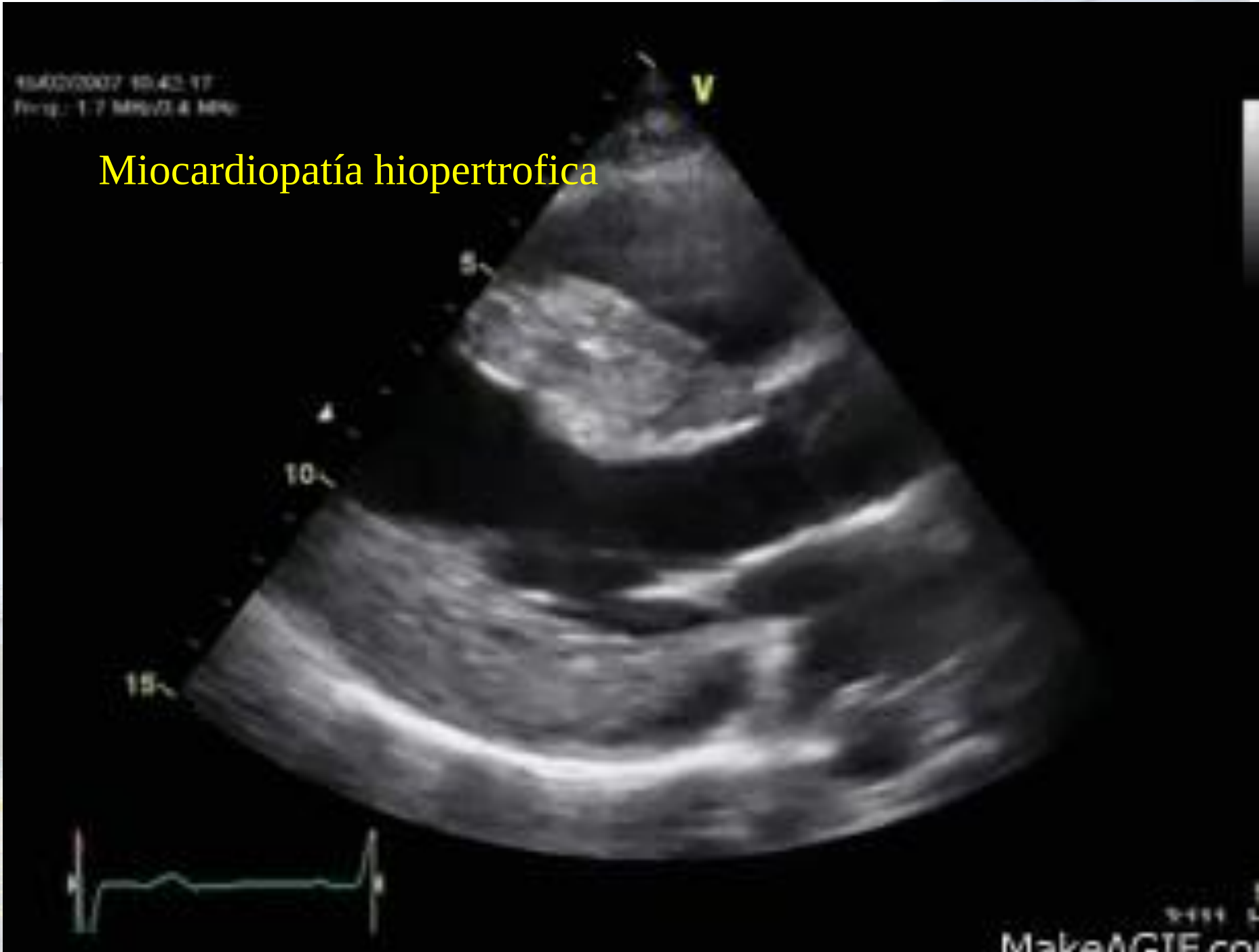
Normal EF= 50-70%

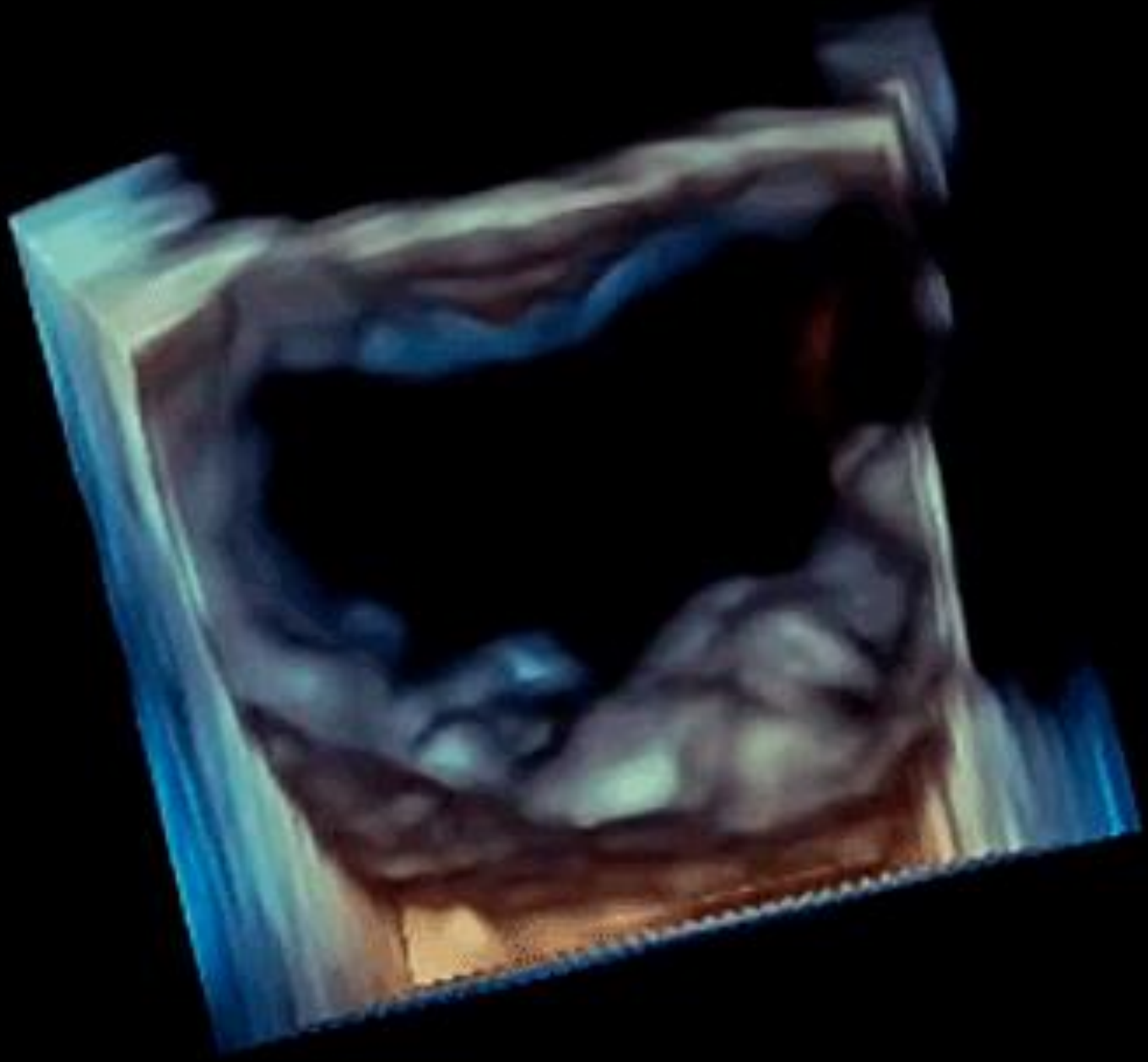


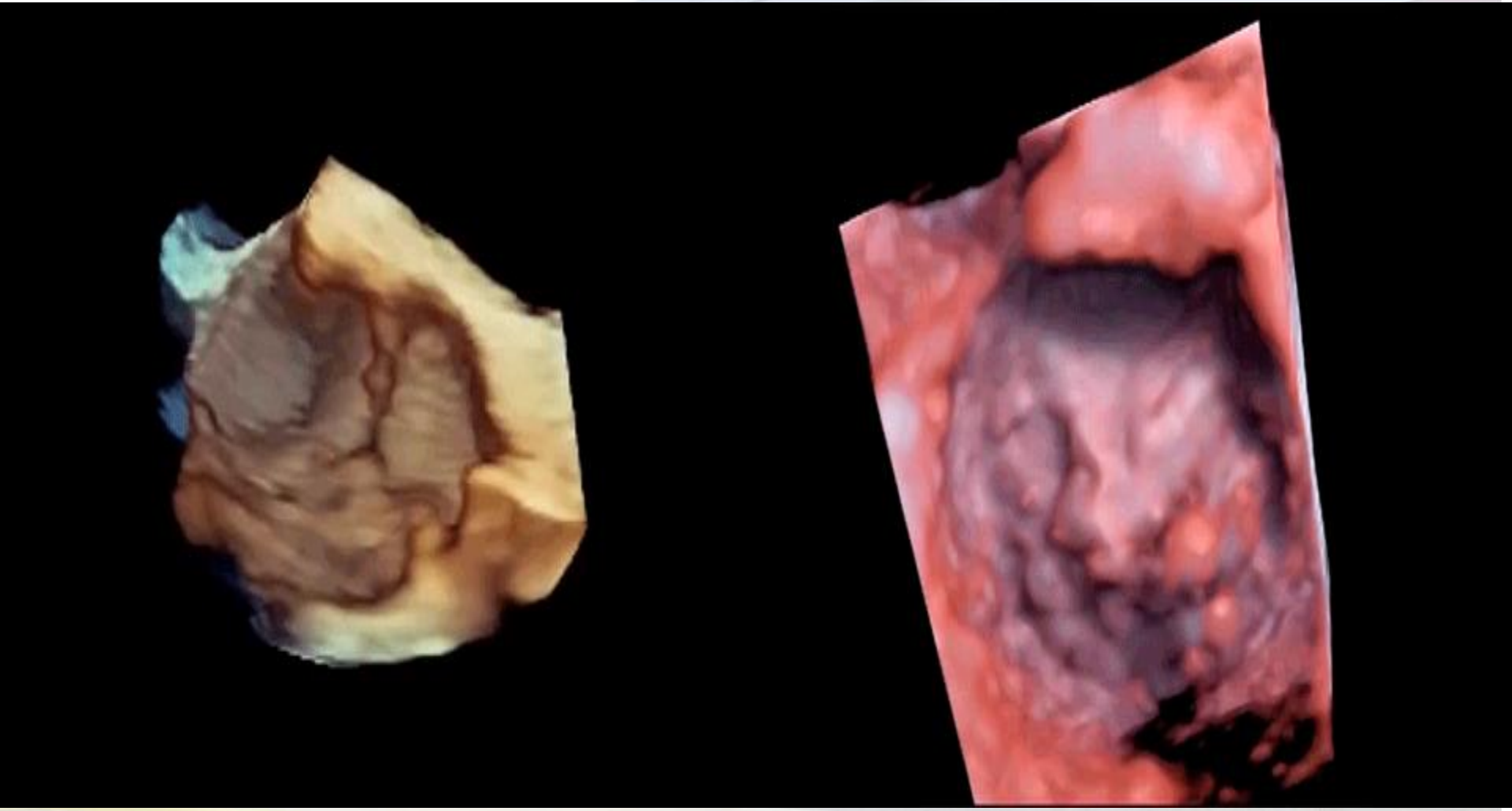

Miocardio no compacto


FR 39Hz
17cm
M3
2D
64%
C 50
P Low
HPen
P
G
P
R
1.4
2.8
JPEG
27 of


05/03/2008 12:54:14
Octave
Frek.: 1.7 MHz/3.5 MHz
FPS: 19.8
Dybde: 16.0 cm
V
L
R
T
B
5
10
15
1:1 HR 76


Miocardiopatía hiopertrofica





Acta Colomb Cuid Intensivo. 2015;xxx(xx):xxx–xxx

Acta Colombiana de
Cuidado Intensivo
www.elsevier.es/acci

ORIGINAL

Ecografía pulmonar para la valoración del agua pulmonar extravascular en el seguimiento de pacientes con edema pulmonar en ventilación mecánica: estudio piloto

Ricardo Ardila-Castellanos[a,*], **Victoria García-Velásquez**[b], **Kevin Hurtado**[c] y **Francisco Naranjo**[d]

[a] *Internista, Neumólogo, Intensivista, Epidemiólogo, Clínica FOSCAL, Universidad Autónoma de Bucaramanga, Bucaramanga, Santander, Colombia*
[b] *Obstetra-Intensivista, Clínica FOSCAL, Bucaramanga, Santander, Colombia*
[c] *Residente de Radiología, Clínica FOSCAL, Universidad Autónoma de Bucaramanga, Bucaramanga, Santander, Colombia*
[d] *Internista, Neumólogo, Intensivista, Coordinador de la Unidad de Cuidados Intensivos de Adultos, Clínica FOSCAL, Universidad Autónoma de Bucaramanga, Bucaramanga, Santander, Colombia*

Recibido el 27 de septiembre de 2015; aceptado el 29 de octubre de 2015

PALABRAS CLAVE
Ultrasonido pulmonar;
Edema pulmonar;
Agua pulmonar extravascular

Resumen

Antecedentes: El agua pulmonar extravascular (EVLW) es la cantidad de agua que está contenida en los pulmones, fuera de la vasculatura pulmonar, y que corresponde a la suma de los líquidos intersticial, alveolar, intracelular y linfático. Algunos estudios han demostrado la utilidad de la ecografía pulmonar para la medición indirecta del EVLW. Se plantea un estudio piloto para evaluar la correlación de la medición del agua pulmonar entre la ecografía pulmonar y el método de termodilución transpulmonar en pacientes en ventilación mecánica invasiva con diagnóstico establecido de edema pulmonar.

Diseño: Estudio piloto doble enmascarado de evaluación de tecnología diagnóstica por muestreo transversal durante un periodo de 6 meses, que compara la ecografía pulmonar con la termodilución transpulmonar por la técnica PiCCO® para el seguimiento de pacientes en ventilación mecánica con edema pulmonar.

Resultados: Veintidós mediciones de ecografía pulmonar con su correspondiente evaluación por termodilución transpulmonar. Se encontró una correlación entre el número de «cometas pulmonares» (líneas B) y el EVLW, $r = 0{,}61$ ($p = 0{,}002$).

Conclusión: Existe una correlación positiva entre el valor del EVLW y el conteo de «cometas pulmonares» por ecografía en los pacientes con diagnóstico ya establecido de edema pulmonar en ventilación mecánica.

* Autor para correspondencia.

L a prueba se considera positiva si se observan al menos 3 “líneas B” en cada espacio estudiado, con artefactos múltiples y difusos de distribución bilateral

Ecografía pulmonar normal con una única “línea B”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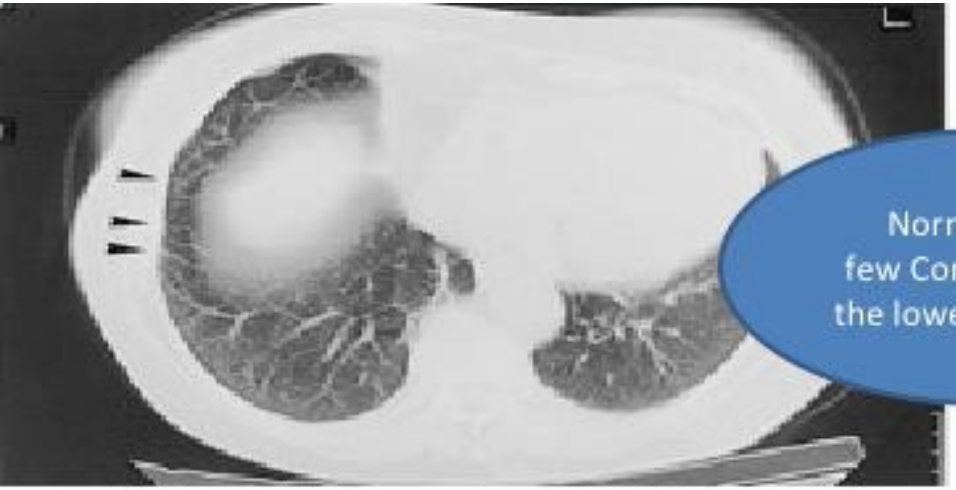
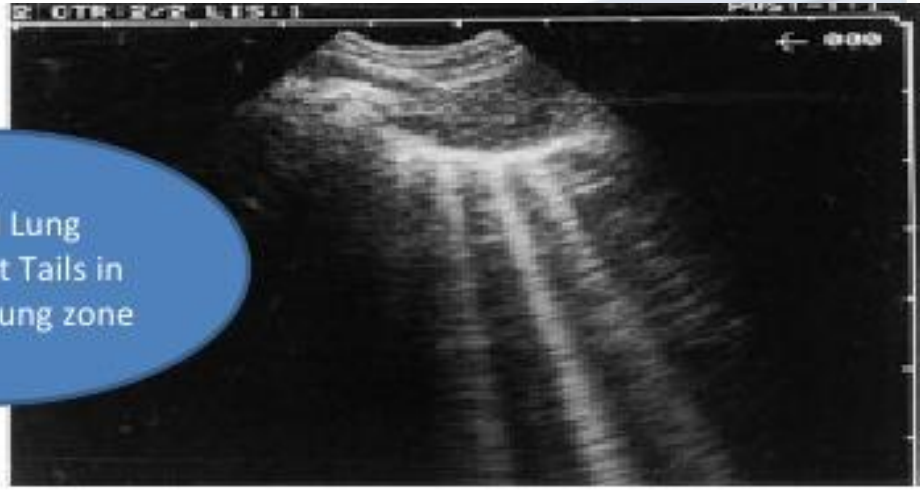
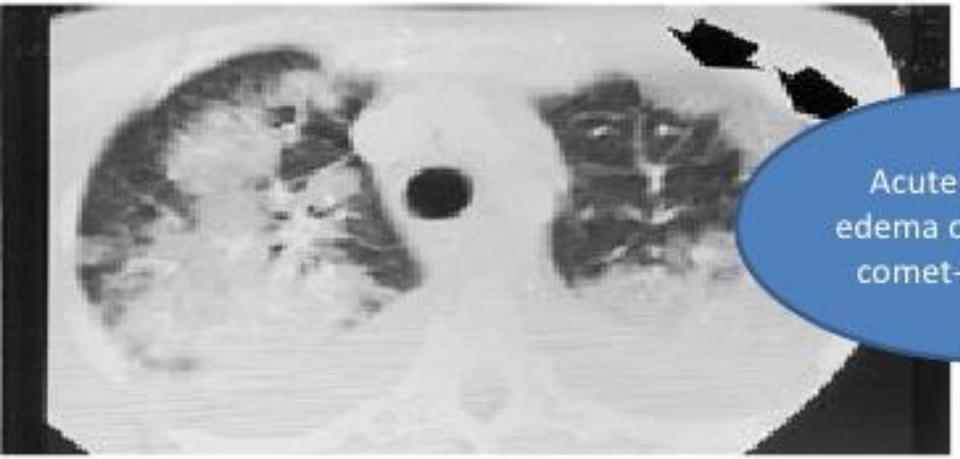
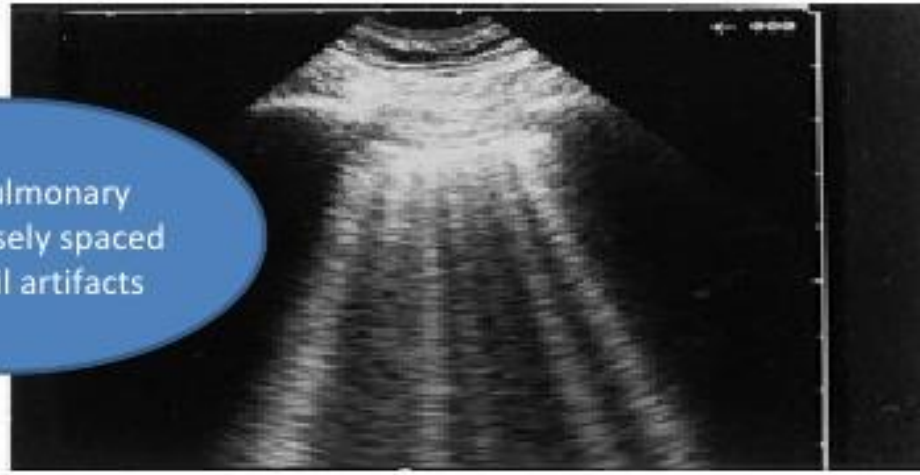
COSMOS
3부. 지식이 두려움을 정복할 때



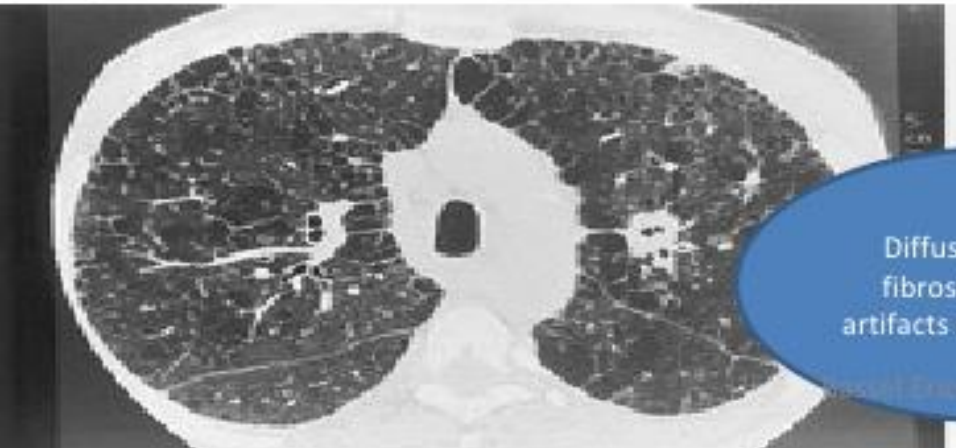


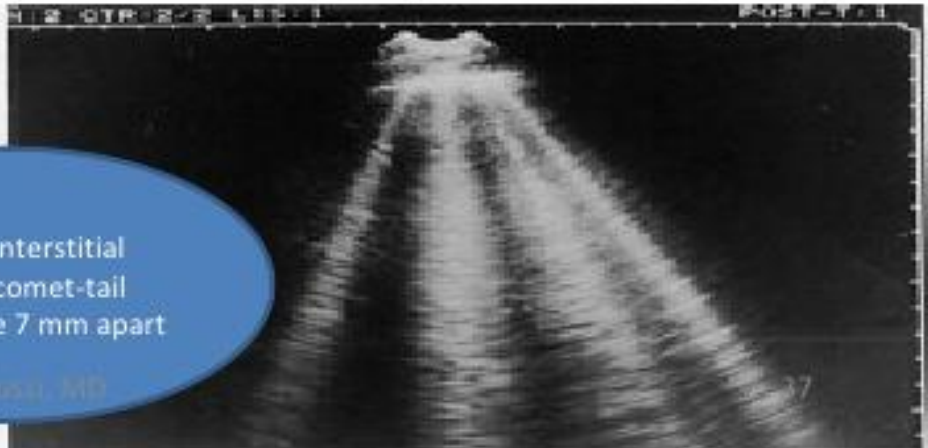
Normal Lung
few Comet Tails in
the lower lung zone





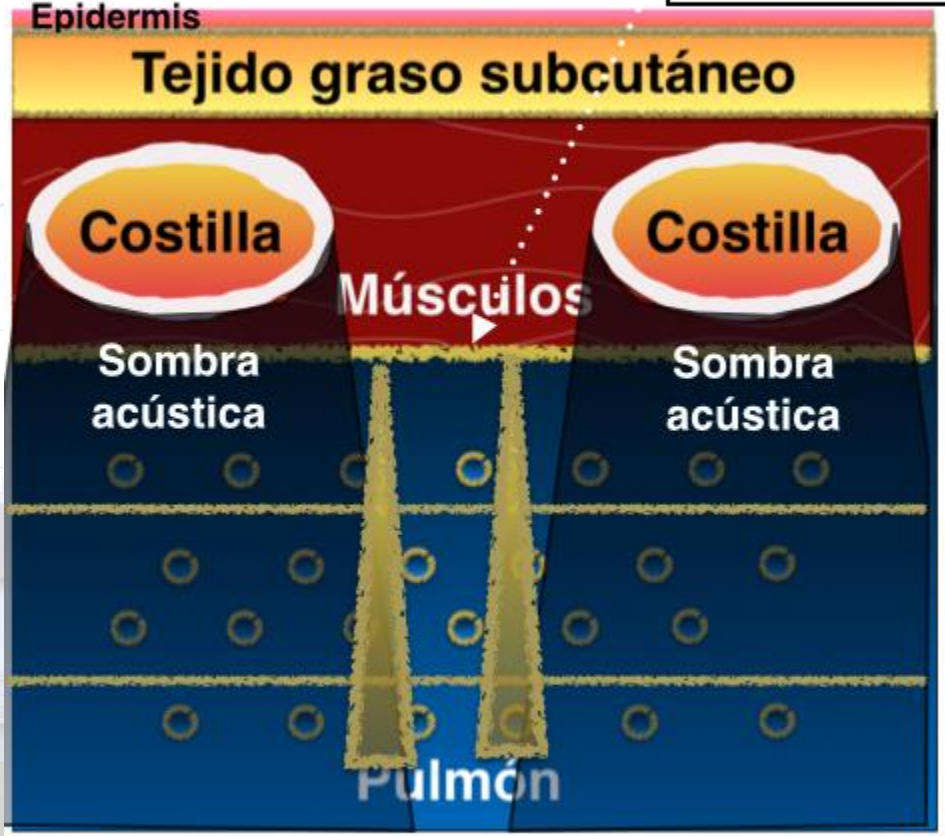
Acute pulmonary
edema closely spaced
comet-tail artifacts

