TURIN, 20TH—21ST NOVEMBER 2008

GREAT INNOVATIONS IN CARDIOLOGY

4TH JOINT MEETING WITH MAYO CLINIC

4TH TURIN CARDIOVASCULAR NURSING CONVENTION

SCOMPENSO CARDIACO II

R. Saviolo (Torino), M. Carli (Pavia)

Screening pre-trapianto cuore

UNIVERSITA' DEGLI STUDI DI TORINO
FACOLTA' DI MEDICINA E CHIRURGIA

Screening pre-trapianto cuore

R. Saviolo

AZIENDA OSPEDALIERA
FACOLTA' DI MEDICINA E CHIRURGIA SAN GIOVANNI BATTISTA "MOLINETTE"
DIPARTIMENTO CARDIO - VASCOLARE

Lo scopo di un programma di inserimento in LAT è selezionare il paziente che avrà beneficio dal ricevere un trapianto cardiaco:

-live longer

-live better

Who needs a heart transplant?

Who gets a heart transplant?

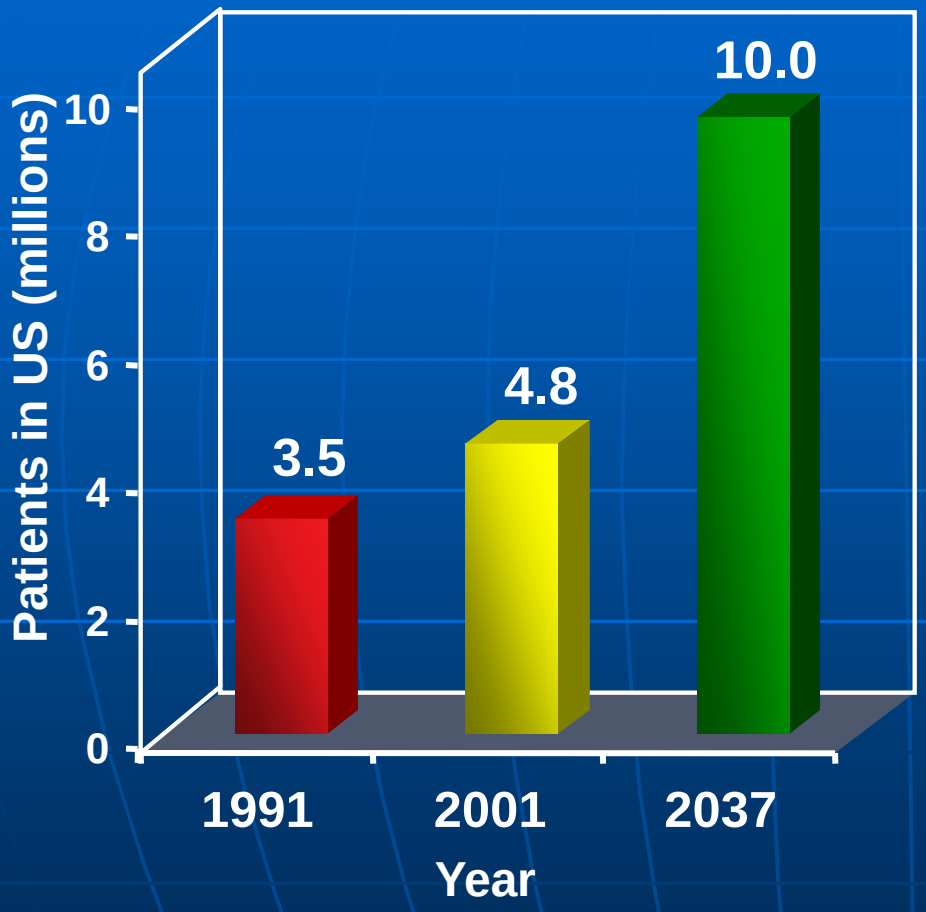
Who gets a heart transplant?

Patients with **end stage heart failure**
non responders
to maximal medical therapies
or conservative surgery
unless comorbid non cardiac condition

BOX 1 Etiologies of End-stage Heart Failure

- Cardiomyopathy
  - Ischemic
  - Nonischemic
    - Idiopathic (familial vs myocarditis)
    - Drug toxicity
    - Postpartum/peripartum
    - Hypertrophic
    - Restrictive
    - Valvular
  - Other
    - Adult congenital heart disease
    - Allograft failure requiring retransplantation