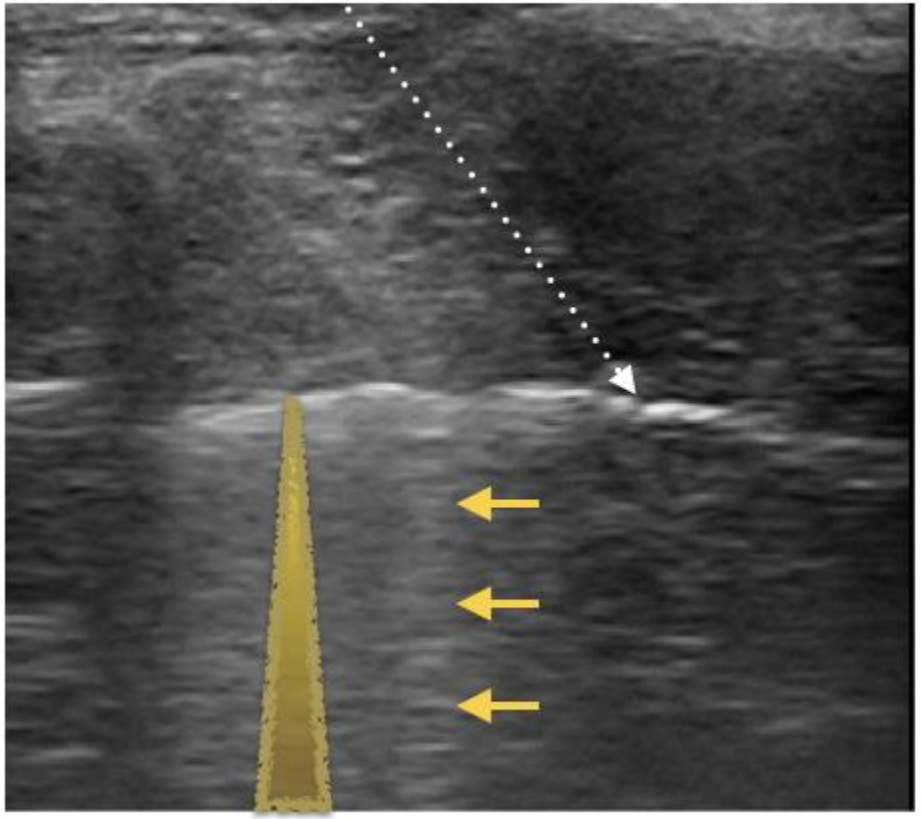




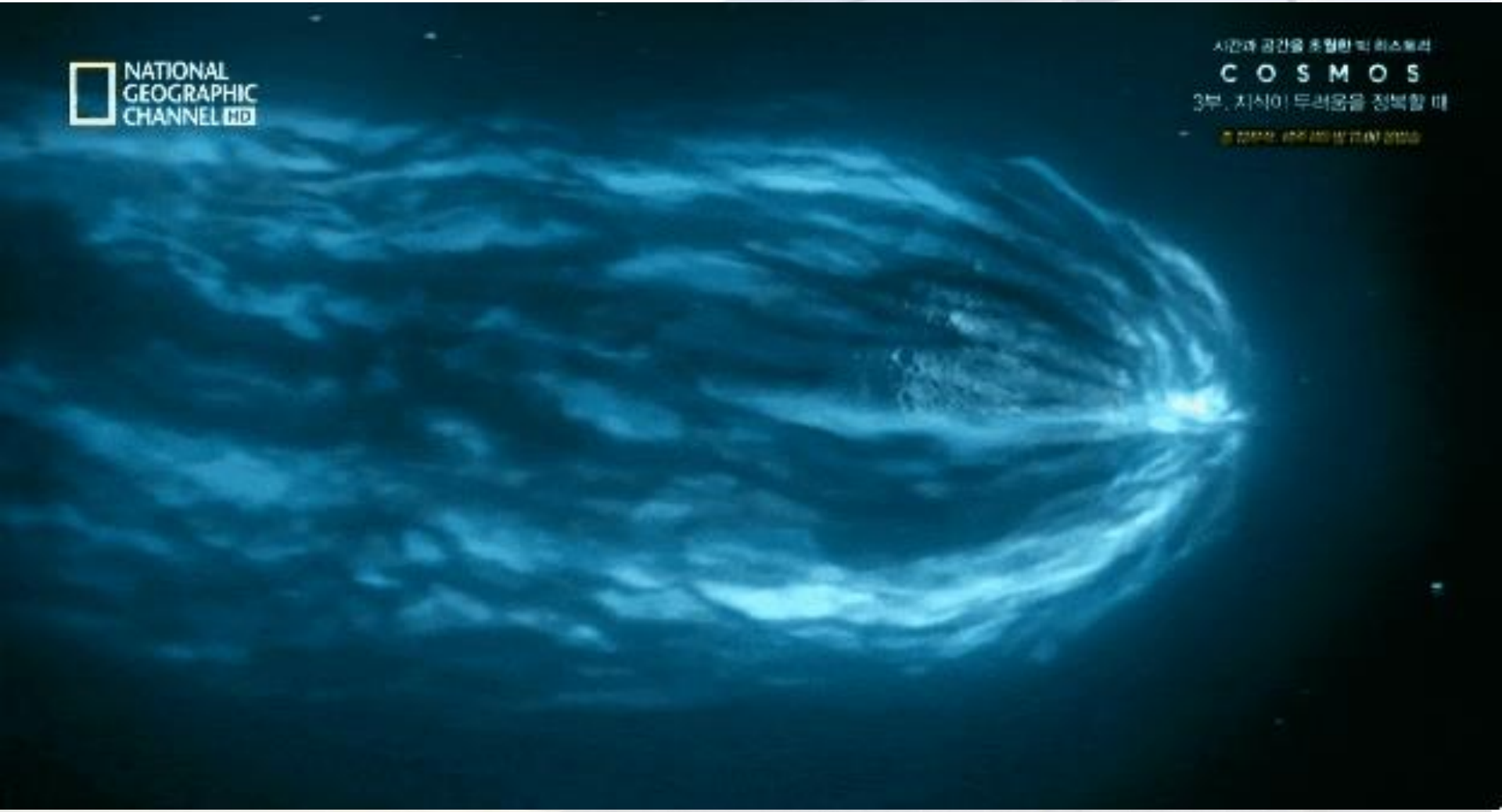
Diffuse interstitial
fibrosis comet-tail
artifacts are 7 mm apart

LINEA PLEURAL





LINEAS B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3부. 지식이 두려움을 정복할 때

LINEAS B/ COLA DE COMETA

- Origen en la línea pleural hasta parte inferior de la pantalla
- Se mueven con el deslizamiento pulmonar
- Normal en zonas inferiores del pulmón (3-4 líneas) en 10-11 espacio intercostal
- Correlación con presencia de agua extravascular pulmonar

Si >= 7 mm de separación: afectación de septos intra-lobares

- Fibrosis intersticial

< 3 mm de separación: proceso intra-alveolar

- Edema pulmonar o SDRA

Mathis G . Chest Sonography . Heidelberg, Germany : Springer Verlag; 2008.

2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure

DOI: http://dx.doi.org/10.1093/eurheartj/ehw1282129-2200 First published online: 20 May 2016

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Symptoms	Signs
Typical	**More specific**
Breathlessness Orthopnoea Paroxysmal nocturnal dyspnoea Reduced exercise tolerance Fatigue, tiredness, increased time to recover after exercise Ankle swelling	Elevated jugular venous pressure Hepatojugular reflux Third heart sound (gallop rhythm) Laterally displaced apical impulse
Less typical	**Less specific**
Nocturnal cough Wheezing Bloated feeling Loss of appetite Confusion (especially in the elderly) Depression Palpitations Dizziness Syncope Bendopnea[53]	Weight gain (>2 kg/week) Weight loss (in advanced HF) Tissue wasting (cachexia) Cardiac murmur Peripheral oedema (ankle, sacral, scrotal) Pulmonary crepitations Reduced air entry and dullness to percussion at lung bases (pleural effusion) Tachycardia Irregular pulse Tachypnoea Cheyne Stokes respiration Hepatomegaly Ascites Cold extremities Oliguria Narrow pulse pressure

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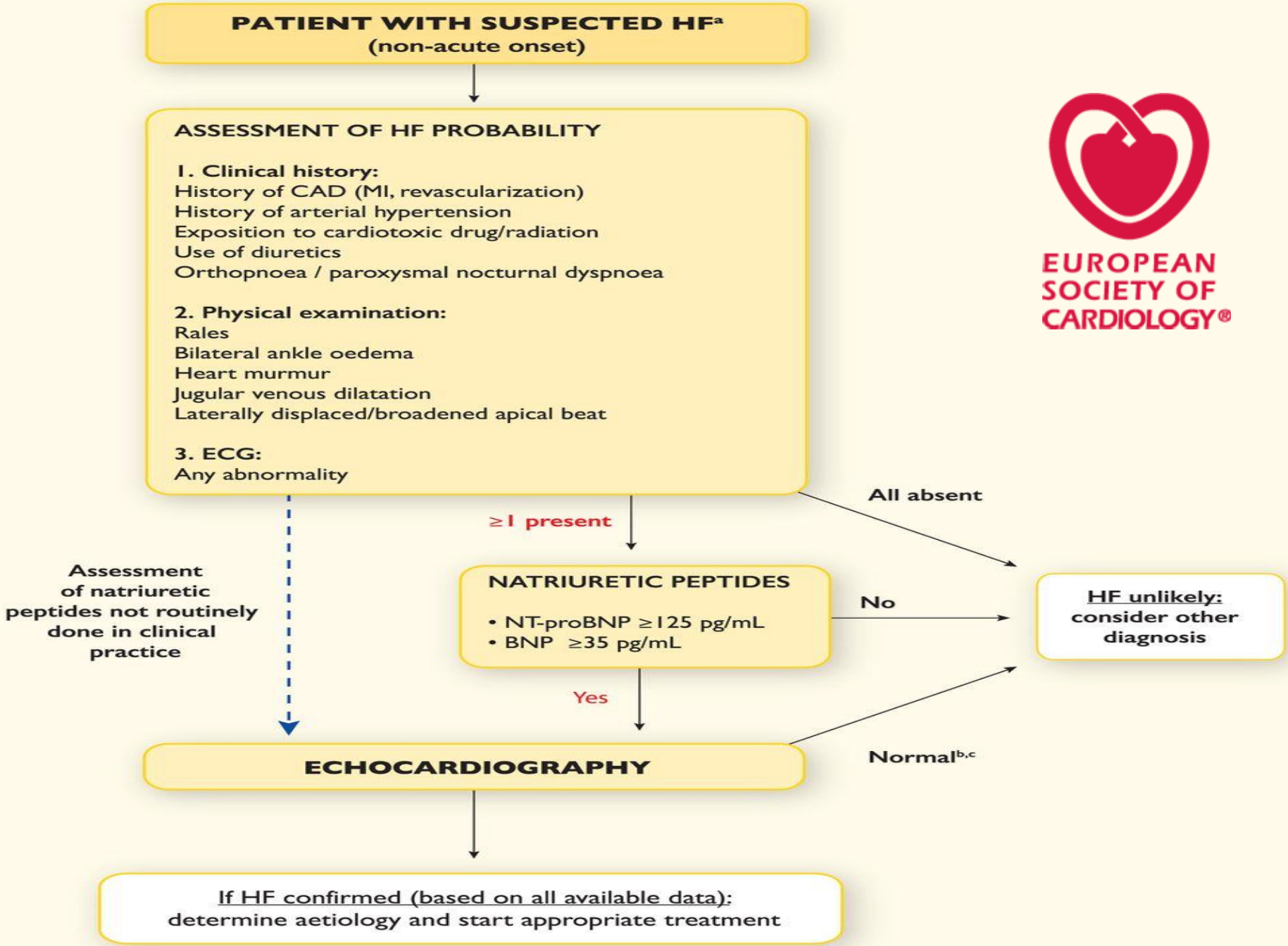

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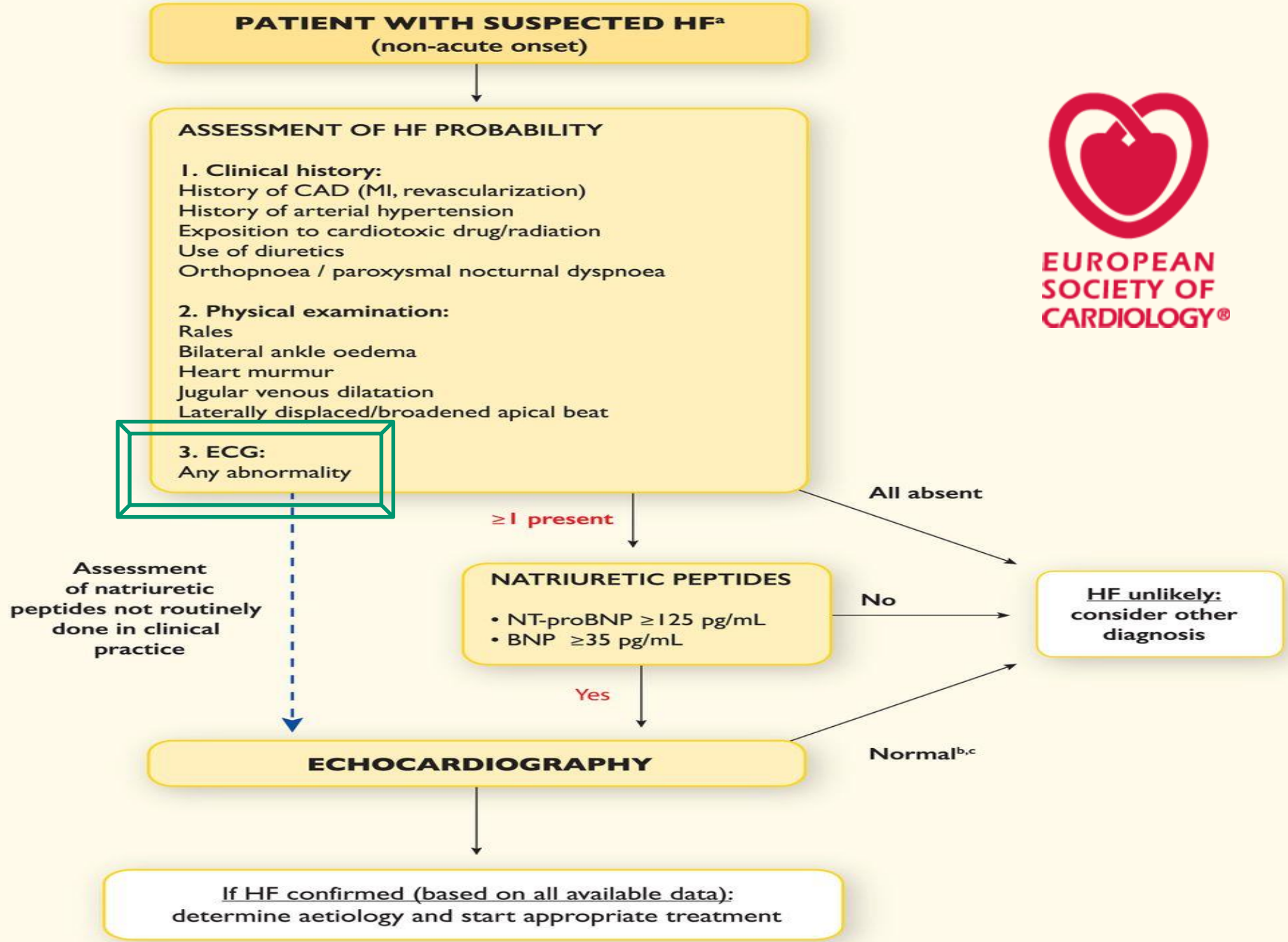

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CINCO MINUTOS…

Definición de icc
Epidemiología de la icc
Diagnostico
Etapas de la enfermedad
y factores pronósticos

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Definición de icc
Epidemiología de la icc
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Etapas de la enfermedad
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Los factores pronósticos

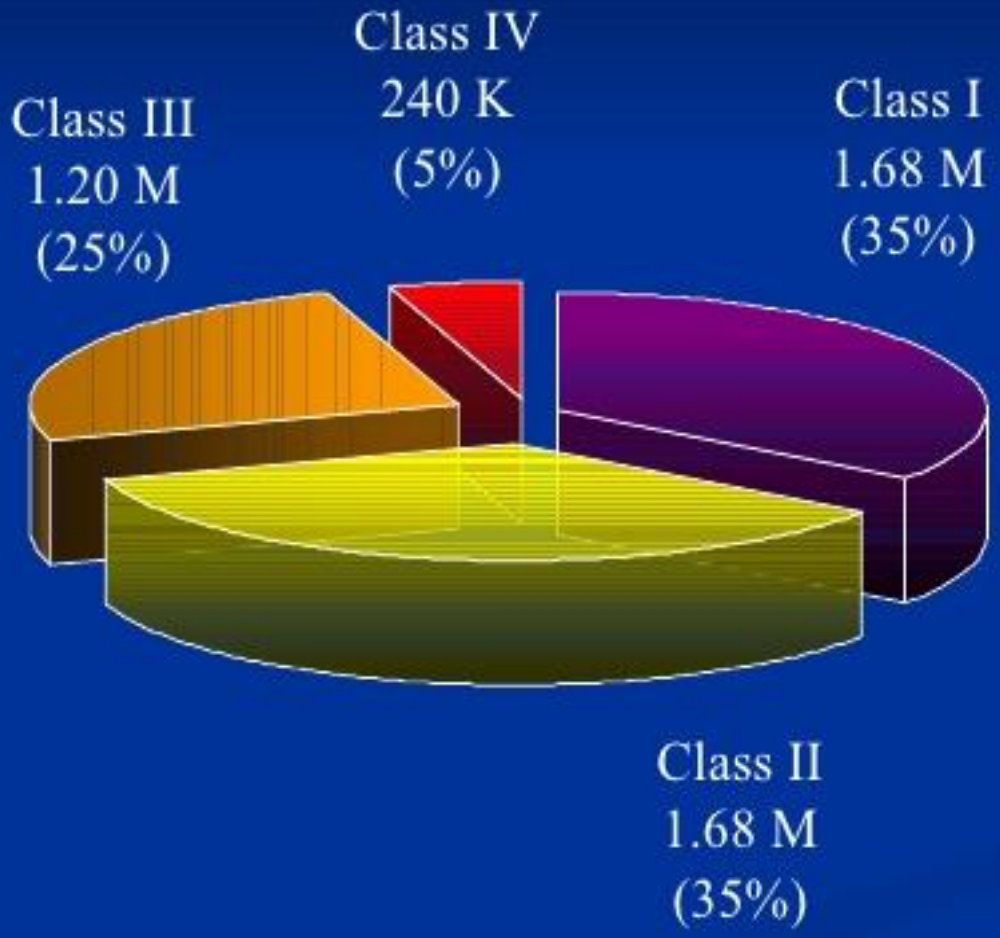
- Clase funcional
- Fracción de eyección
- Consumo de oxigeno
- Hiponatremia
- biobarcadores

Los factores pronósticos

- **Clase funcional**
- Fracción de eyección
- Consumo de oxigeno
- Hiponatremia
- biobarcadores

¿Cuantos pacientes en hay en cada clase en promedio con el esquema actual de tratamiento?

CHF PATIENT POPULATION BY NYHA CLASS

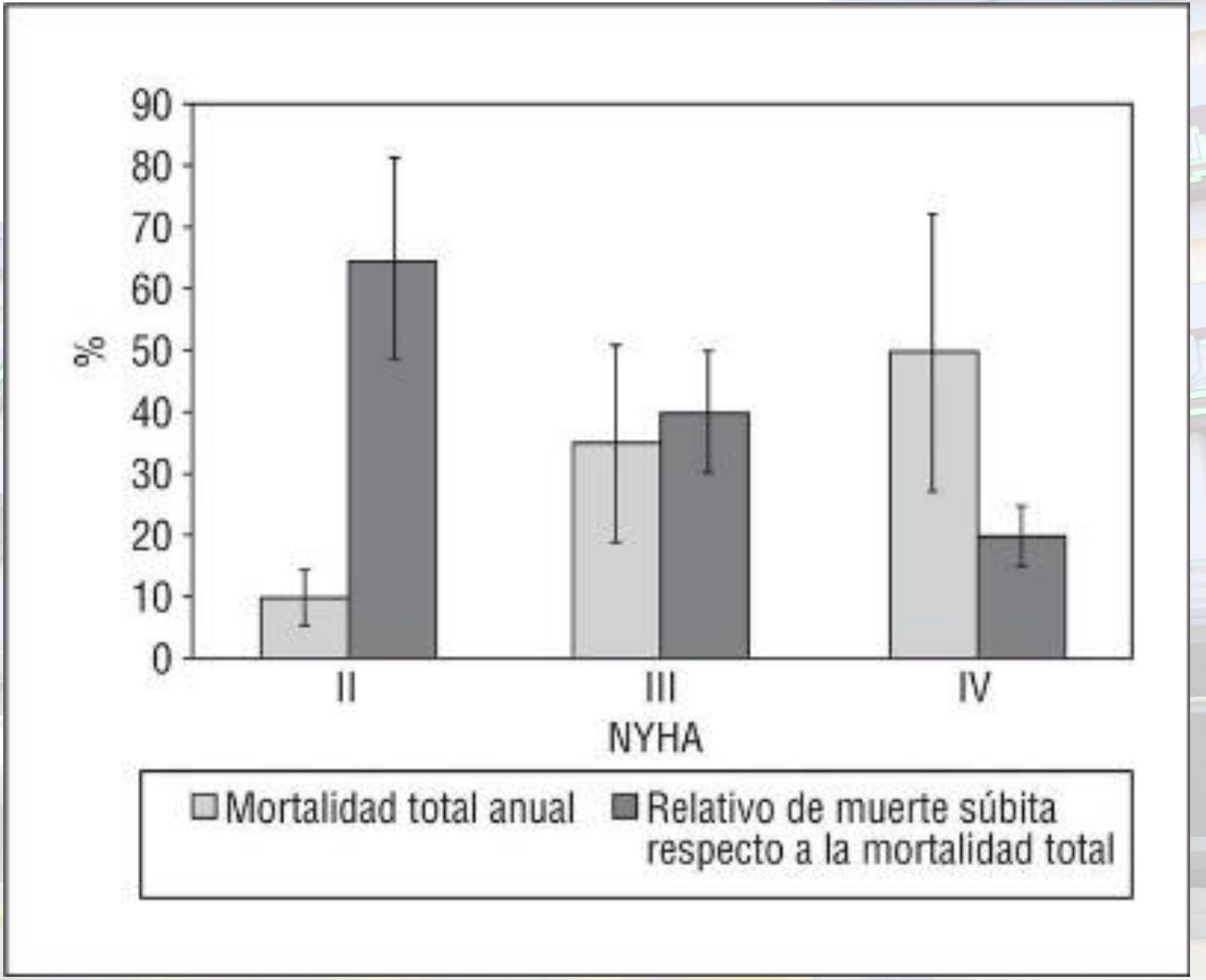


Class I
No limitations of physical activity

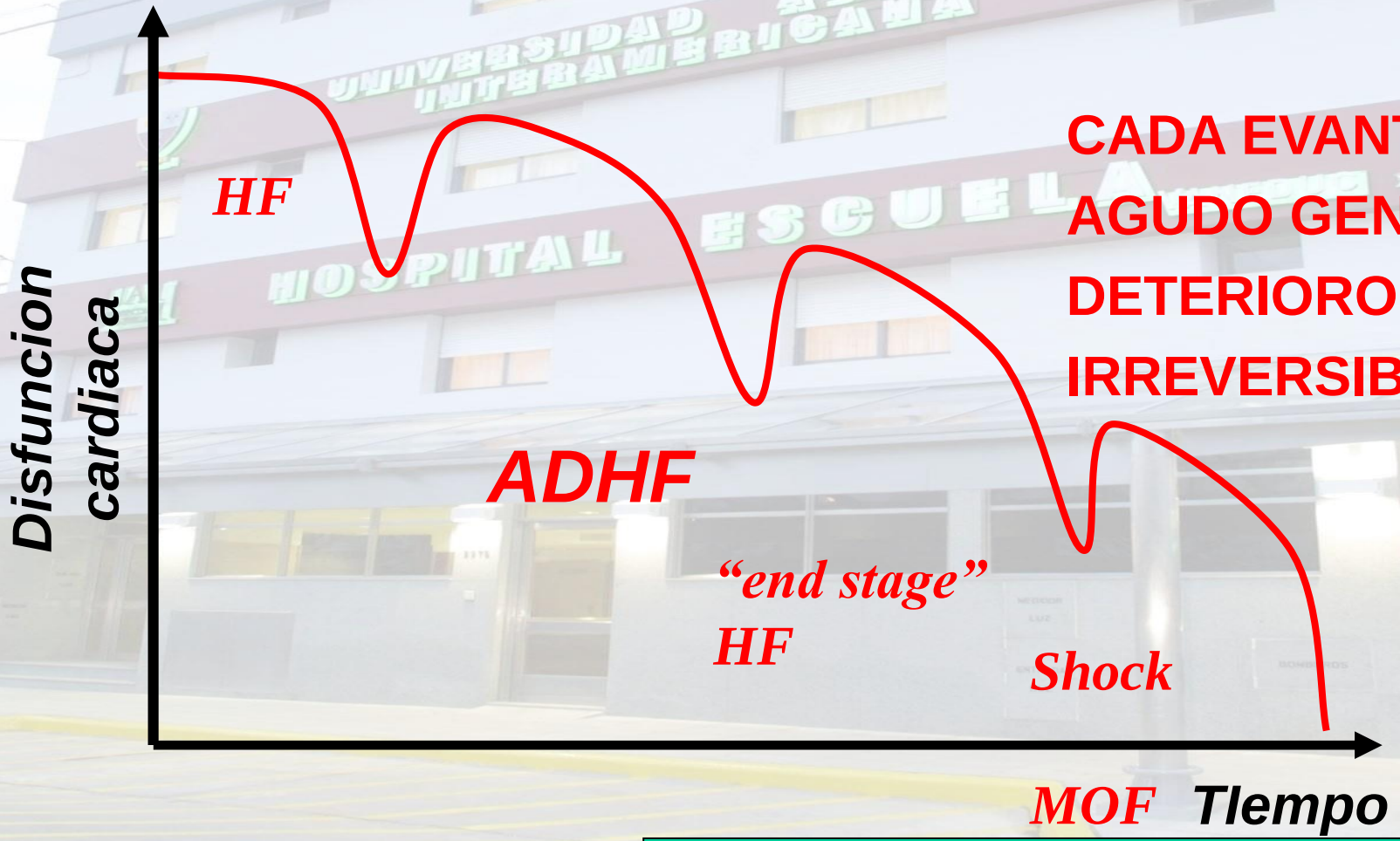
Class II
Slight limitations of physical activity

Class III
Marked limitations of physical activity

Class IV
Inability to carry out physical activities without discomfort and/or symptoms at rest


90
80
70
60
50
40
30
20
10
0
%
II
III
IV
NYHA
Mortalidad total anual
Relativo de muerte súbita respecto a la mortalidad total

EVOLUCIÓN DE LA ICC AVANZADA



CADA EVANTO AGUDO GENERA UN DETERIORO IRREVERSIBLE .

da Gheorghiades : HF 2007

BENDOPNEA

JACC: Heart Failure
© 2014 by the American College of Cardiology Foundation
Published by Elsevier Inc.

Vol. 2, No. 1, 2014
ISSN 2213-1779/$36.00
http://dx.doi.org/10.1016/j.jchf.2013.07.009

Characterization of a Novel Symptom of Advanced Heart Failure: Bendopnea

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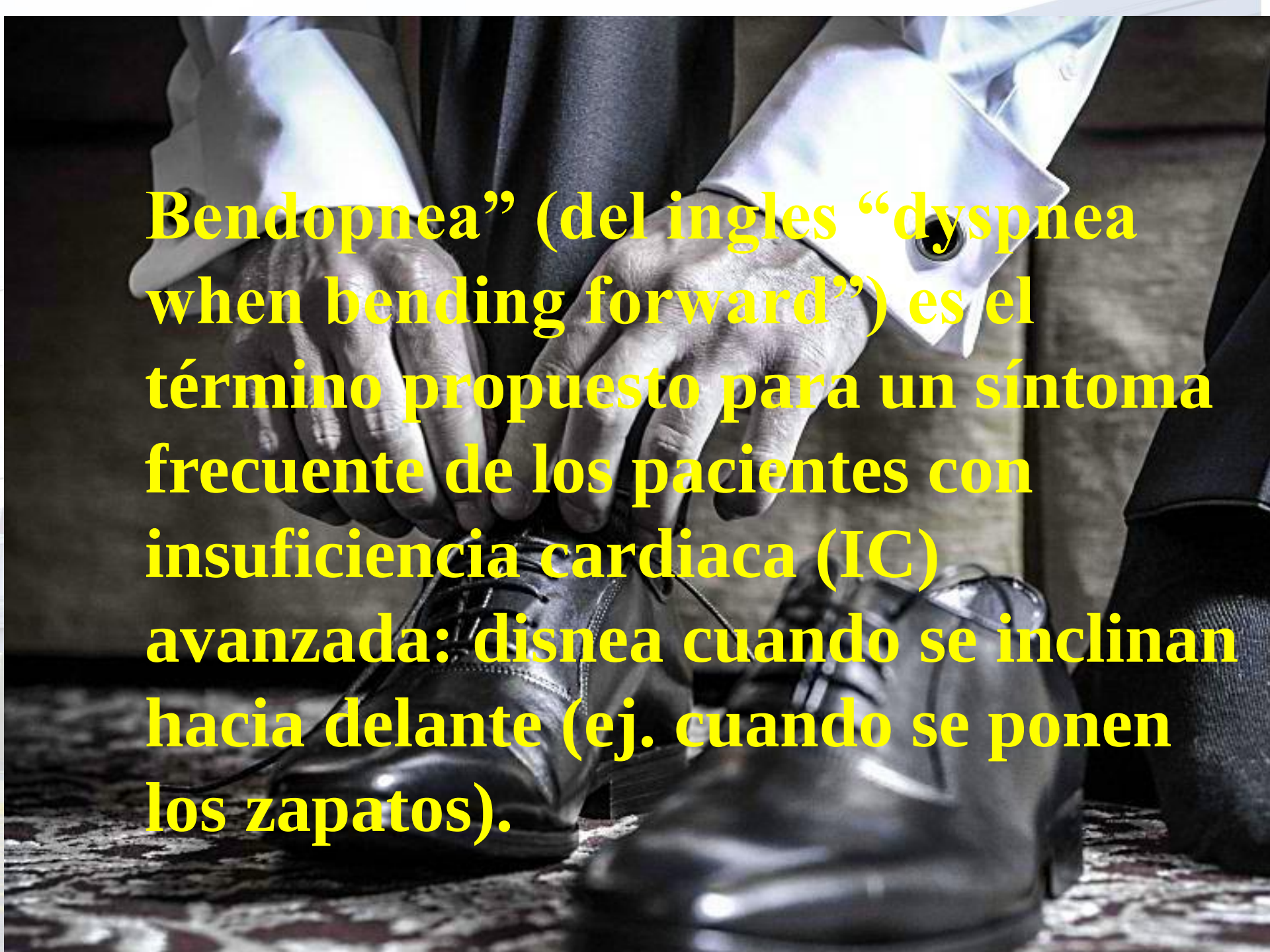
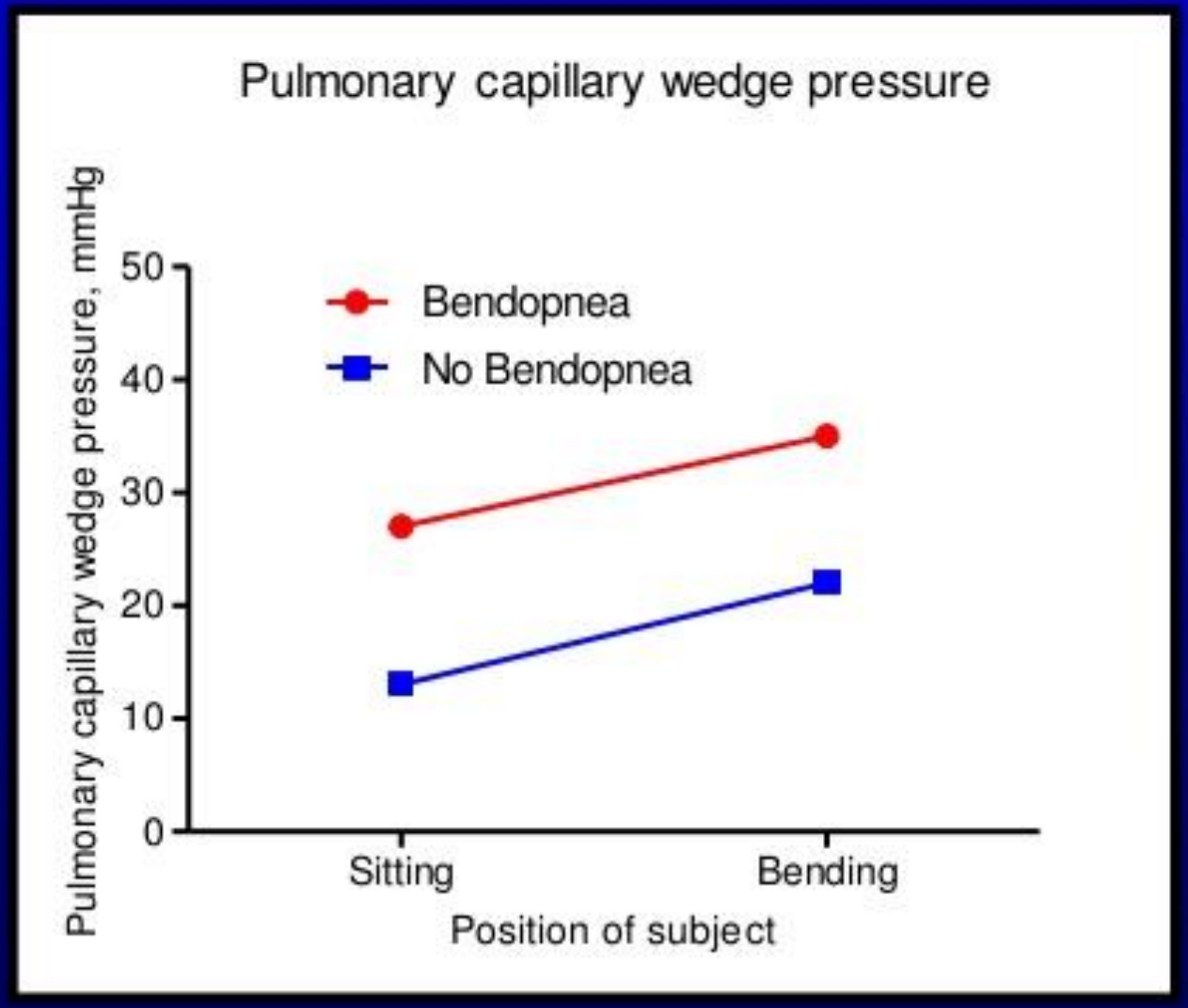
Dallas, Texas



Bendopnea” (del ingles “dyspnea when bending forward”) es el término propuesto para un síntoma frecuente de los pacientes con insuficiencia cardiaca (IC) avanzada: disnea cuando se inclinan hacia delante (ej. cuando se ponen los zapatos).

Bendopnea is Associated with Elevated LV Filling Pressures



Thibodeau, JACC HF, 2014

Assessment of bendopnea impact on decompensated heart failure

European Journal of Heart Failure (2017) 19, 111–115 doi:10.1002/ejhf.610

Bendopnea is related to advanced HF symptoms and it is associated with mortality in the short term and advanced
NYHA functional class. This symptom produces moderate to severe limitation of QoL.

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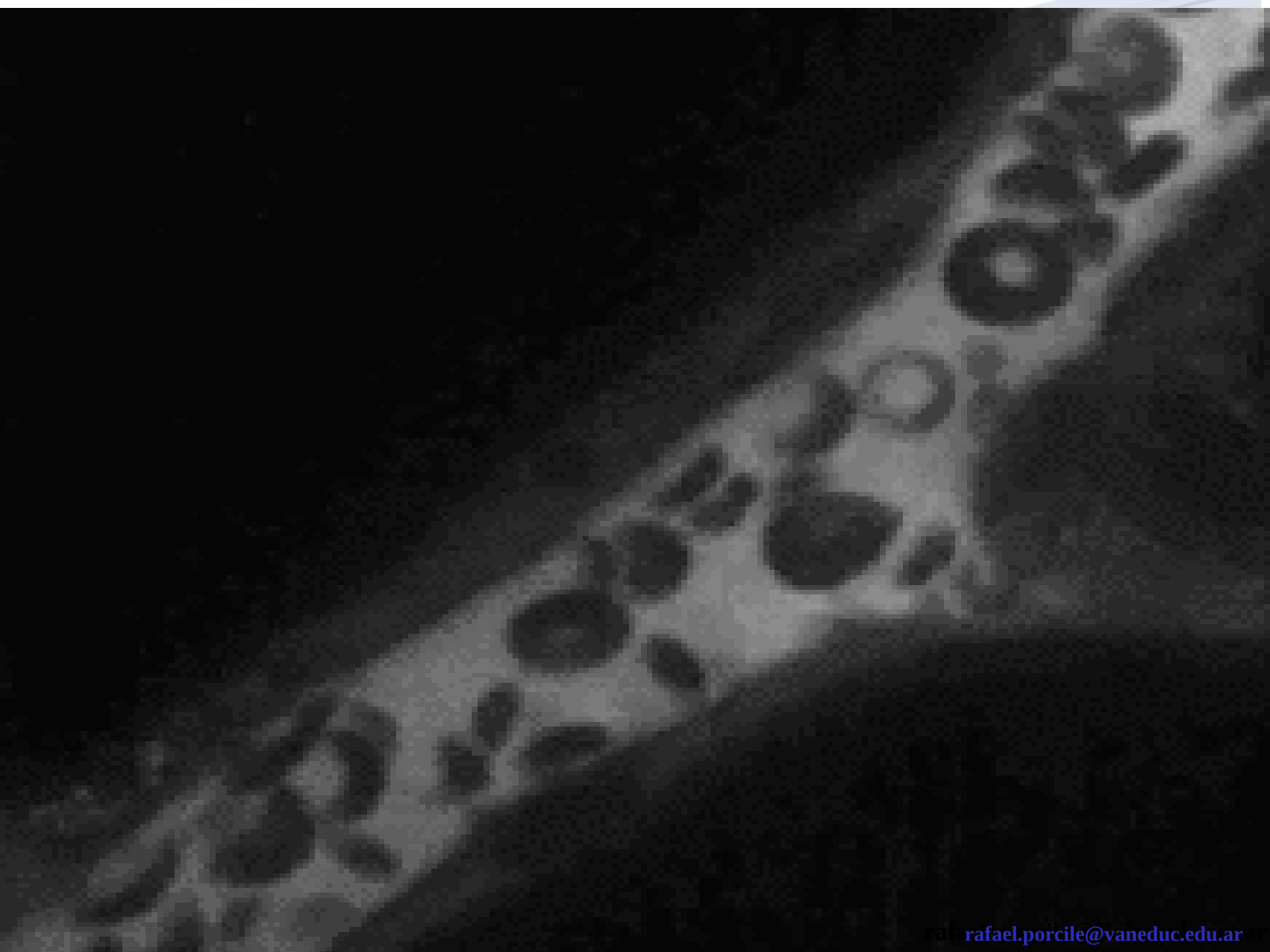

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El consumo de oxígeno en reposo de un individuo normal es alrededor de 250 ml/min y en ejercicio intenso puede aumentar más de 10 veces.

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La disnea es sumplemente el desequilibrio entre el consumo y el transporte

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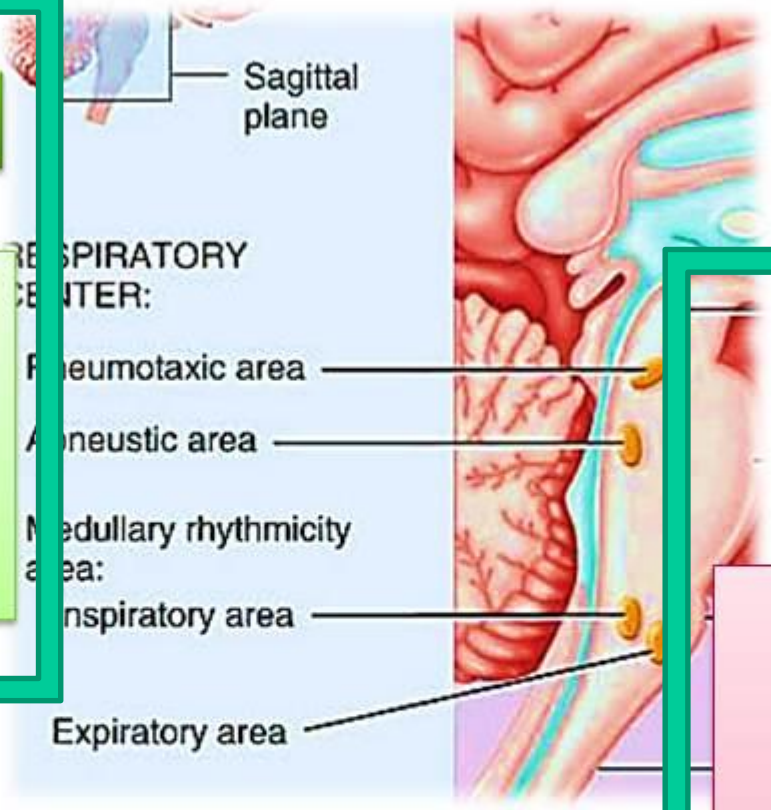
Centros de la Respiración

Centro Apnéustico

Estimula la inspiración, acortando la fase espiratoria e incluso produciendo apneusis→ Estimulando al bulbo raquídeo.

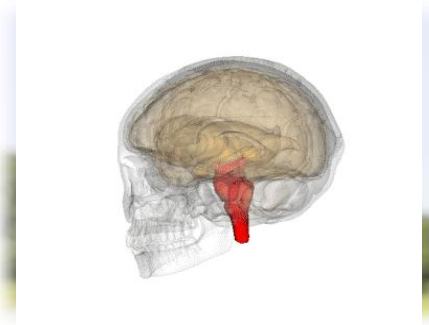


Centro Neumotáxico

- Inhibición de la inspiración.
- Regula el punto de apagado de la inspiración y consecuentemente el volumen inspiratorio y la frecuencia respiratoria.
- Previene la apneusis (paro respiratorio en inspiración)

Centro de la Ritmicidad

Tiene un área inspiratoria y otra espiratoria.



RECEPTORES

- Temperatura
- Propioceptores de articulaciones y músculos (indican si el brazo esta flexionado…)
- Quimiorreceptores carotideos y aorticos (detectan elementos en la sangre y sus niveles como CO2, O2, PH)
- Receptores de distensión pulmonar y tórax (detectan el nivel de distensión)

- Aferencias centrales: corteza motora (voluntad) e hipotálamo (emoción)

CENTROS DE CONTROL

Se localizan en:

-Protuberancia (función modificadora)
- Bulbo
  Cent. Inspir.
  Cent. Espir.
(función que regula frecuencia intensidad de la respiración pulmonar)

Envían la información de lo que tiene que hacer a los efectores (por vía eferente).
Los centros de control son zonas del encéfalo.

EFECTORES

Los músculos que intervienen en la respiración.

Efector es cualquier célula, órgano, miembro que realice y ejecute una acción.

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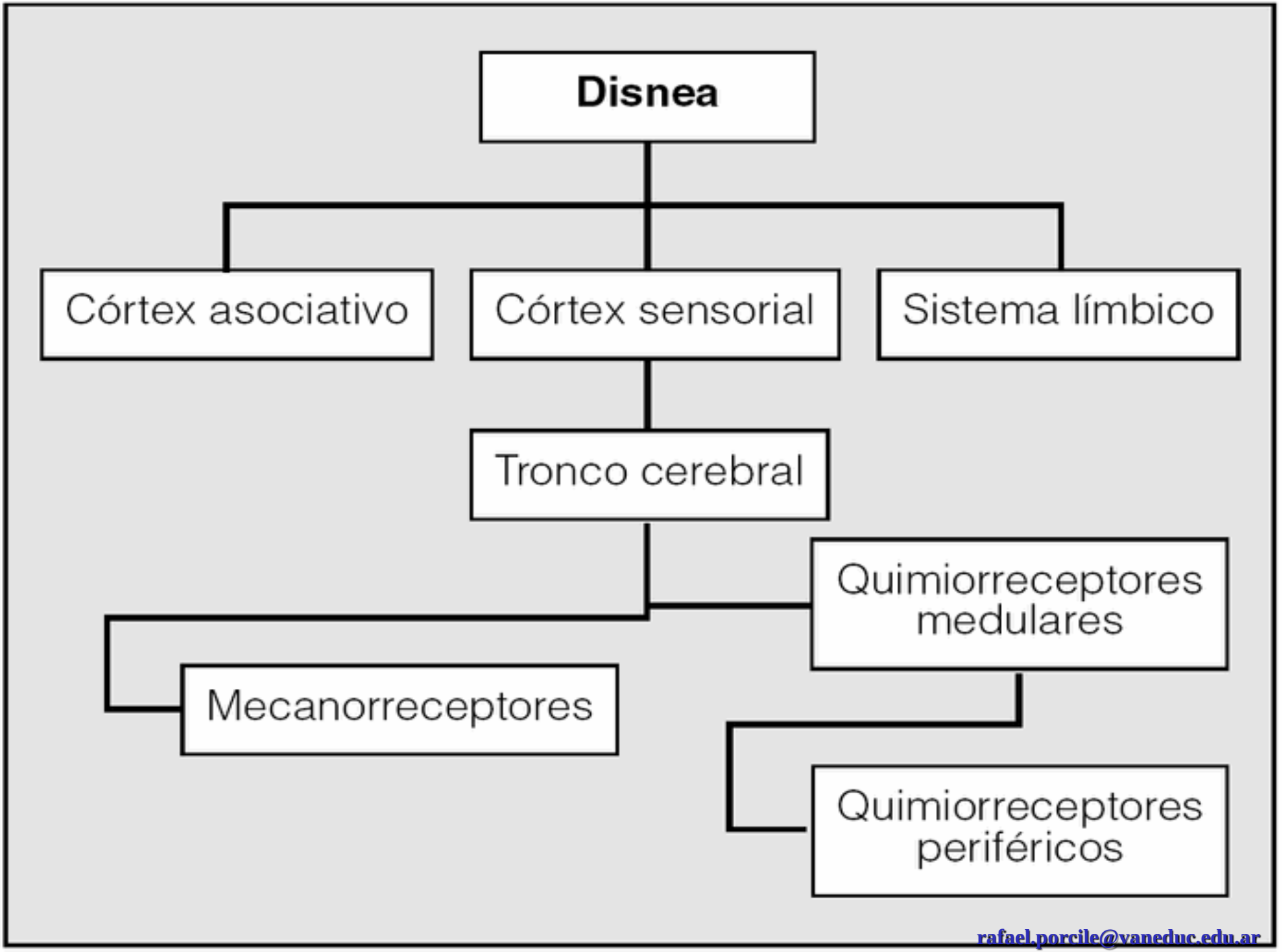

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¿QUE TIPO DE DISNEA TIENE MI PACIENTE?

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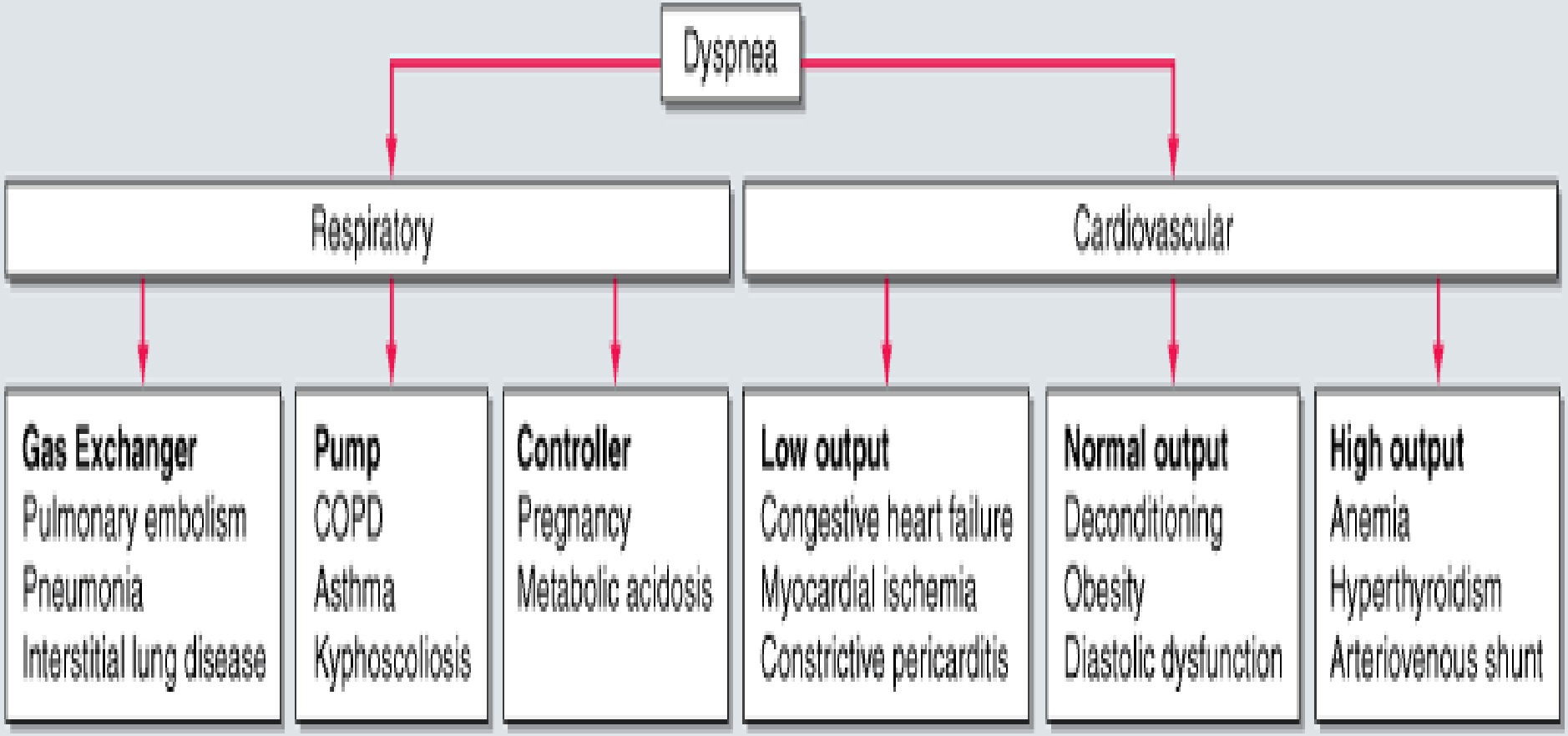
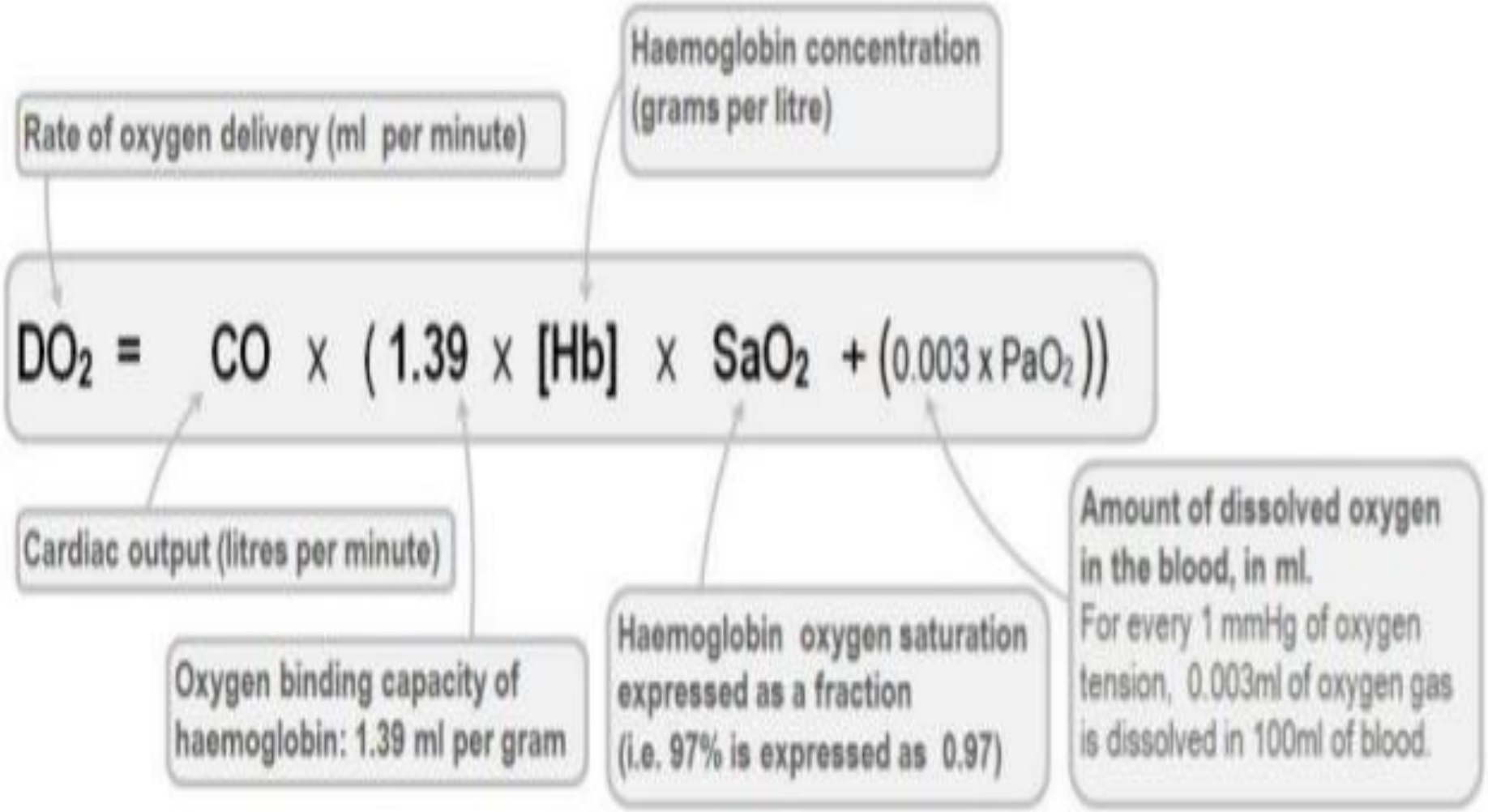
Algorithm for Dyspnea Pathophysiology



Source: Fauci AS, Kasper DL, Braunwald E, Hauser SL, Longo DL, Jameson JL, Loscalzo J: *Harrison's Principles of Internal Medicine*, 17th Edition: http://www.accessmedicine.com


Rate of oxygen delivery (ml per minute)
Haemoglobin concentration (grams per litre)
$DO_2 = CO \times (1.39 \times [Hb] \times SaO_2 + (0.003 \times PaO_2))$
Cardiac output (litres per minute)
Oxygen binding capacity of haemoglobin: 1.39 ml per gram
Haemoglobin oxygen saturation expressed as a fraction (i.e. 97% is expressed as 0.97)
Amount of dissolved oxygen in the blood, in ml.
For every 1 mmHg of oxygen tension, 0.003ml of oxygen gas is dissolved in 100ml of blood.