Epidemiology of Heart Failure in the United States



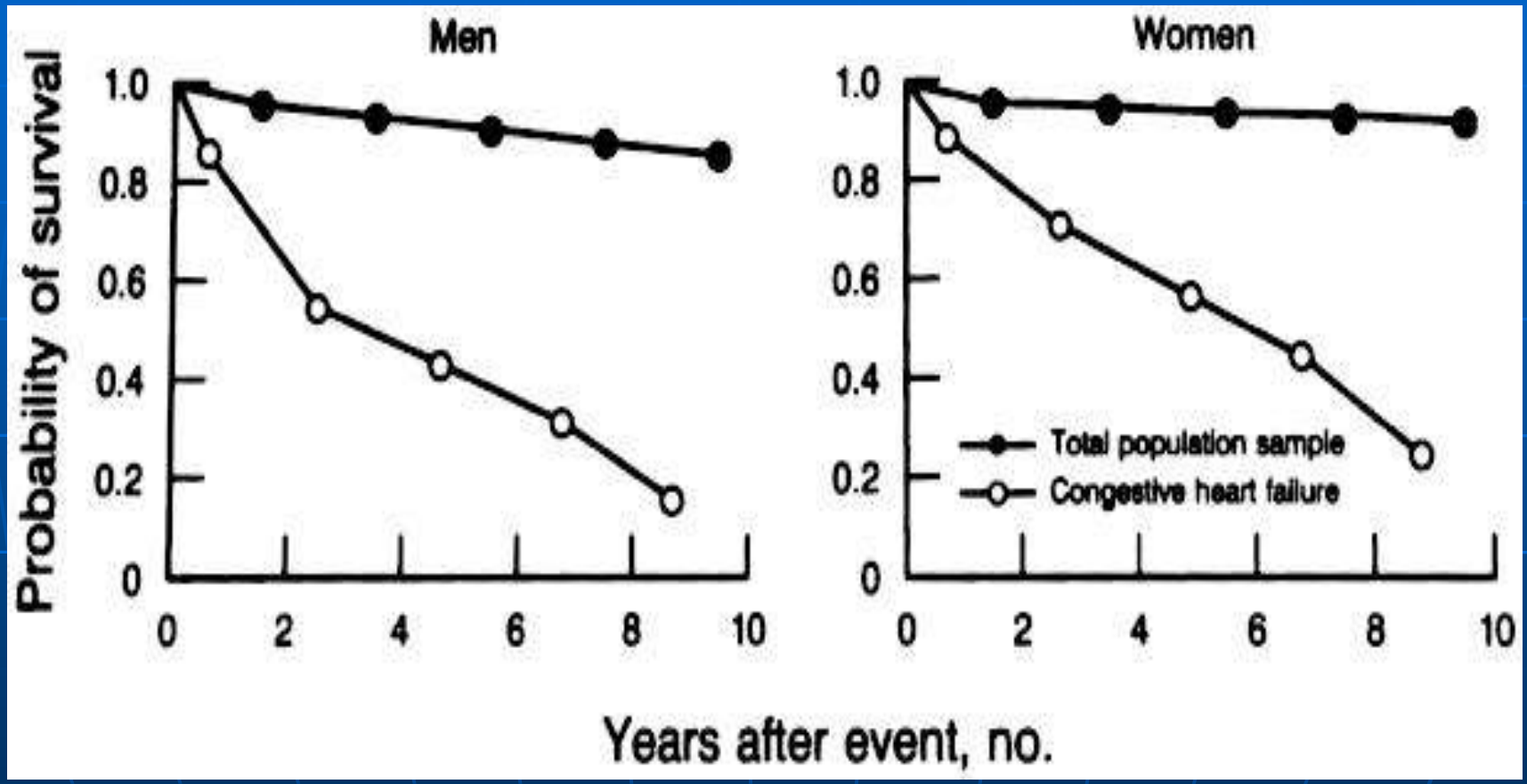
- **5.0 million patients[1]; estimated 10 million in 2037[2]**
- **Incidence: about 550,000 new cases each year[1]**
- **Prevalence is 2% in persons aged 40 to 59 years, progressively increasing to 10% for those aged 70 years and older[3]**
- **Sudden cardiac death is 6 to 9 times higher in the heart failure population[1]**

1. American Heart Association. *2004 Heart and Stroke Statistical Update.* 2001.
2. Croft JB et al. *J Am Geriatr Soc.* 1997;45:270-275.
3. National Heart, Lung, and Blood Institute. *Congestive Heart Failure Data Fact Sheet*. Available at: http://www.nhlbi.nih.gov/health/public/heart/other/CHF.htm.