UAI HOSPITAL UNIVERSITARIO

EVALUACION DEL TRANSPORTE DE OXIGENO

- DO2= CaO2 x VM x 10

VN= 520-720 ml/min/m2

- Cont. de O2 = (0,003 x pO2) + (1,39 x [Hb] x SO2) ml/dl
  Disuelto
  Unido a la Hb

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El CaO2 se calcula por la siguiente fórmula:

$$CaO_2 = (Hb \times SaO_2 \times 1{,}39)/100 + (PaO_2 \times 0{,}0031)$$

En la clínica, la valoración de DO2 está expresada en relación con el peso del enfermo o con el ASC

$$DO_2\ (ml/min/kg) = (GC \times CaO_2 \times 10)/\text{peso en kg}$$

$$DO_2\ (ml/min/m^2) = IC \times CaO_2 \times 10$$

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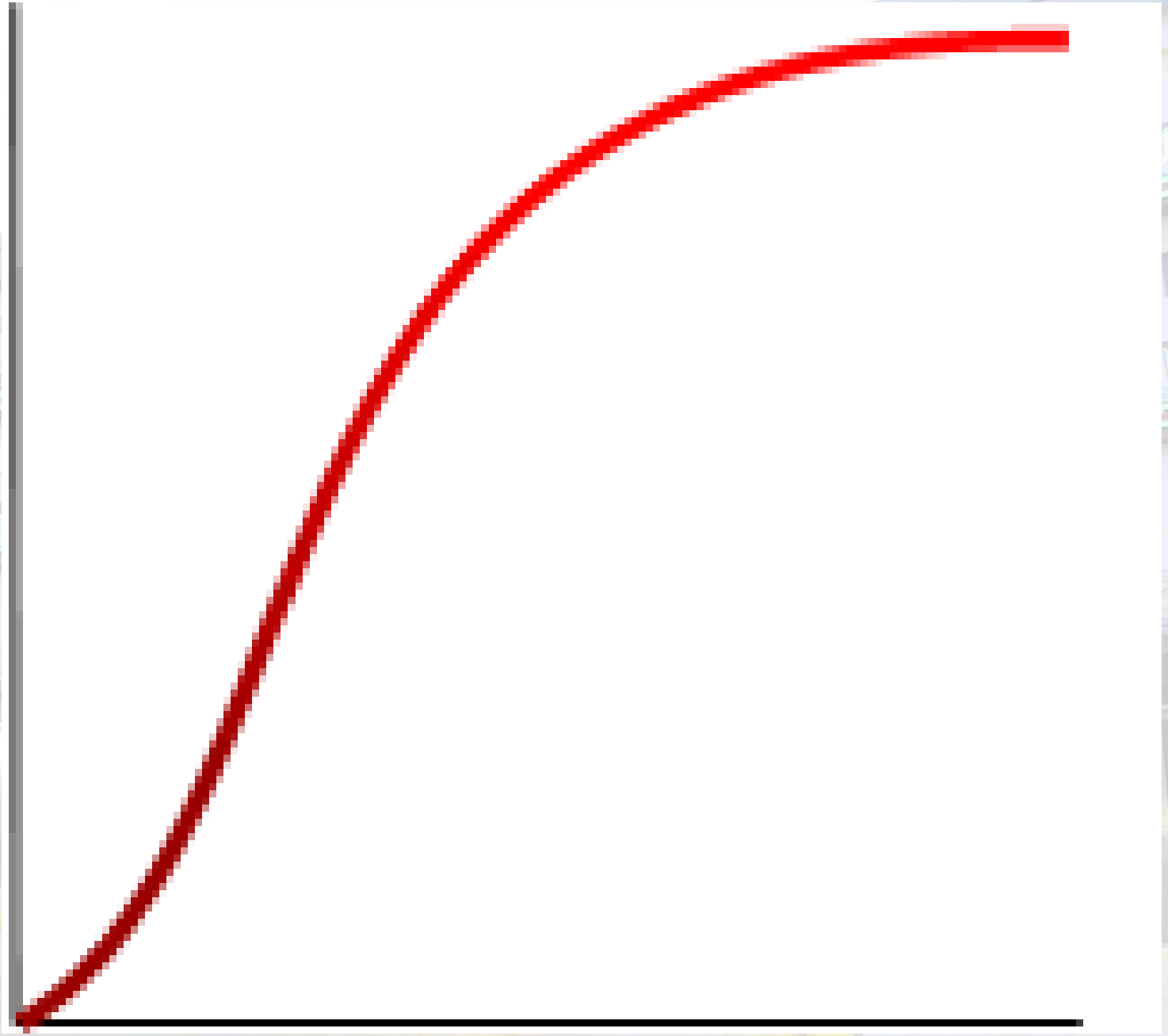

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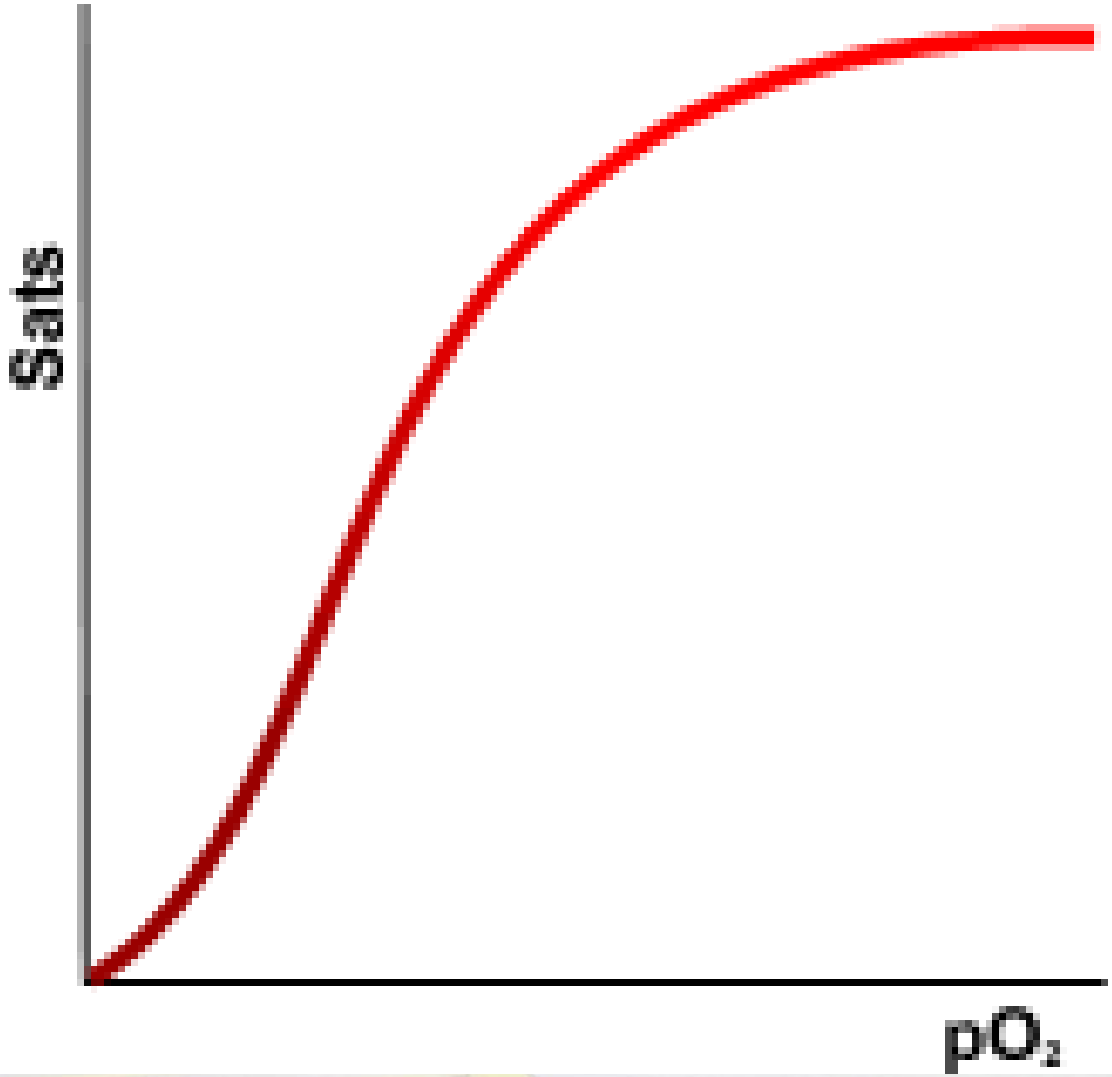
PEQUEÑAS
O
MODERADAS
CAIDAS
DE LA
PRESION
ARTERIAL
DE OXIGENO
AFECTAN
MINIMAMENTE
LA
SATURACIÓN



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Disociación de la Hb. P50

⬆ P50(D Afinidad)	⬇ P50(A Afinidad)
⬆ DPG	⬇ DPG
⬆ Temperatura	⬇ Temperatura
⬇ pH	⬆ pH
⬆ H+	⬇ H+
⬆ pCO2	⬇ pCO2
Curva a la derecha	Curva a la izquierda

El CaO2 se calcula por la siguiente fórmula:

$$CaO_2 = (Hb \times SaO_2 \times 1{,}39)/100 + (PaO_2 \times 0{,}0031)$$

En la clínica, la valoración de DO2 está expresada en relación con el peso del enfermo o con el ASC

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$$DO_2\ (ml/min/m^2) = IC \times CaO_2 \times 10$$

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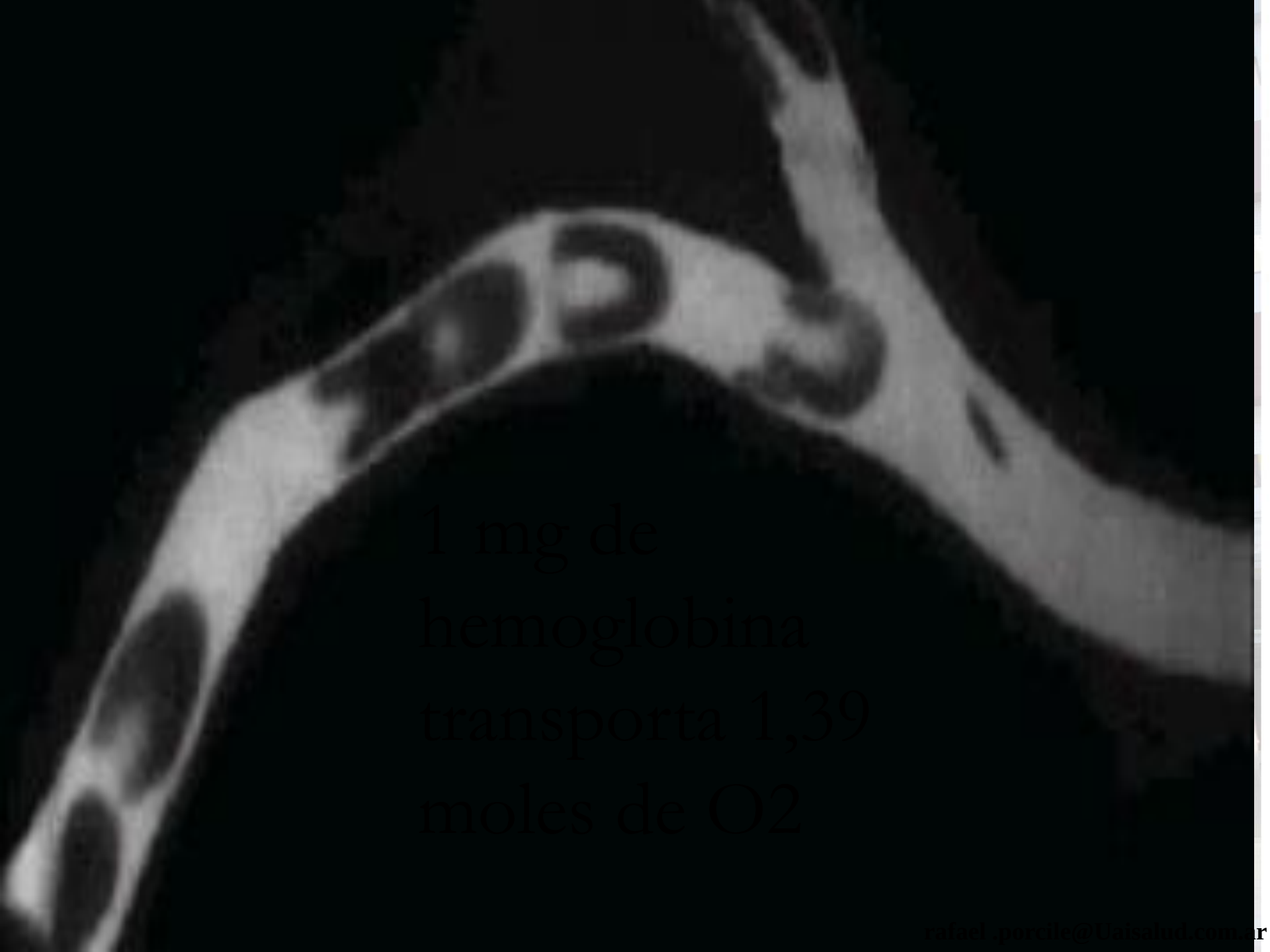
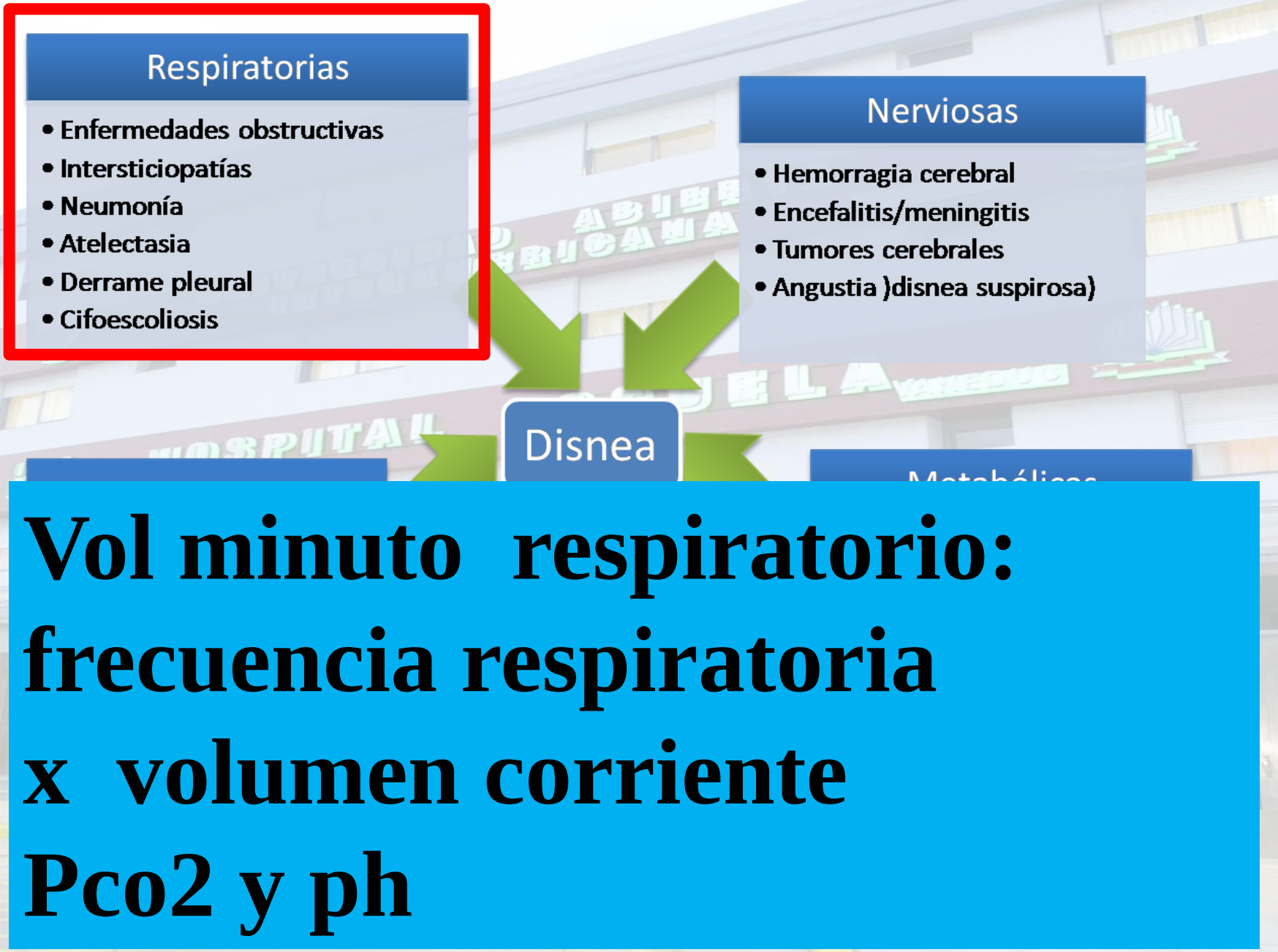
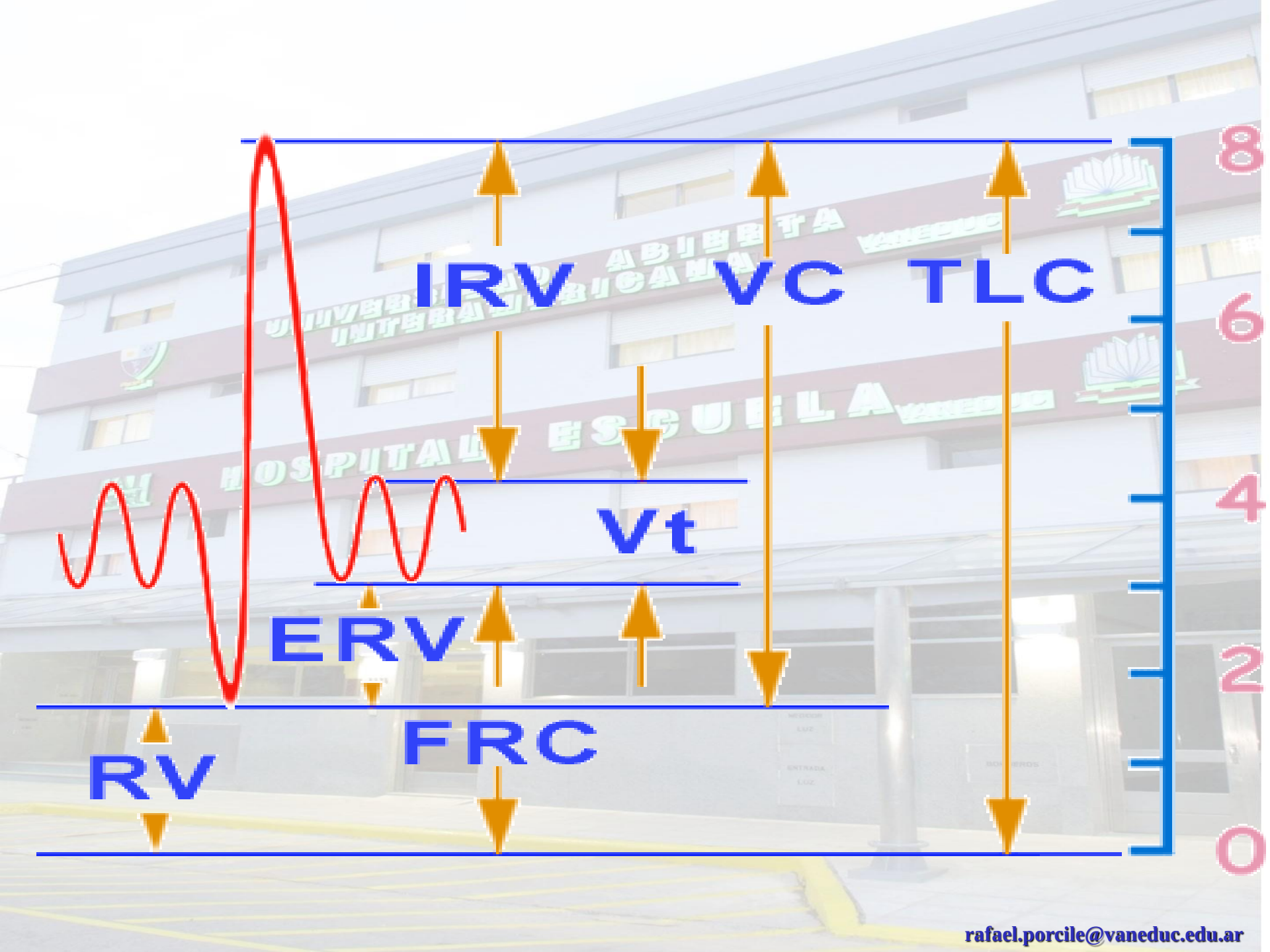



Respiratorias
• Enfermedades obstructivas
• Intersticiopatías
• Neumonía
• Atelectasia
• Derrame pleural
• Cifoescoliosis
Nerviosas
• Hemorragia cerebral
• Encefalitis/meningitis
• Tumores cerebrales
• Angustia)disnea suspirosa)
Disnea
Vol minuto respiratorio:
frecuencia respiratoria
x volumen corriente
Pco2 y ph



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2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure

DOI: http://dx.doi.org/10.1093/eurheartj/ehw1282129-2200 First published online: 20 May 2016

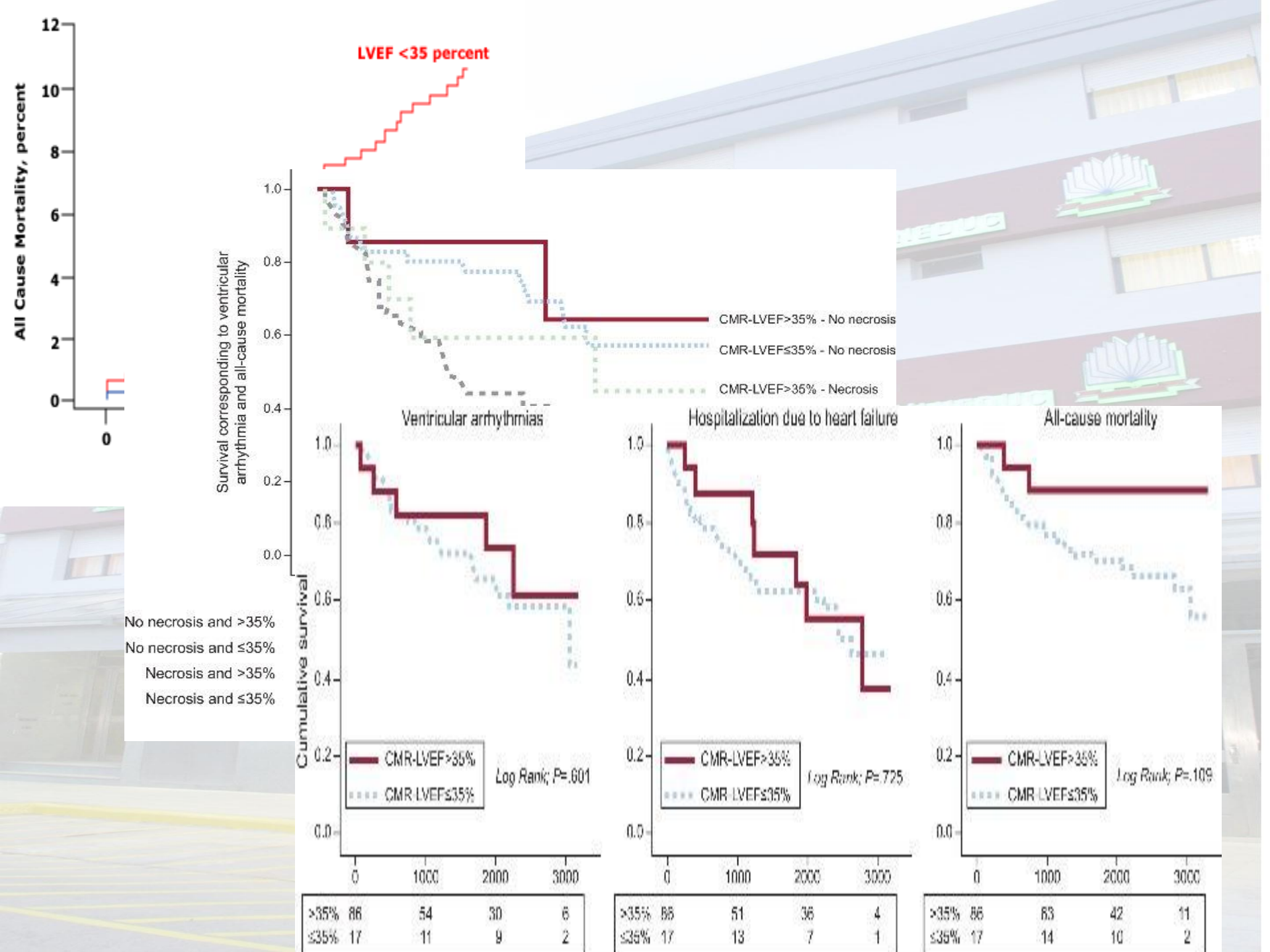
Recommendations	Class [a]	Level [b]
The following diagnostic tests are recommended/should be considered for initial assessment of a patient with newly diagnosed HF in order to evaluate the patient's suitability for particular therapies, to detect reversible/treatable causes of HF and co-morbidities interfering with HF:		
- haemoglobin and WBC - sodium, potassium, urea, creatinine (with estimated GFR) - liver function tests (bilirubin, AST, ALT, GGTP) - glucose, HbA1c - lipid profile - TSH - ferritin, TSAT = TIBC	I	C
- natriuretic peptides	IIa	C
Additional diagnostic tests aiming to identify other HF aetiologies and comorbidities should be considered in individual patients with HF when there is a clinical suspicion of a particular pathology (see Table 3.4 on HF aetiologies).	IIa	C
A 12-lead ECG is recommended in all patients with HF in order to determine heart rhythm, heart rate, QRS morphology, and QRS duration, and to detect other relevant abnormalities. This information is needed to plan and monitor treatment.	I	C
Exercise testing in patients with HF:		
- is recommended as a part of the evaluation for heart transplantation and/or mechanical circulatory support (cardiopulmonary exercise testing);	I	C
- should be considered to optimize prescription of exercise training (preferably cardiopulmonary exercise testing);	IIa	C
- should be considered to identify the cause of unexplained dyspnoea (cardiopulmonary exercise testing).	IIa	C
- may be considered to detect reversible myocardial ischaemia.	IIb	C
Chest radiography (X-ray) is recommended in patients with HF to detect/exclude alternative pulmonary or other diseases, which may contribute to dyspnoea. It may also identify pulmonary congestion/oedema and is more useful in patients with suspected HF in the acute setting.	I	C
Right heart catheterization with a pulmonary artery catheter:		
- is recommended in patients with severe HF being evaluated for heart transplantation or mechanical circulatory support;	I	C
- should be considered in patients with probable pulmonary hypertension assessed by echocardiography in order to confirm pulmonary hypertension and its reversibility before the correction of valve/structural heart disease;	IIa	C
- may be considered in order to adjust therapy in patients with HF who remain severely symptomatic despite initial standard therapies and whose haemodynamic status is unclear.	IIb	C
EMB should be considered in patients with rapidly progressive HF despite standard therapy when there is a probability of a specific diagnosis which can be confirmed only in myocardial samples and specific therapy is available and effective.	IIa	C
Thoracic ultrasound may be considered for the confirmation of pulmonary congestion and pleural effusion in patients with AHF.	IIb	C
Ultrasound measurement of inferior vena cava diameter may be considered for the assessment of volaemia status in patients with HF.	IIb	C

Los factores pronósticos

- Clase funcional
- Fracción de eyección
- Consumo de oxigeno
- Hiponatremia
- biobarcadores

Los factores pronósticos

- Clase funcional
- **Fracción de eyección**
- Consumo de oxigeno
- Hiponatremia
- biobarcadores


All Cause Mortality, percent
12
10
8
6
4
2
0
0
LVEF <35 percent
Survival corresponding to ventricular arrhythmia and all-cause mortality
1.0
0.8
0.6
0.4
CMR-LVEF>35% - No necrosis
CMR-LVEF≤35% - No necrosis
CMR-LVEF>35% - Necrosis
No necrosis and >35%
No necrosis and ≤35%
Necrosis and >35%
Necrosis and ≤35%
Ventricular arrhythmias
Hospitalization due to heart failure
All-cause mortality
Cumulative survival
1.0
0.8
0.6
0.4
0.2
0.0
CMR-LVEF>35%
CMR LVEF≤35%
Log Rank; P=.601
Log Rank; P=.725
Log Rank; P=.109
0
1000
2000
3000
>35% 86 54 30 6
≤35% 17 11 9 2
>35% 86 51 36 4
≤35% 17 13 7 1
>35% 86 63 42 11
≤35% 17 14 10 2

Los factores pronósticos

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Los factores pronósticos

- Clase funcional
- Fracción de eyección
- **Consumo de oxigeno**
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CONSUMO DE OXÍGENO VO2

CONS oxígeno
que la l el aporte
de ox jre venosa
(RO_2).

Tabla n.º 2 Clasificación funcional de Weber por la prueba de esfuerzo cardiopulmonar[12]

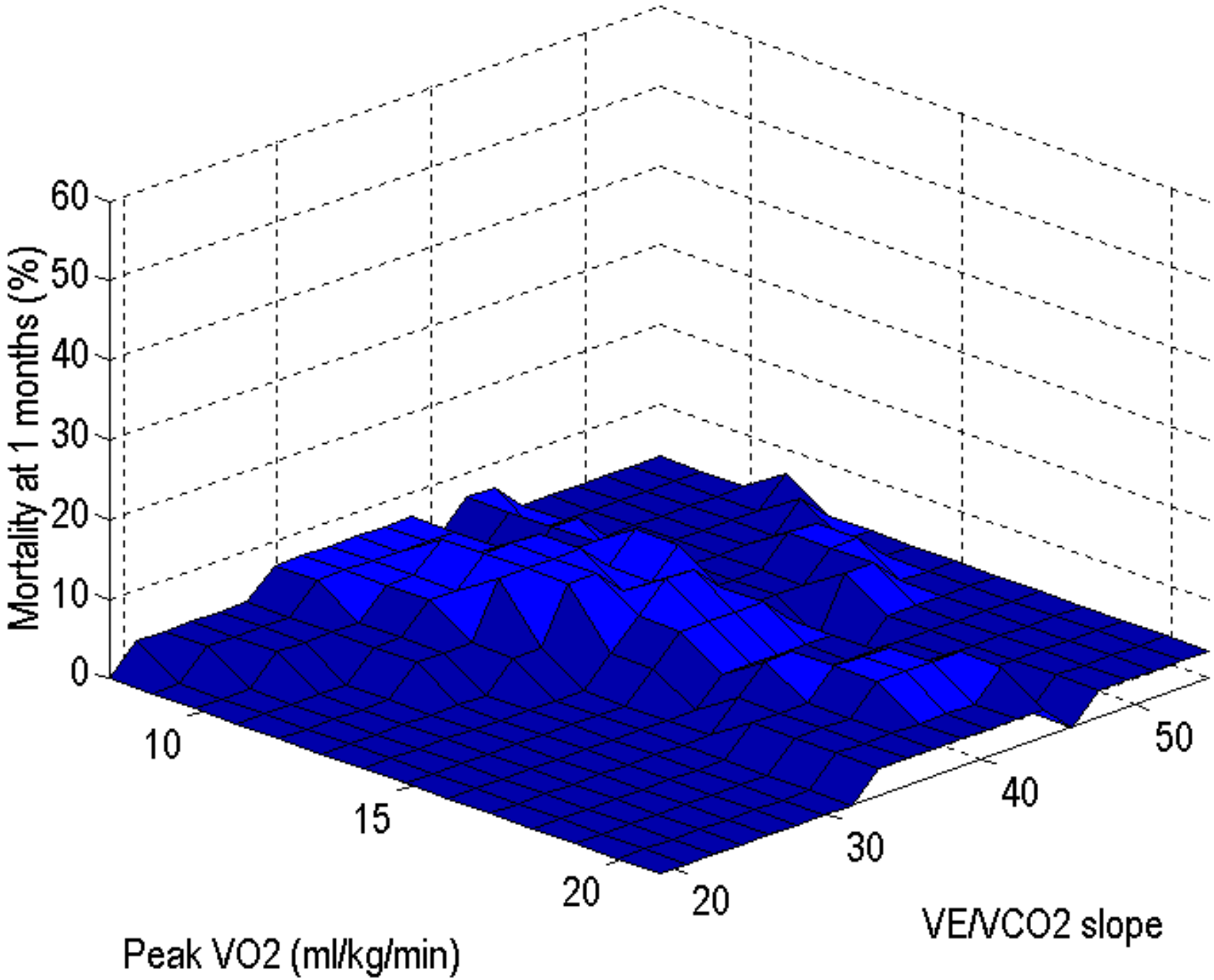
Clase	Gravedad	VO_2 pico (mL/kg/min)	VO_2 en el UA (mL/kg/min)	Índice cardíaco (L/min/m^2)
A	Ninguna o leve	> 20	> 14	> 8
B	Leve a moderada	16-20	11-14	6-8
C	Moderada a grave	10-15,9	8-10,9	4-5,9
D	Grave	6-9,9	5-7,9	2-3,9
E	Muy grave	< 6	< 5	< 2

VO_2 VO_2 max = consumo pico de oxígeno; VO_2 en UA = consumo de oxígeno en el umbral anaerobio.

los tejidos

$$VO_2 = GC \times CaO_2 - GC \times CvO_2$$

$$VO_2 = G.C. \times D(a-v)\ O_2$$


Mortality at 1 months (%)
60
50
40
30
20
10
0
10
15
20
Peak VO2 (ml/kg/min)
20
30
40
50
VE/VCO2 slope

A PROPOSITO….

¿Qué ES EL CONSUMO DE OXIGENO??

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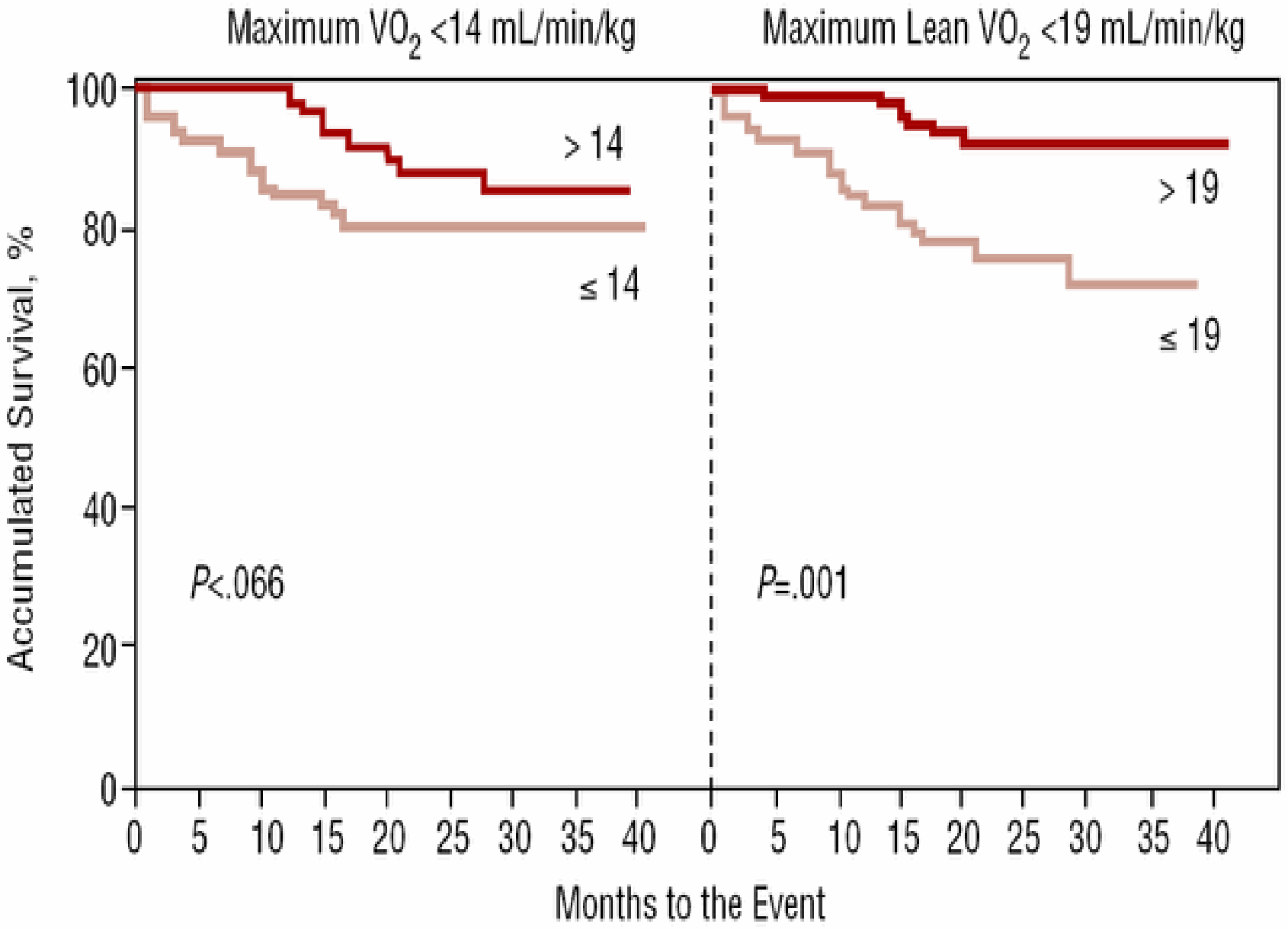
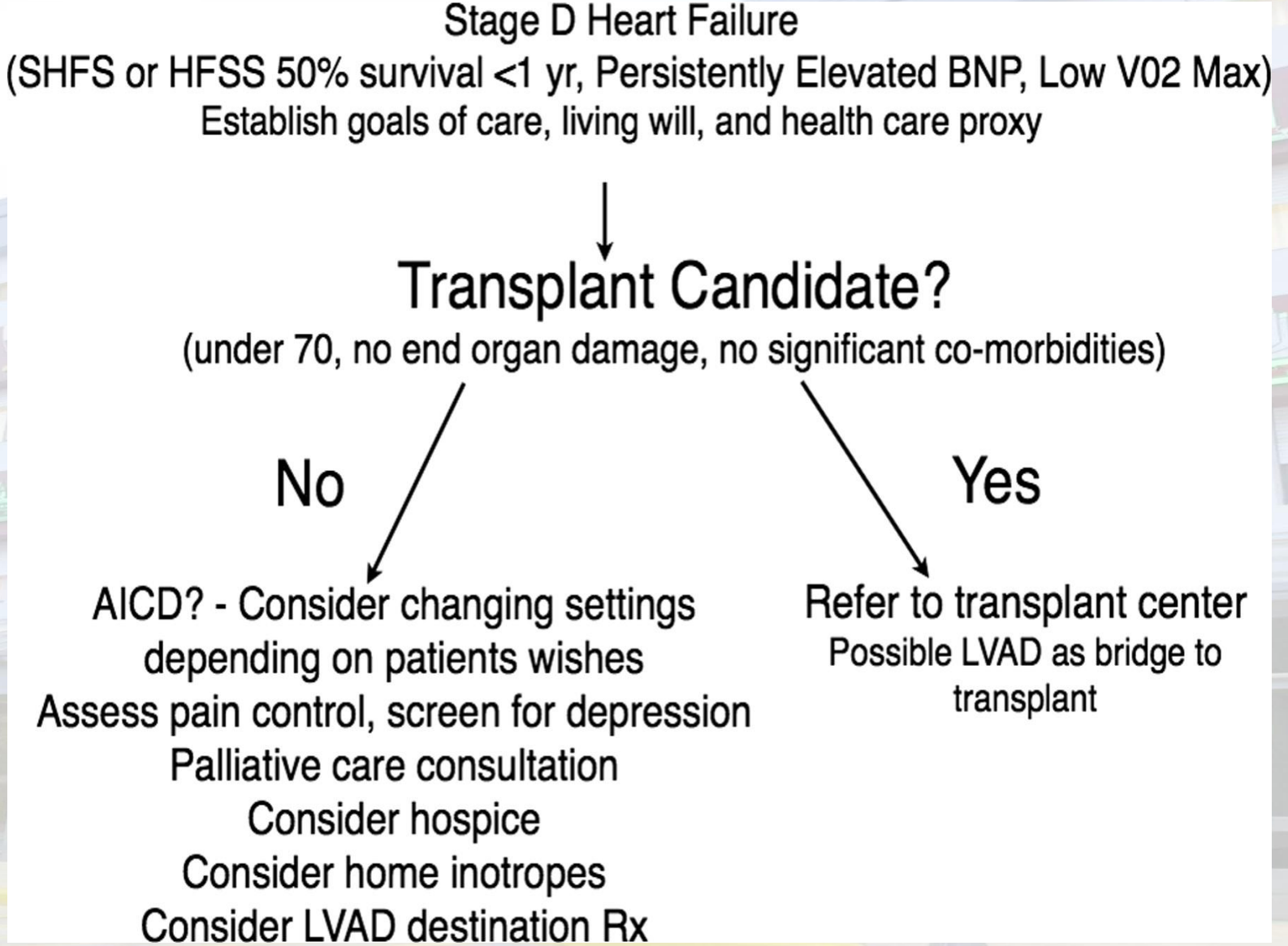

Maximum VO_2 <14 mL/min/kg
Maximum Lean VO_2 <19 mL/min/kg
Accumulated Survival, %
100
80
60
40
20
0
> 14
≤ 14
> 19
≤ 19
P<.066
P=.001
0 5 10 15 20 25 30 35 40
0 5 10 15 20 25 30 35 40
Months to the Event


Stage D Heart Failure
(SHFS or HFSS 50% survival <1 yr, Persistently Elevated BNP, Low V02 Max)
Establish goals of care, living will, and health care proxy
Transplant Candidate?
(under 70, no end organ damage, no significant co-morbidities)
No
Yes
AICD? - Consider changing settings depending on patients wishes
Assess pain control, screen for depression
Palliative care consultation
Consider hospice
Consider home inotropes
Consider LVAD destination Rx
Refer to transplant center
Possible LVAD as bridge to transplant

AHA/ACC

¿Peak VO2?

ABSOLUTE INDICATIONS IN APPROPRIATE PATIENTS

1. For hemodynamic compromise due to HF

- Refractory cardiogenic shock
- Documented dependence inotropic support iv [illegible]
- p-VO2 <10 mL/kg per min

2. Severe symptoms of ischemia that consistently limit routine activity and are not amenable to coronary artery bypass surgery or percutaneous coronary intervention.

3. Recurrent symptomatic ventricular arrhythmias refractory to all therapeutic modalities

RELATIVE INDICATIONS:

- Peak V02 of 11 to 14 mL/kg per minute (or 55 percent predicted) and major limitation of the patient's daily activities
- Recurrent unstable ischemia not amenable to other intervention
- Recurrent instability of fluid balance/renal function not due to patient noncompliance with medical regimen

INSUFFICIENT INDICATIONS:

- Low left ventricular ejection fraction
- History of functional class II or IV symptoms of HF
- Peak VO2 greater than 15 mL/kg per minute (or greater than 55 percent predicted) without other indications

Los factores pronósticos

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Los factores pronósticos

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A PROPOSITO….

¿Qué implica la hiponatremia en insuficiencia cardíaca??

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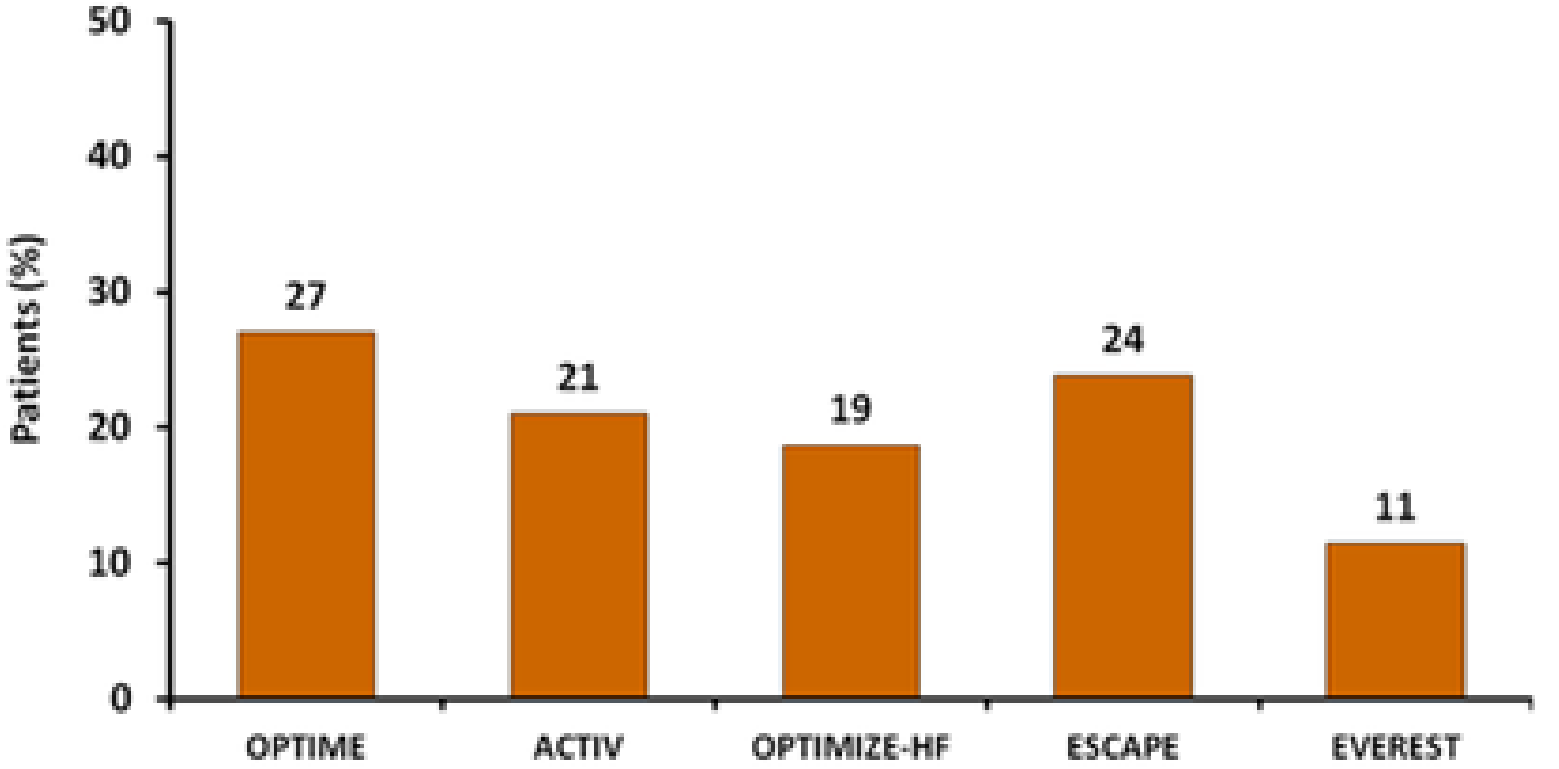
Prevalence of Hyponatremia in HF

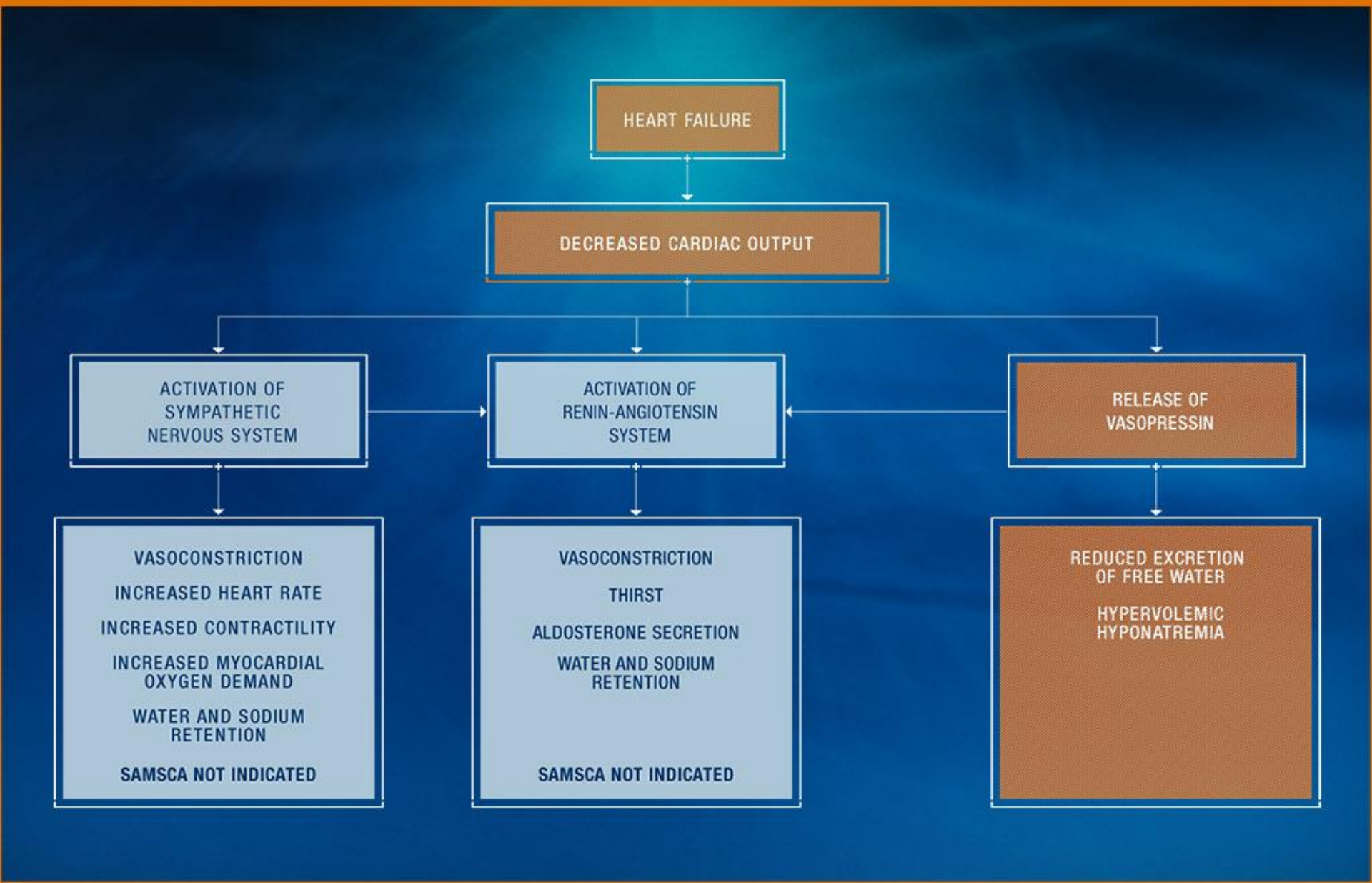
- Hyponatremia (serum sodium < 135 mEq/L) is common in patients hospitalized with HF.



HF = heart failure

Klein L, et al. *Circulation*. 2005;111:2454-2460; Gheorghiade M, et al. *JAMA*. 2004;291:1963-1971; Gheorghiade M, et al. *Eur Heart J*. 2007;28:980-988; Gheorghiade M, et al. *Arch Intern Med*. 2007;167:1998-2005; MA Konstam, personal communication, October 2011

REDUCED CARDIAC OUTPUT CAN STIMULATE EXCESS VASOPRESSIN RELEASE, WHICH MAY CAUSE HYPONATREMIA IN HEART FAILURE PATIENTS[1]



Rusinaru D,

Relationship of serum sodium concentration to mortality in a wide spectrum of heart failure patients with preserved and with reduced ejection fraction: an individual patient data meta-analysis(†): Meta-Analysis Global Group in Chronic heart failure (MAGGIC). *Eur J Heart Fail*. 2012;**14**:1139-1146.

meta-analysis that included 14766 patients from 22 studies and used as endpoint the death from any cause at 3 years showed that the risk of death is linearly increasing with serum sodium levels < 140 mmol/L

Los factores pronósticos

- Clase funcional
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Los factores pronósticos

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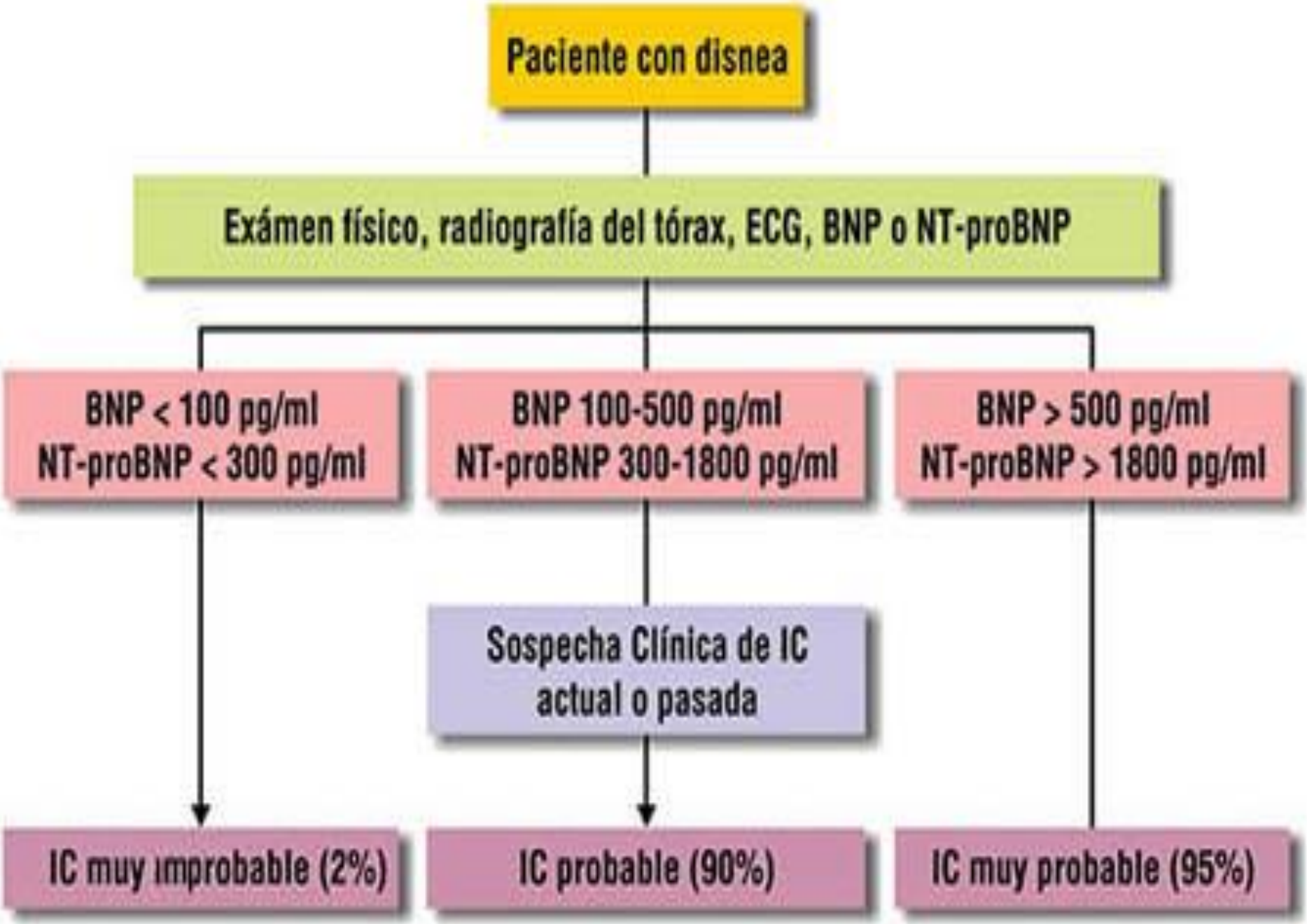
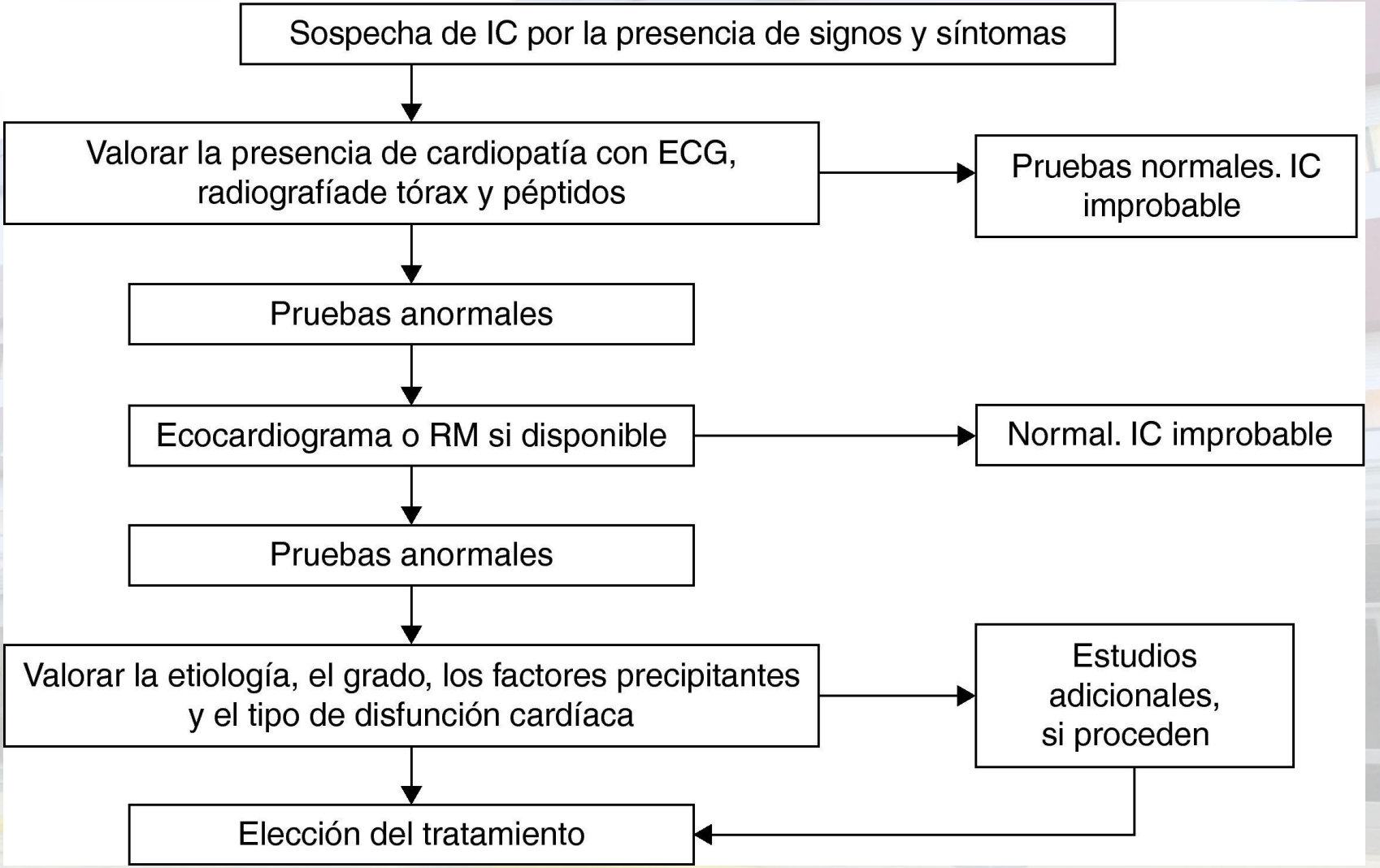
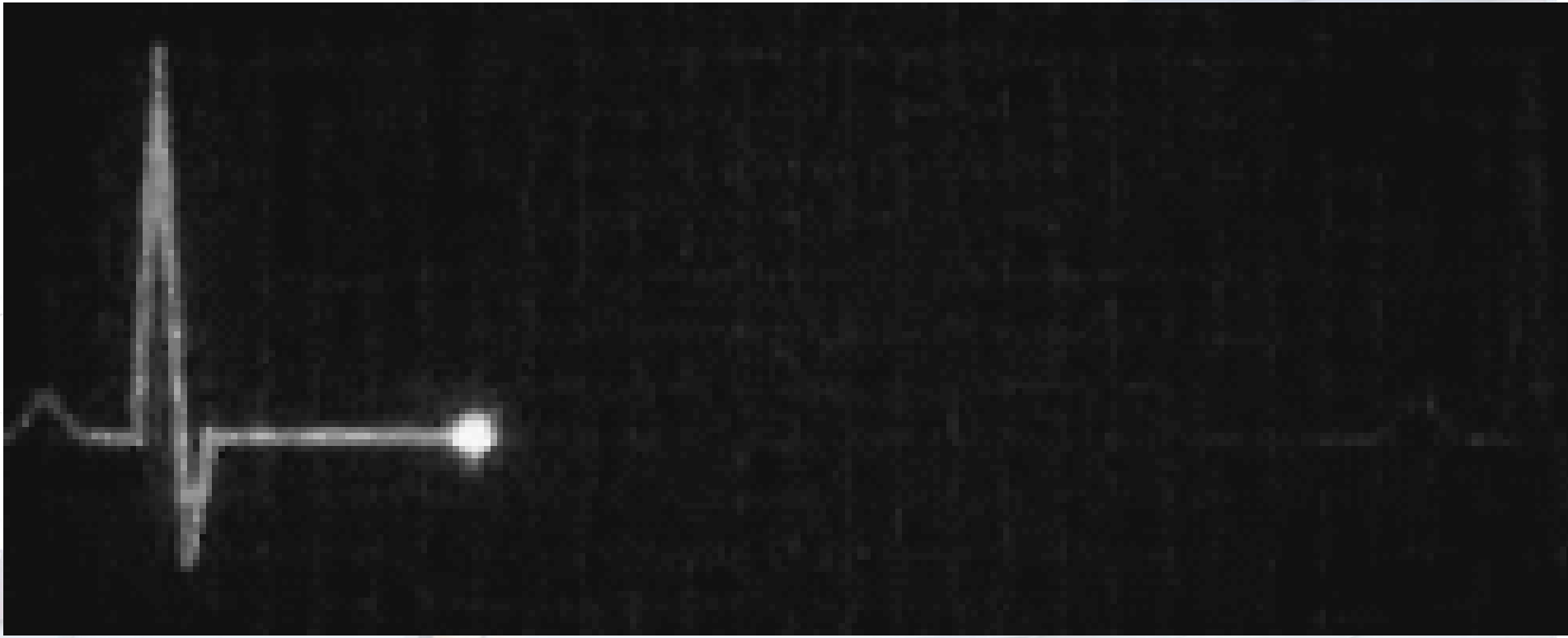

Paciente con disnea
Exámen físico, radiografía del tórax, ECG, BNP o NT-proBNP
BNP < 100 pg/ml
NT-proBNP < 300 pg/ml
BNP 100-500 pg/ml
NT-proBNP 300-1800 pg/ml
BNP > 500 pg/ml
NT-proBNP > 1800 pg/ml
Sospecha Clínica de IC
actual o pasada
IC muy improbable (2%)
IC probable (90%)
IC muy probable (95%)

Recommendations for Biomarkers in HF

Biomarker, Application	Setting	COR	LOE
Natriuretic peptides			
Diagnosis or exclusion of HF	Ambulatory, Acute	I	A
Prognosis of HF	Ambulatory, Acute	I	A
Achieve GDMT	Ambulatory	IIa	B
Guidance of acutely decompensated HF therapy	Acute	IIb	C
Biomarkers of myocardial injury			
Additive risk stratification	Acute, Ambulatory	I	A
Biomarkers of myocardial fibrosis			
Additive risk stratification	Ambulatory	IIb	B
	Acute	IIb	A


Sospecha de IC por la presencia de signos y síntomas
Valorar la presencia de cardiopatía con ECG, radiografíade tórax y péptidos
Pruebas normales. IC improbable
Pruebas anormales
Ecocardiograma o RM si disponible
Normal. IC improbable
Pruebas anormales
Valorar la etiología, el grado, los factores precipitantes y el tipo de disfunción cardíaca
Estudios adicionales, si proceden
Elección del tratamiento



European Journal of Heart Failure (2016) **18**, 1032–1040
doi:10.1002/ejhf.561

RESEARCH ARTICLE

Insights into the importance of the electrocardiogram in patients with acute heart failure

Pishoy Gouda[1], Paul Brown[1], Brian H. Rowe[2], Finlay A. McAlister[1,3,4], and Justin A. Ezekowitz[1,5]*

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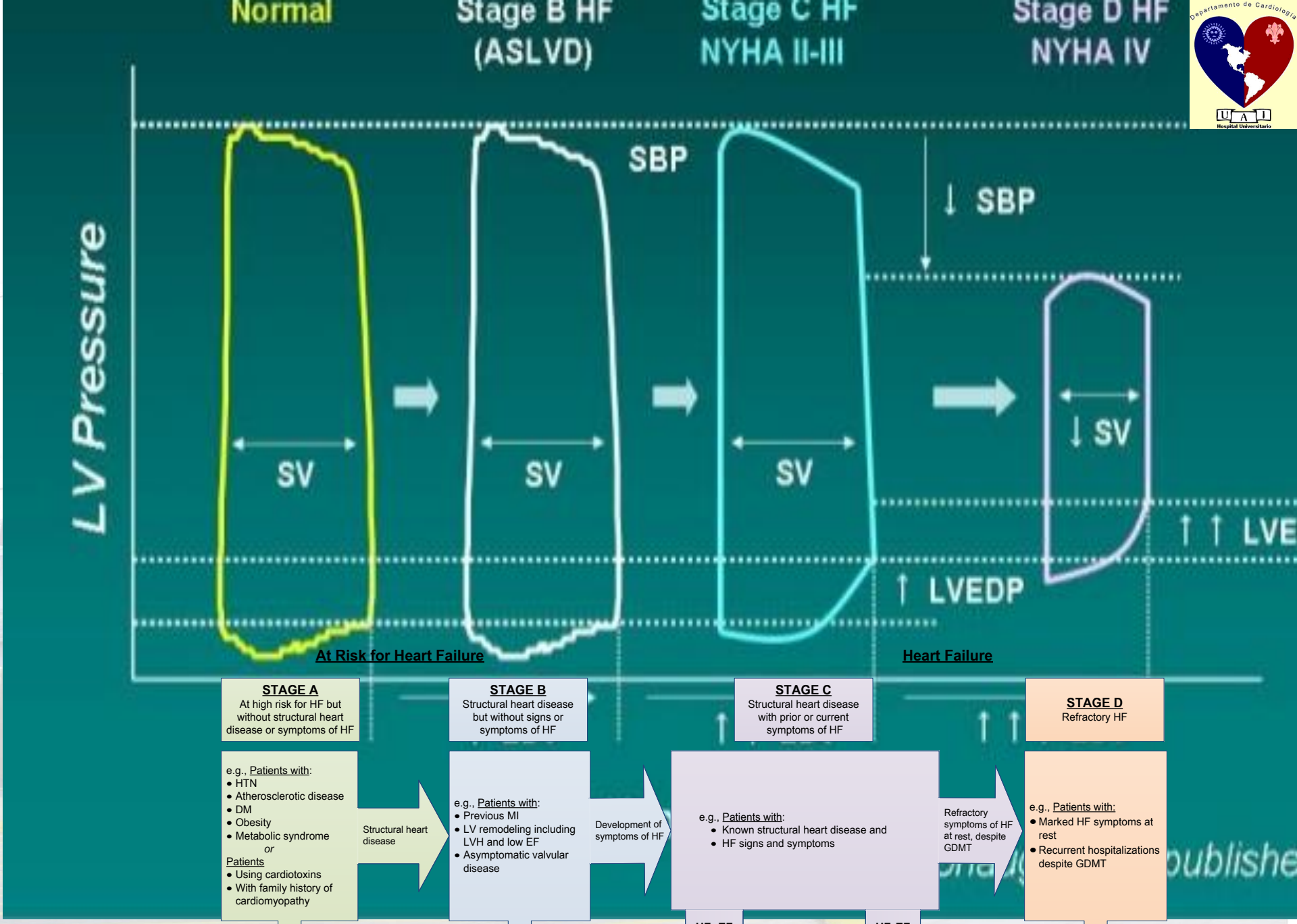
Received 25 January 2016; revised 1 March 2016; accepted 20 March 2016; online publish-ahead-of-print 5 May 2016

Table 1 Baseline characteristics

	Baseline electrocardiogram		
	Normal ($n = 61$)	Abnormal ($n = 755$)	P-value
Demographics			
Age (yrs)	73 (61–82)	77 (67–85)	0.0222
Male, %	24 (39.3)	420 (55.6)	0.0160
Co-morbidities, %			
Hypertension	48 (78.7)	570 (75.5)	0.6438
Diabetes mellitus	36 (60.0)	270 (36.2)	0.0005
Previous CAD	30 (50.8)	400 (53.3)	0.7869
Atrial fibrillation	17 (27.9)*	408 (54.0)	<0.0001
Current smoker	7 (11.5)	93 (12.3)	1.0000
Device			
Any device	2 (3.3)	131 (17.4)	0.0019
CRT	0 (0.0)	3 (1.4)	
ICD	0 (0.0)	47 (21.8)	
Pacemaker	2 (22.2)†	103 (47.5)	
Physical examination			
Heart rate, b.p.m.	82 (68–100)	84 (70–103)	0.5060

Cinco minuctos



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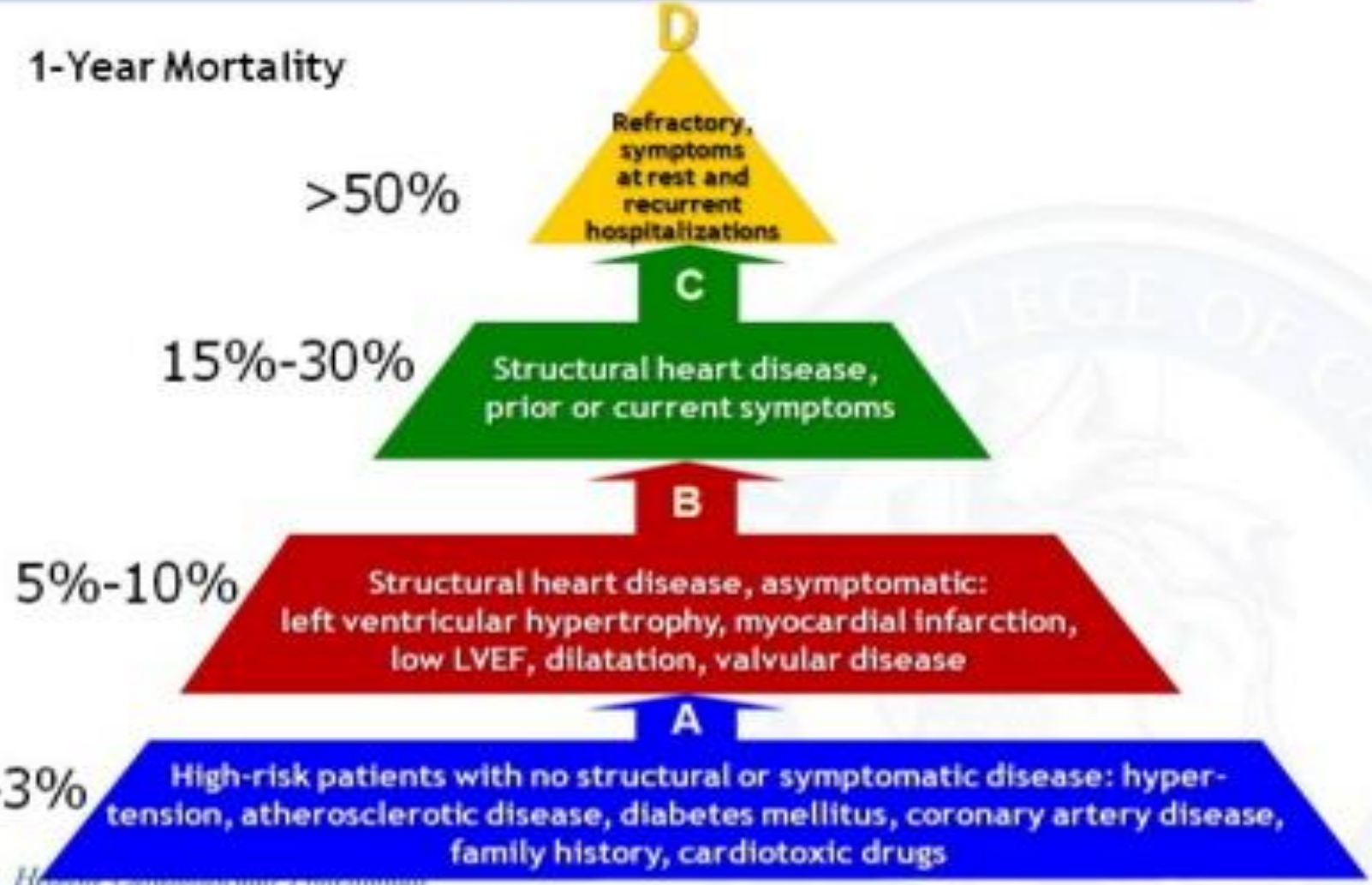
New ACCF/AHA Classification System

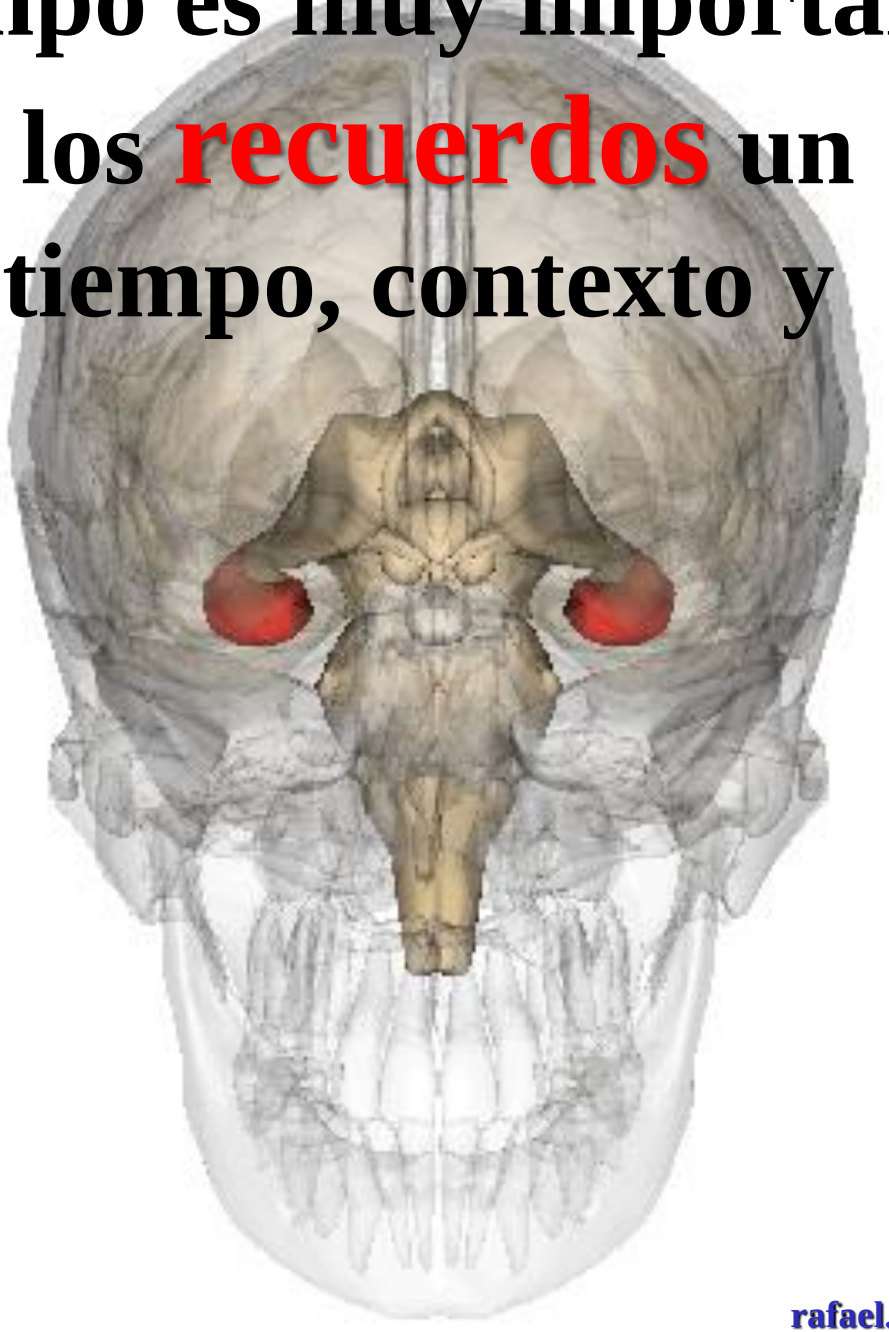


Learn. Advance. Heal.

Hunt SA et al. J Am Coll Cardiol 2009;53;e1-e90.

Trastornos neurocognitivos como expresión de insuficiencia cardíaca

El hipocampo es muy importante para dar a los recuerdos un sentido de tiempo, contexto y secuencia.



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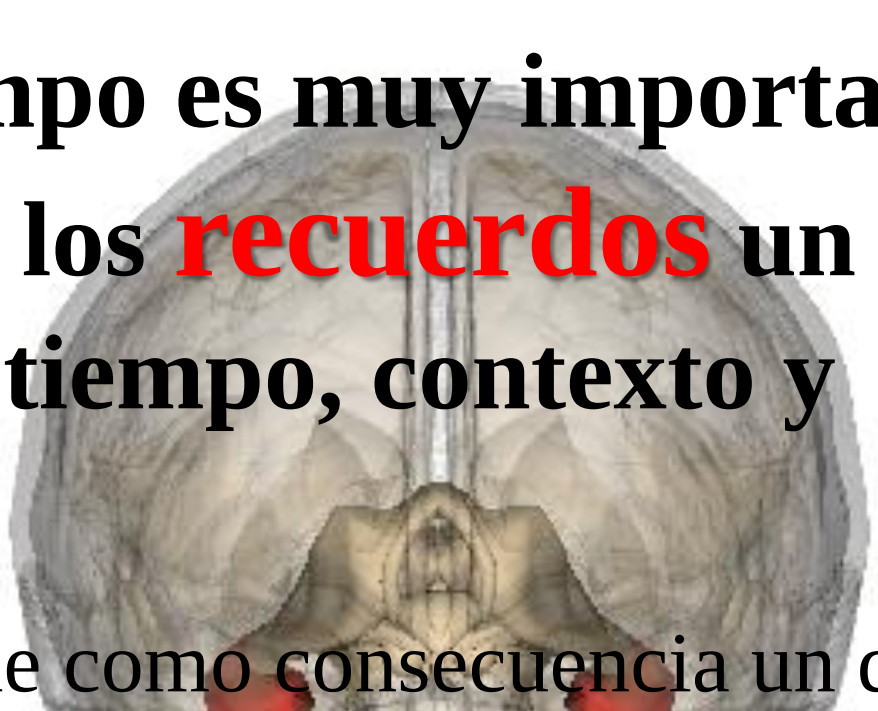
El hipocampo es muy importante para dar a los recuerdos un sentido de tiempo, contexto y secuencia.



El estrés tiene como consecuencia un descenso en el hipocampo, de uno de los receptores de la serotonina, también una atrofia en la región CA3 del hipocampo y daño en la memoria. El factor neurotrópico derivado del cerebro (FNDC) se reduce en el hipocampo como resultado del estrés prolongado y ello puede llevar a la muerte celular.

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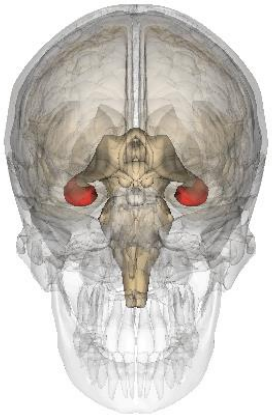

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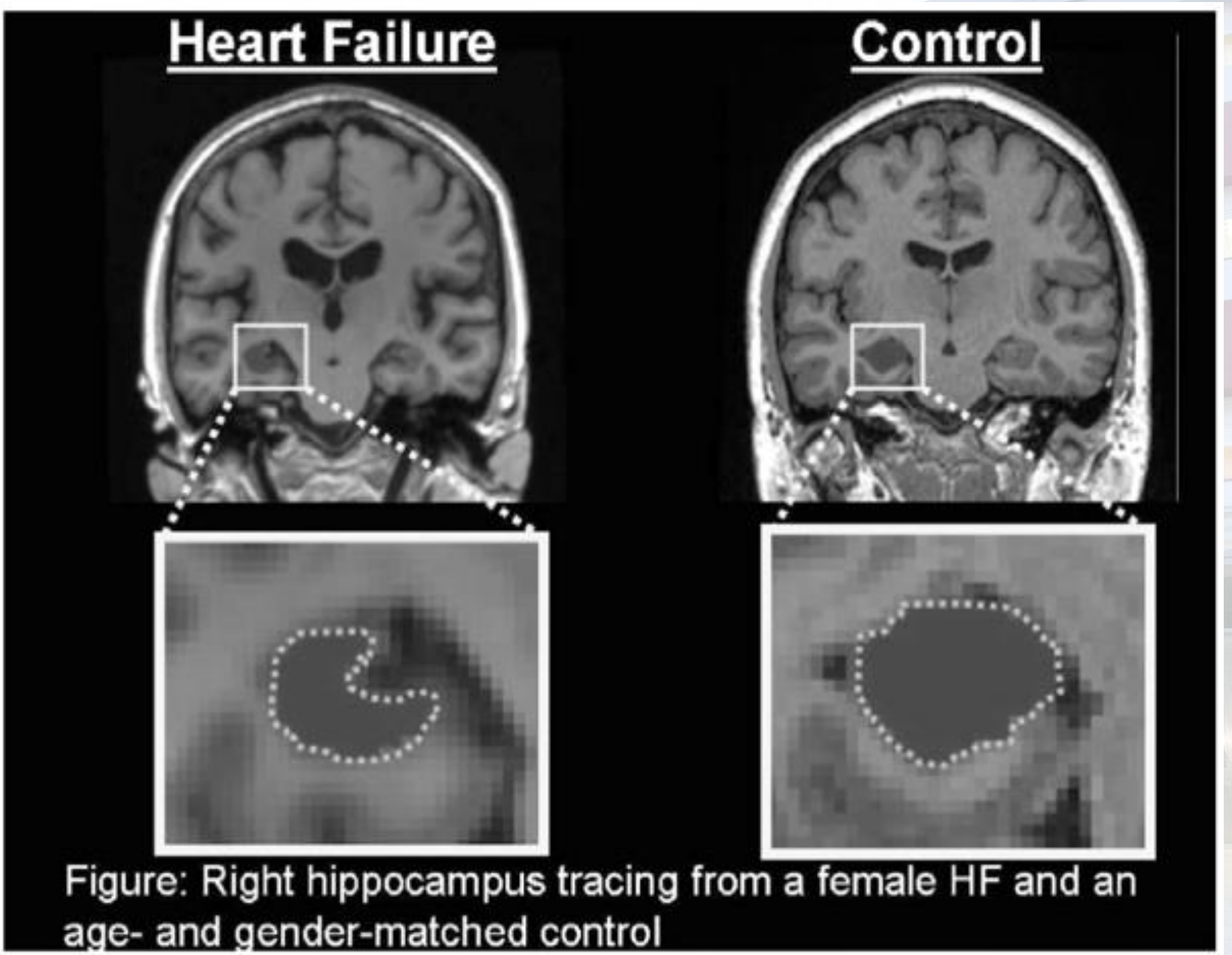
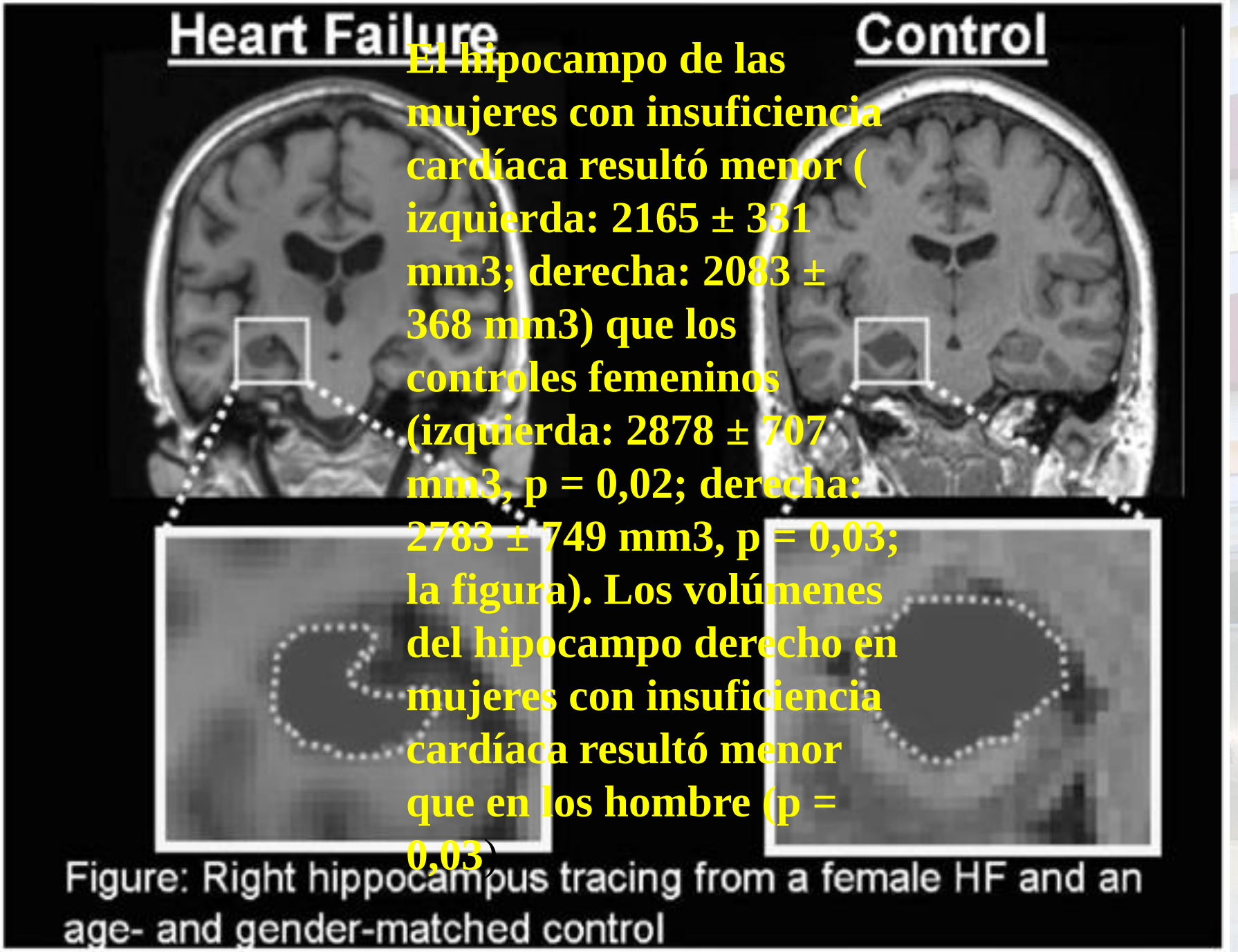


Figure: Right hippocampus tracing from a female HF and an age- and gender-matched control


Heart Failure
Control
El hipocampo de las mujeres con insuficiencia cardíaca resultó menor (izquierda: 2165 ± 331 mm3; derecha: 2083 ± 368 mm3) que los controles femeninos (izquierda: 2878 ± 707 mm3, p = 0,02; derecha: 2783 ± 749 mm3, p = 0,03; la figura). Los volúmenes del hipocampo derecho en mujeres con insuficiencia cardíaca resultó menor que en los hombre (p = 0,03)
Figure: Right hippocampus tracing from a female HF and an age- and gender-matched control

RESEARCH ARTICLE

Cognitive Function in Ambulatory Patients with Systolic Heart Failure: Insights from the Warfarin versus Aspirin in Reduced Cardiac Ejection Fraction (WARCEF) Trial

Susan Graham[1], Siqin Ye[2], Min Qian[3], Alexandra R. Sanford[3], Marco R. Di Tullio[2], Ralph L. Sacco[4], Douglas L. Mann[5], Bruce Levin[3], Patrick M. Pullicino[6], Ronald S. Freudenberger[7], John R. Teerlink[8], J. P. Mohr[9], Arthur J. Labovitz[10], Gregory Y. H. Lip[11], Conrado J. Estol[12], Dirk J. Lok[13], Piotr Ponikowski[14], Stefan D. Anker[15], John L. P. Thompson[3], Shunichi Homma[3]* for the WARCEF Investigators[¶]

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In conclusion, six-minute walk distance, but not LVEF or NYHA functional class, was an important predictor of cognitive function in ambulatory patients with systolic heart failure

LAS IMÁGENES EN INSUFICIENCIA CARDÍACA

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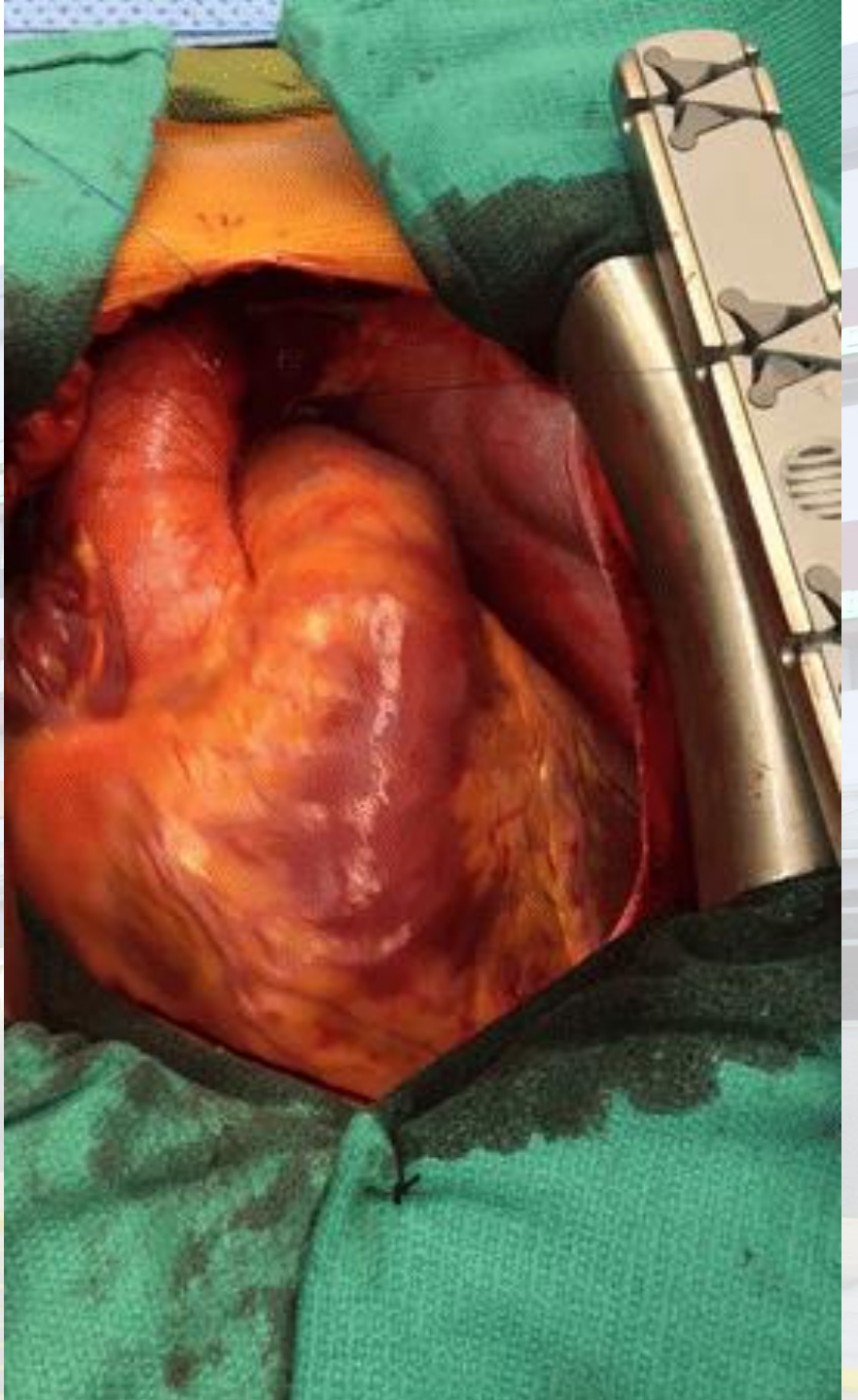
Dynamic changes and prognostic value of pulmonary congestion by lung ultrasound in acute and chronic heart failure: a systematic review

European Journal of Heart Failure **(2017)** 19, 1154–1163 RESEARCH ARTICLE doi:10.1002/ejhf.839

Lung ultrasound findings change rapidly in response to HF therapy. This technique may represent a useful and non-invasive method to track dynamic changes in pulmonary congestion. Furthermore, **residual congestion at the time of discharge in acute HF or in ambulatory patients with chronic HF may identify those at high risk for adverse events.**

Recommendations	Class [a]	Level [b]
TTE is recommended for the assessment of myocardial structure and function in subjects with suspected HF in order to establish a diagnosis of either HFrEF, HFmrEF or HFpEF.	I	C
TTE is recommended to assess LVEF in order to identify patients with HF who would be suitable for evidence-based pharmacological and device (ICD, CRT) treatment recommended for HFrEF.	I	C
TTE is recommended for the assessment of valve disease, right ventricular function and pulmonary arterial pressure in patients with an already established diagnosis of either HFrEF, HFmrEF or HFpEF in order to identify those suitable for correction of valve disease.	I	C
TTE is recommended for the assessment of myocardial structure and function in subjects to be exposed to treatment which potentially can damage myocardium (e.g. chemotherapy).	I	C
Other techniques (including systolic tissue Doppler velocities and deformation indices, i.e. strain and strain rate), should be considered in a TTE protocol in subjects at risk of developing HF in order to identify myocardial dysfunction at the preclinical stage.	IIa	C
CMR is recommended for the assessment of myocardial structure and function (including right heart) in subjects with poor acoustic window and patients with complex congenital heart diseases (taking account of cautions/contra-indications to CMR).	I	C
CMR with LGE should be considered in patients with dilated cardiomyopathy in order to distinguish between ischaemic and non-ischaemic myocardial damage in case of equivocal clinical and other imaging data (taking account of cautions/contra-indications to CMR).	IIa	C
CMR is recommended for the characterization of myocardial tissue in case of suspected myocarditis, amyloidosis, sarcoidosis, Chagas disease, Fabry disease non-compaction cardiomyopathy, and haemochromatosis (taking account of cautions/contra-indications to CMR).	I	C
Non-invasive stress imaging (CMR, stress echocardiography, SPECT, PET) may be considered for the assessment of myocardial ischaemia and viability in patients with HF and CAD (considered suitable for coronary revascularization) before the decision on revascularization.	IIb	B
Invasive coronary angiography is recommended in patients with HF and angina pectoris recalcitrant to pharmacological therapy or symptomatic ventricular arrhythmias or aborted cardiac arrest (who are considered suitable for potential coronary revascularization) in order to establish the diagnosis of CAD and its severity.	I	C
Invasive coronary angiography should be considered in patients with HF and intermediate to high pre-test probability of CAD and the presence of ischaemia in non-invasive stress tests (who are considered suitable for potential coronary revascularization) in order to establish the diagnosis of CAD and its severity.	IIa	C
Cardiac CT may be considered in patients with HF and low to intermediate pre-test probability of CAD or those with equivocal non-invasive stress tests in order to rule out coronary artery stenosis.	IIb	C
Reassessment of myocardial structure and function is recommended using non-invasive imaging: - in patients presenting with worsening HF symptoms (including episodes of AHF) or experiencing any other important cardiovascular event; - in patients with HF who have received evidence-based pharmacotherapy in maximal tolerated doses, before the decision on device implantation (ICD, CRT); - in patients exposed to therapies which may damage the myocardium (e.g. chemotherapy) (serial assessments).	I	C



Recommendations for Noninvasive Imaging

Recommendation	COR	LOE
Patients with suspected, acute, or new-onset HF should undergo a chest x-ray	I	C
A 2-dimensional echocardiogram with Doppler should be performed for initial evaluation of HF	I	C
Repeat measurement of EF is useful in patients with HF who have had a significant change in clinical status or received treatment that might affect cardiac function, or for consideration of device therapy	I	C
Noninvasive imaging to detect myocardial ischemia and viability is reasonable in HF and CAD	IIa	C
Viability assessment is reasonable before revascularization in HF patients with CAD	IIa	B
Radionuclide ventriculography or MRI can be useful to assess LVEF and volume	IIa	C
MRI is reasonable when assessing myocardial infiltration or scar	IIa	B
Routine repeat measurement of LV function assessment should not be performed	III: No Benefit	B

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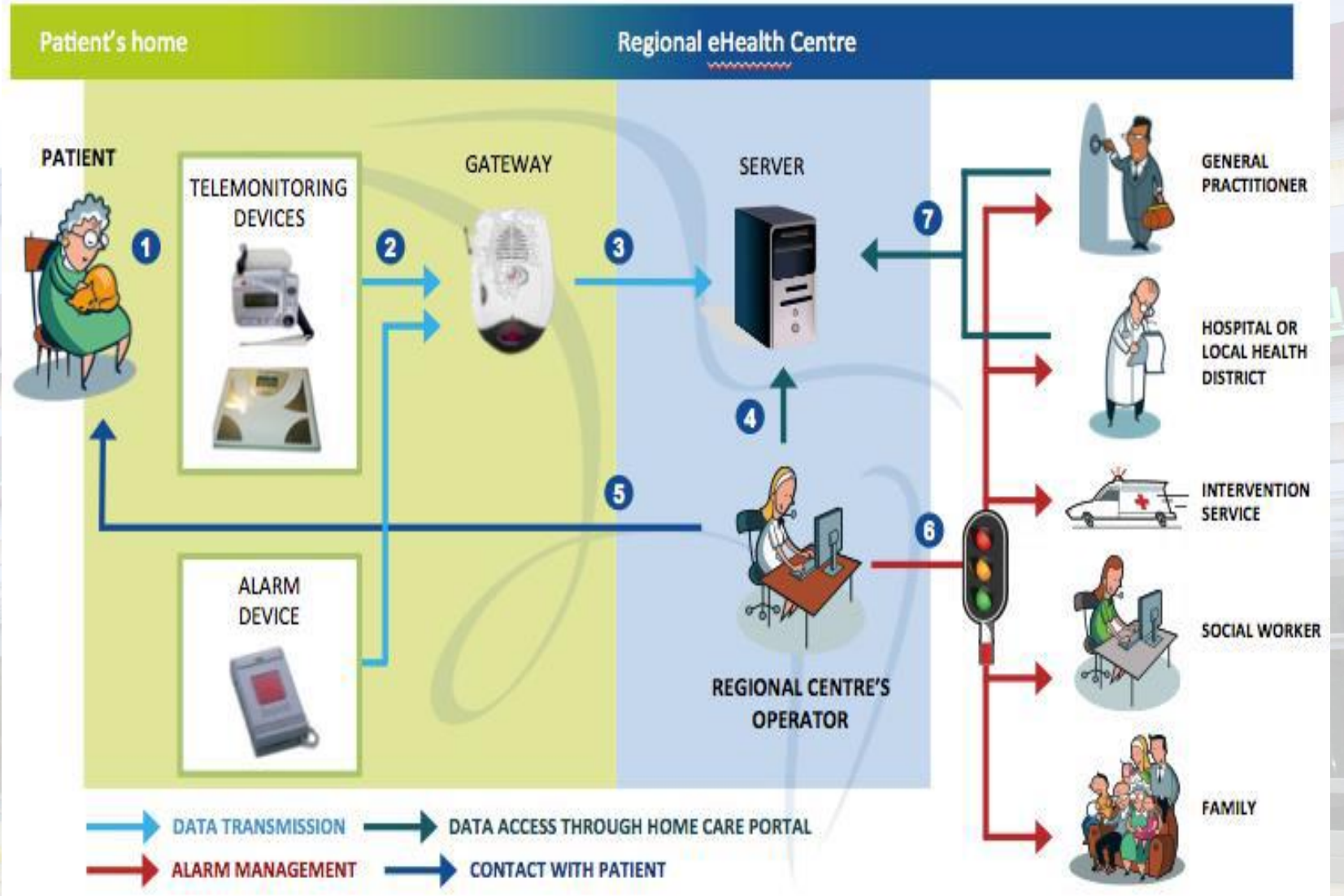
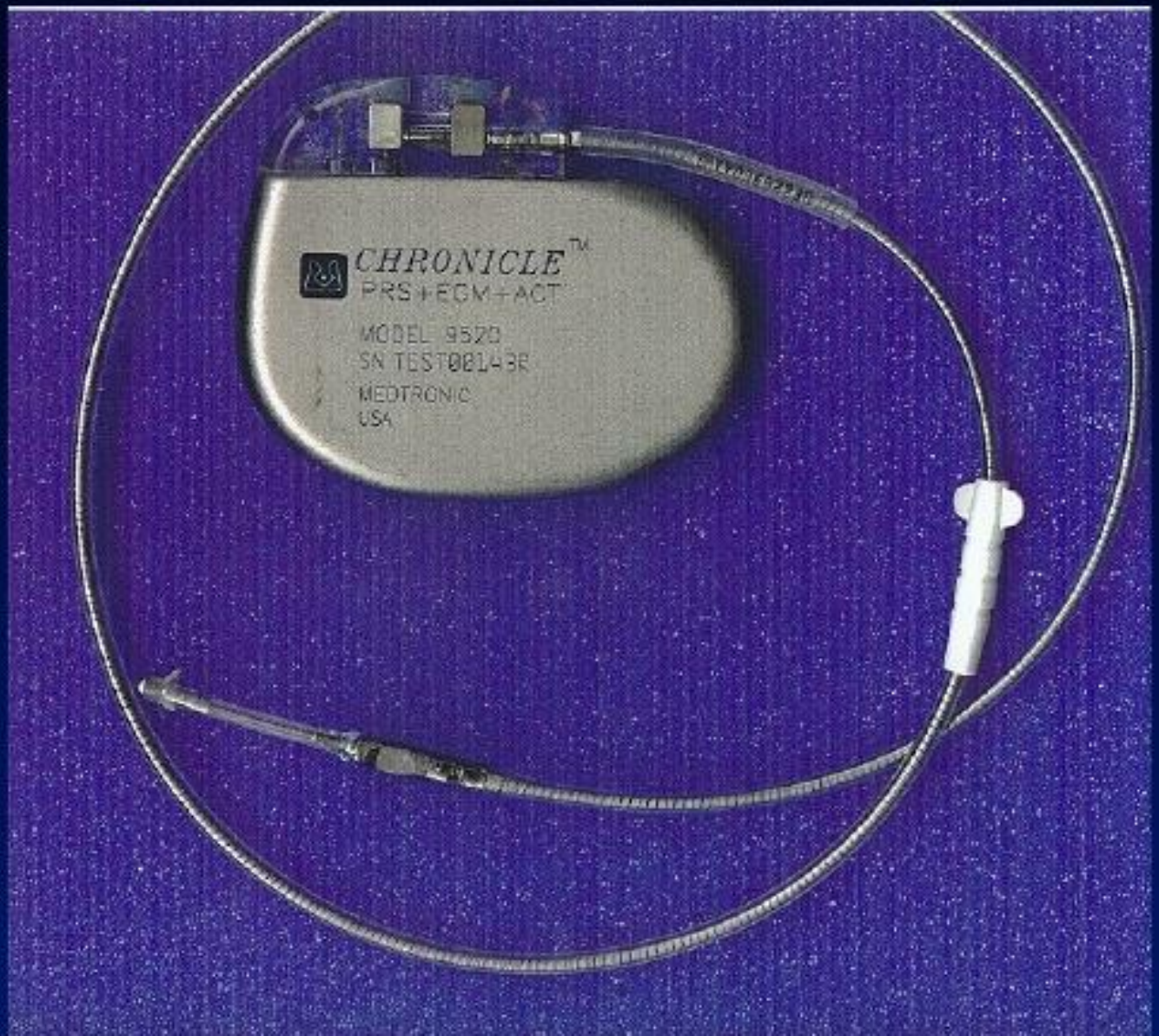
Recommendations for Invasive Evaluation

Recommendation	COR	LOE
Monitoring with a pulmonary artery catheter should be performed in patients with respiratory distress or impaired systemic perfusion when clinical assessment is inadequate	I	C
Invasive hemodynamic monitoring can be useful for carefully selected patients with acute HF with persistent symptoms and/or when hemodynamics are uncertain	IIa	C
When coronary ischemia may be contributing to HF, coronary arteriography is reasonable	IIa	C
Endomyocardial biopsy can be useful in patients with HF when a specific diagnosis is suspected that would influence therapy	IIa	C
Routine use of invasive hemodynamic monitoring is not recommended in normotensive patients with acute HF	III: No Benefit	B
Endomyocardial biopsy should not be performed in the routine evaluation of HF	III: Harm	C

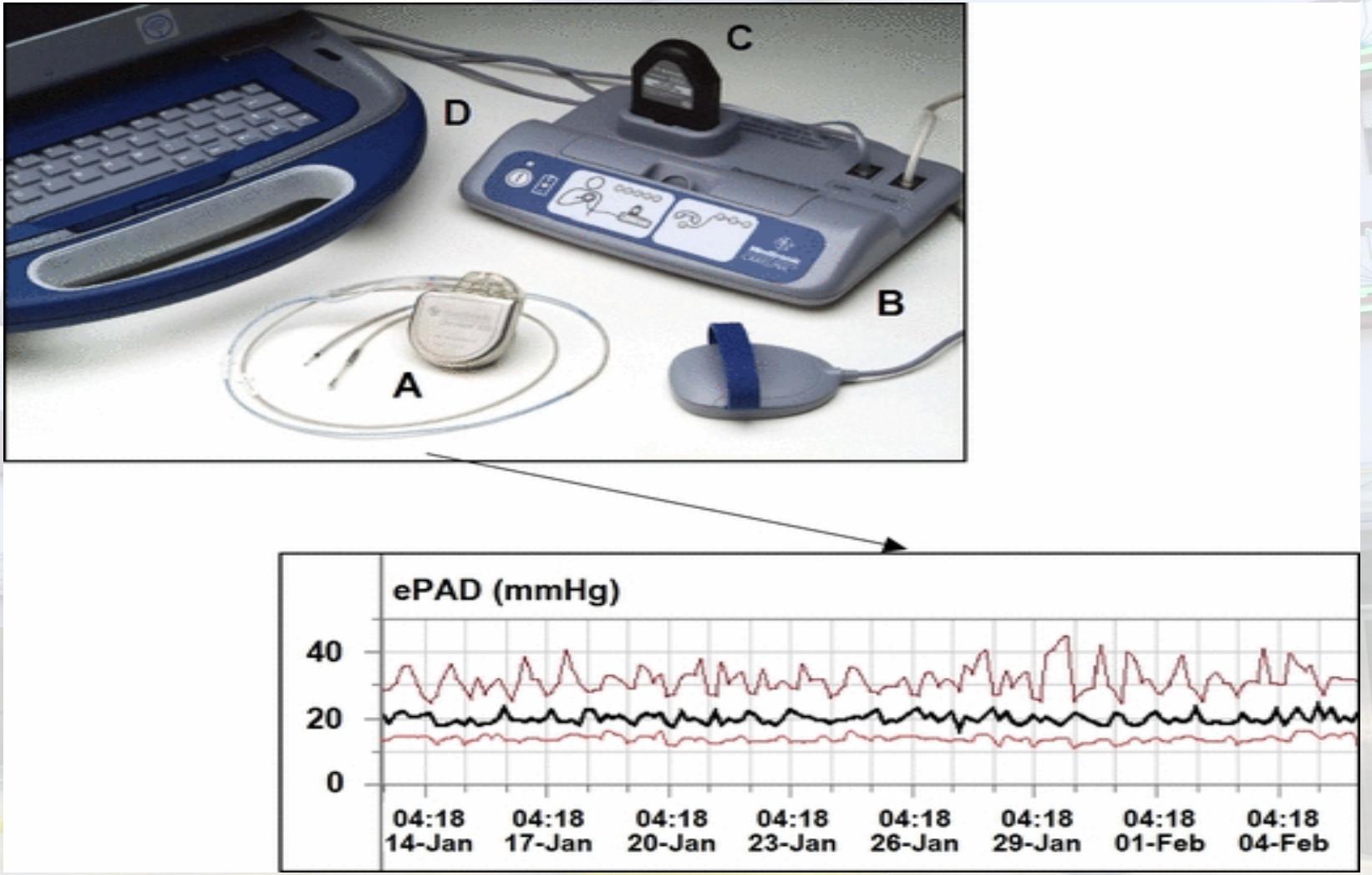
Dispositivos implantadles para en monitoreo y diagnostico de la insuficiencia cardíaca


Patient's home
Regional eHealth Centre
PATIENT
TELEMONITORING DEVICES
GATEWAY
SERVER
GENERAL PRACTITIONER
HOSPITAL OR LOCAL HEALTH DISTRICT
INTERVENTION SERVICE
SOCIAL WORKER
FAMILY
ALARM DEVICE
REGIONAL CENTRE'S OPERATOR
1
2
3
4
5
6
7
DATA TRANSMISSION
DATA ACCESS THROUGH HOME CARE PORTAL
ALARM MANAGEMENT
CONTACT WITH PATIENT

Chronicle™ : Monitor Hemodinámico Implantable (Medtronic, Inc.)



Continuous Hemodynamic Monitoring in Patients With Mild to Moderate Heart Failure: Results of the Reducing Decompensation Events Utilizing Intracardiac Pressures in Patients With Chronic Heart Failure (REDUCE*hf*) Trial



Congestive Heart Failure
Volume 17, Issue 5, pages 248-254, 10 AUG 2011 DOI: 10.1111/j.1751-7133.2011.00247.x
http://onlinelibrary.wiley.com/doi/10.1111/j.1751-7133.2011.00247.x/full#f1

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Congestive Heart Failure
Volume 17, *Issue 5, pages 248–254,* ***September*/October 2011**

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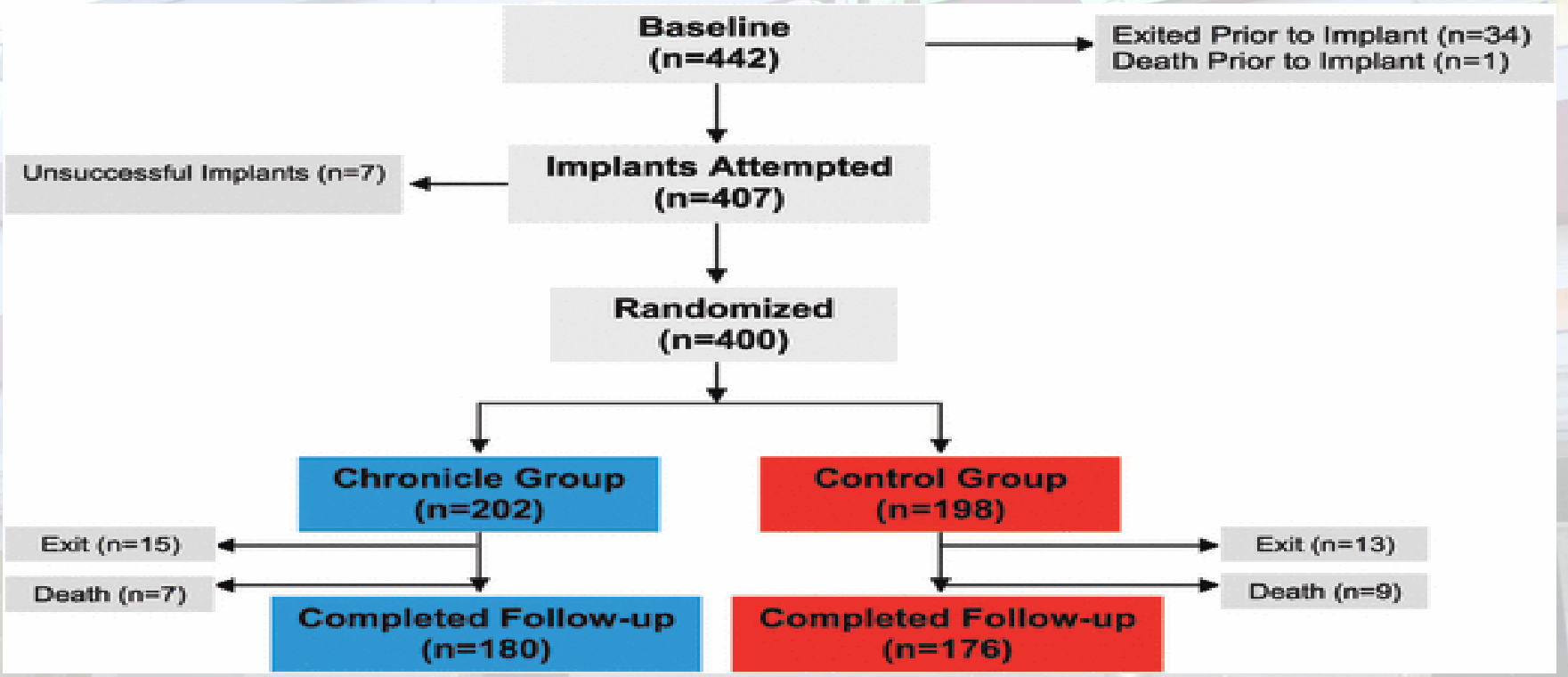

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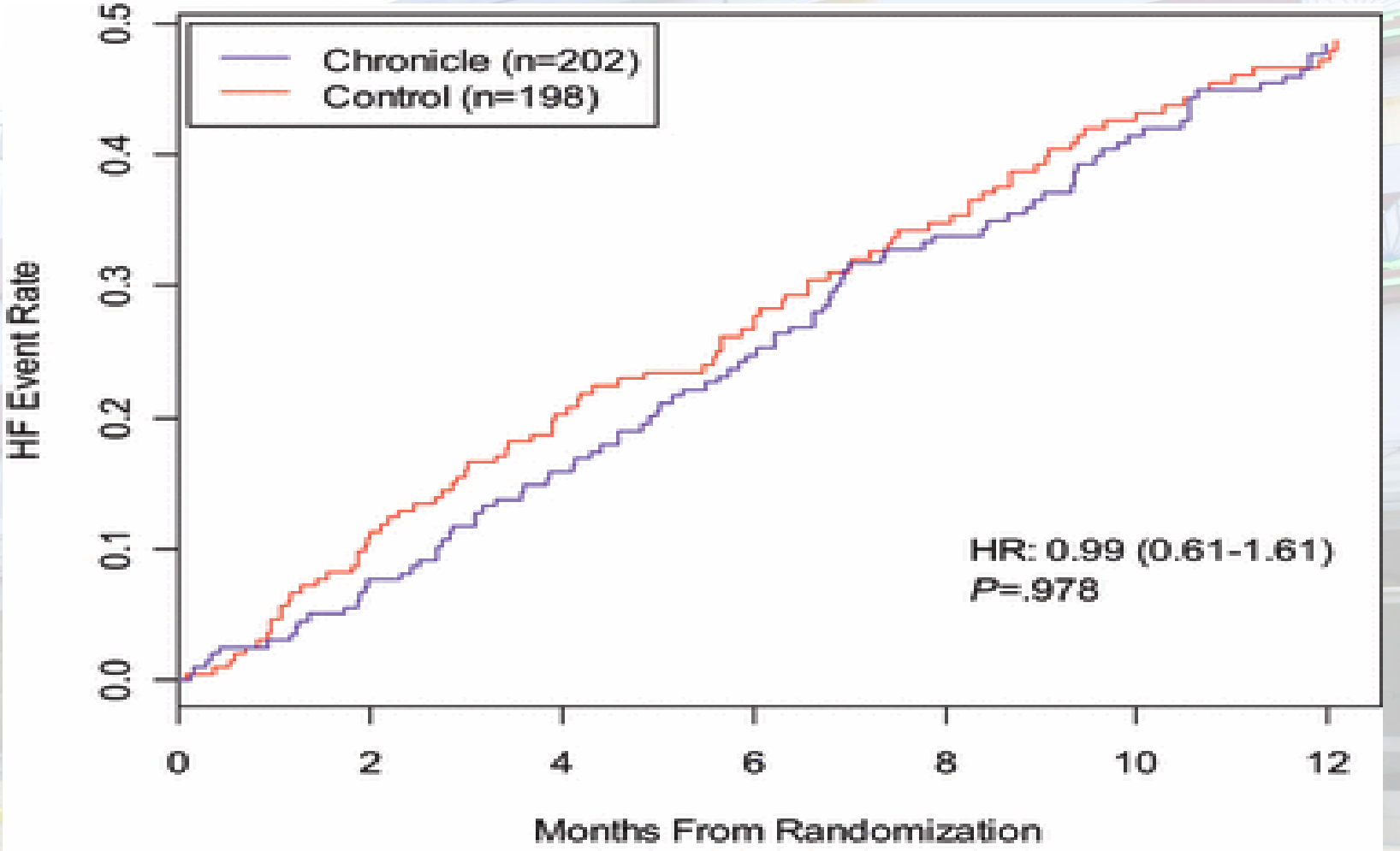

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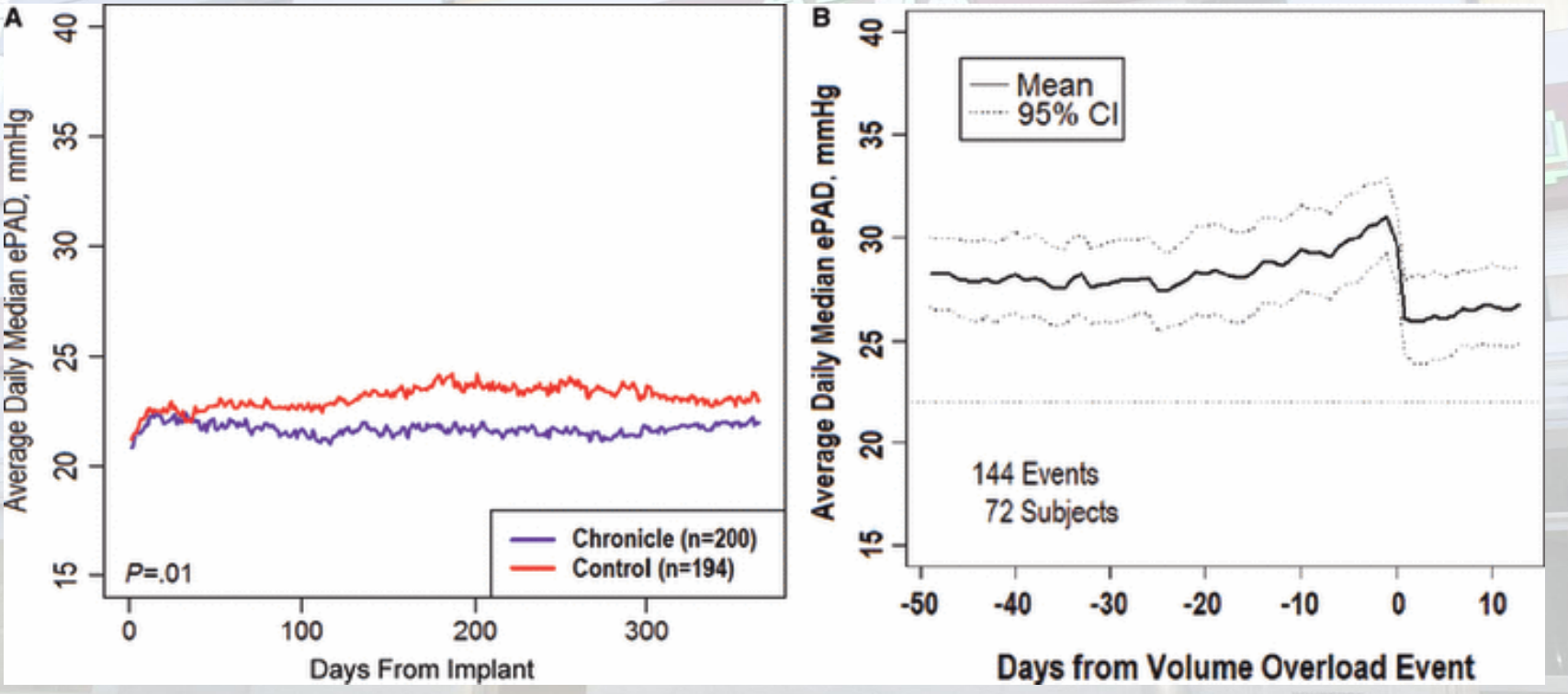

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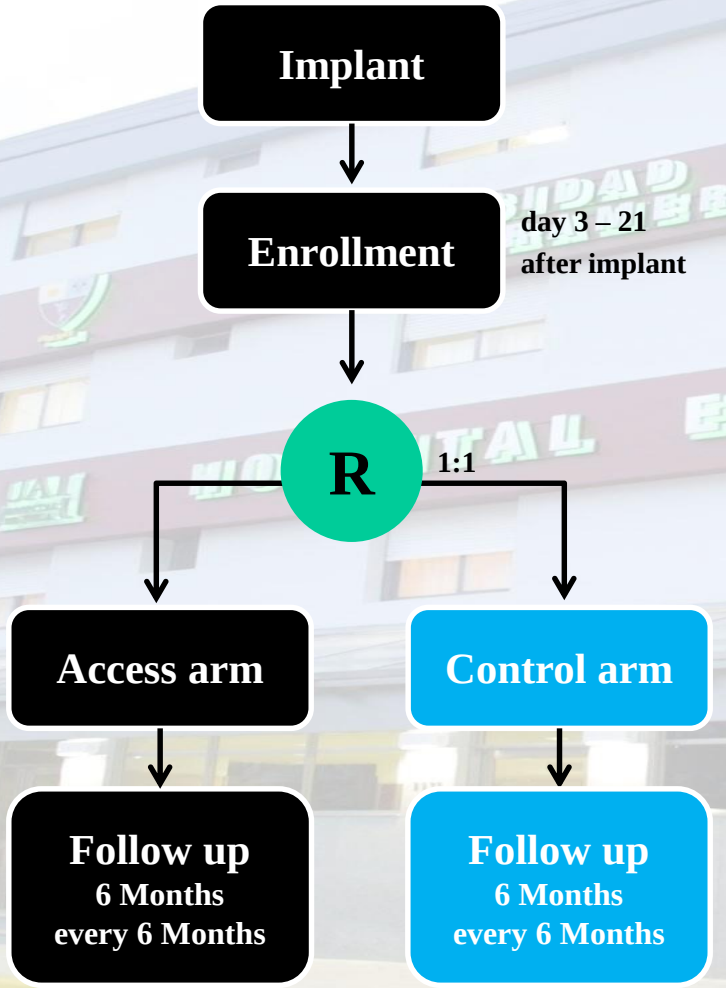
http://onlinelibrary.wiley.com/doi/10.1111/j.1751-7133.2011.00247.x/full#f4

Efficacy was inconclusively tested because of the early termination of the trial, but the experience helps define the patient population most likely to benefit from IHM-based HF management

•2015

OPTILINK HF STUDY DESIGN



Access arm:

- Telemedicine guided,
- **No audible alert** for fluid retention

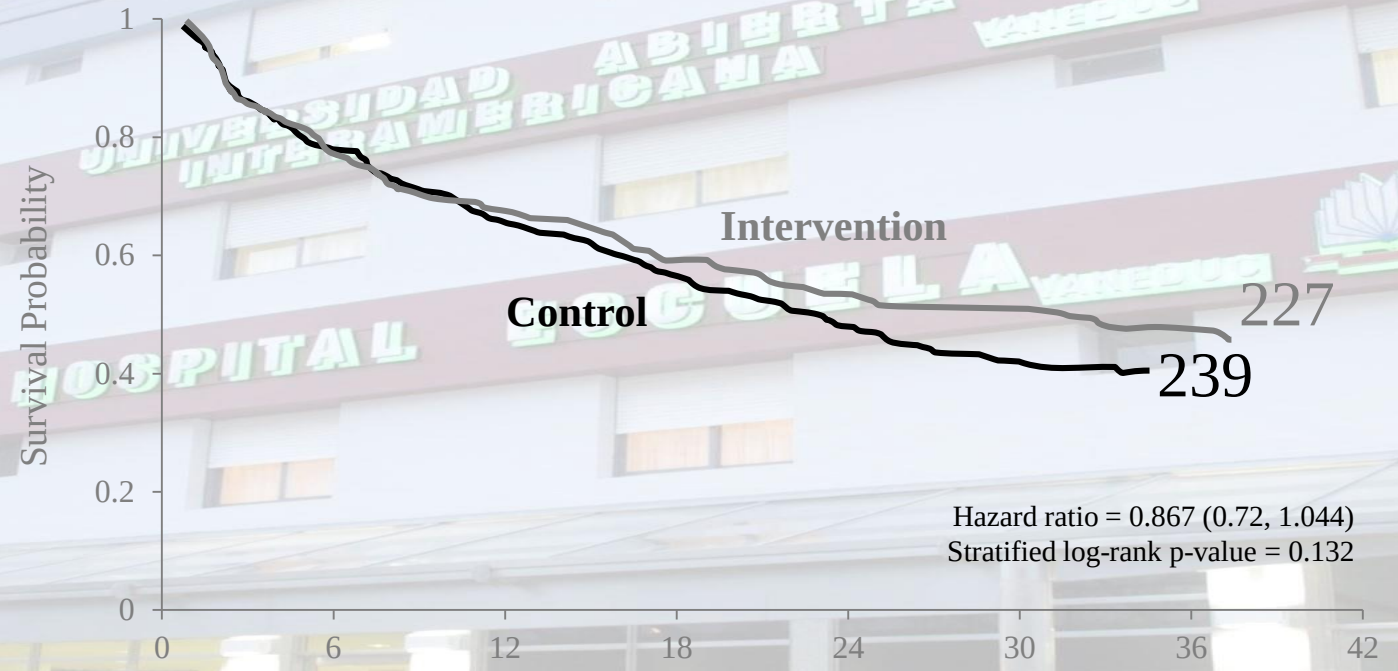
Control arm:

- Standard clinical assessment,
- No alert for fluid retention

Risk stratified:

- NYHA II vs. III,
- Ischemic vs. Non-Ischemic,
- Atrial Fibrillation,
- Primary vs. Secondary Prevention (VT/VF before Implant)

OPTILINK HF: PRIMARY ENDPOINT:
ALL-CAUSE DEATH OR CV HOSPITALISATION



Number at risk

Control	497	361	302	175	84	64	45	29
Intervention	505	361	310	183	94	80	58	35

Conclusions

OptiLink HF did not show superiority of a specific intra-thoracic impedance and telemedicine-based heart failure disease management strategy over standard clinical assessment.

Telemonitoring depends upon multiple factors, successful transmission, subsequent intervention/medical action, and patient adherence.

These latter obstacles need to be overcome.

MUCHAS GRACIAS POR SU ATENCIÓN

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