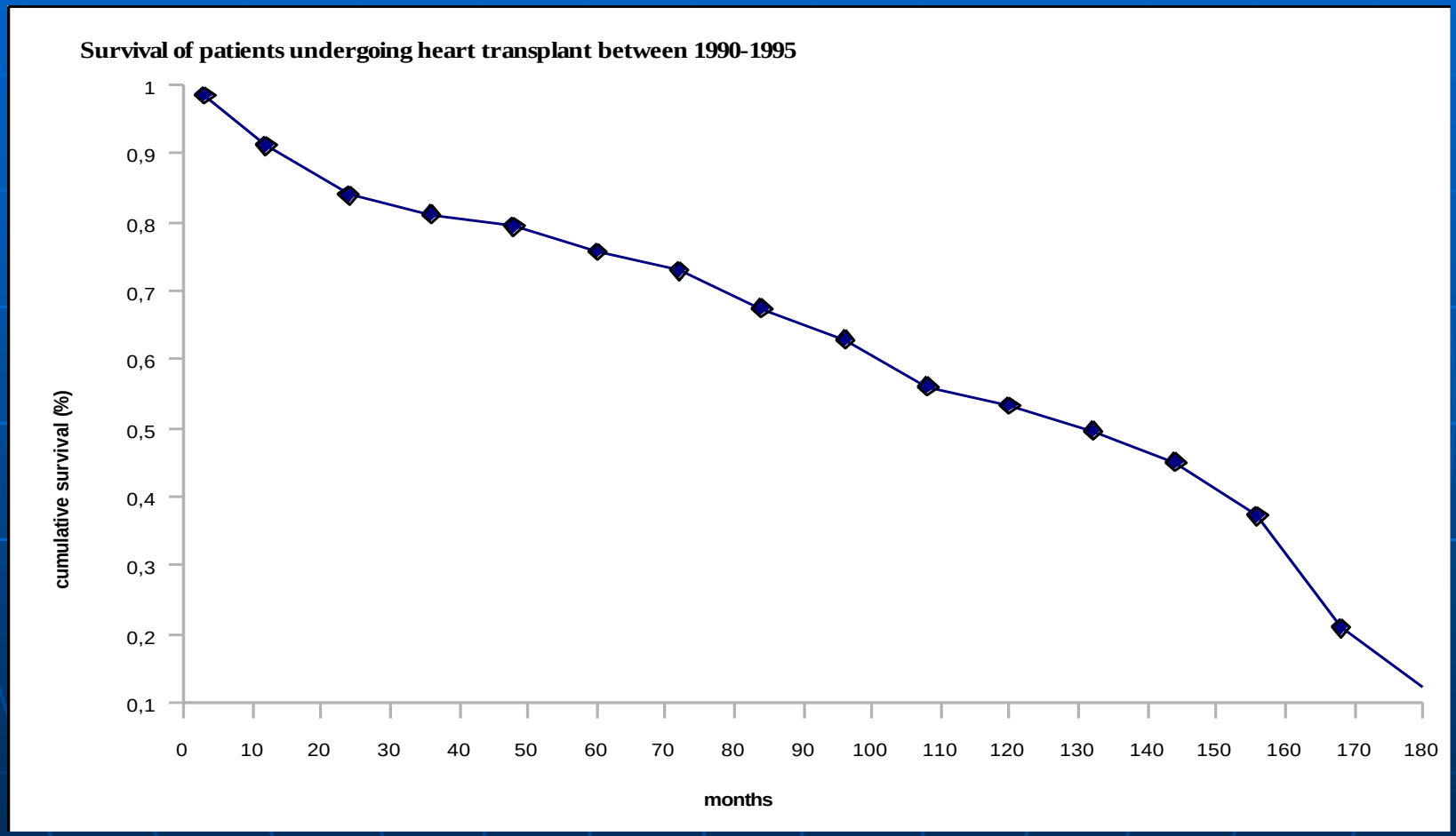
Who does need a heart transplant?

- **Hospitalized patients:**
- **- Pts with decompensated HF**
- **- Pts with cardiogenic shock and AMI**

- **Outpatients: 1 year mortality rates of 10-13% in advanced HF**


Men
Women
Probability of survival
1.0
0.8
0.6
0.4
0.2
0
0
2
4
6
8
10
Total population sample
Congestive heart failure
Years after event, no.

Survival



ASO San Giovanni Battista, Torino

How do we select patients?

Quantificare il rischio di un singolo individuo con HF è notoriamente difficile.

Misurare il rischio è di cruciale importanza

- **Chi avrà il maggior benefico da un trapianto cardiaco.**
- **Heart failure survival score**

BOX 4 Determinants of Severity of Heart Failure

Left ventricular ejection fraction (LVEF)

Hemodynamics

Functional capacity

Peak oxygen consumption (VO_2 max), ventilatory equivalent of carbon dioxide, NYHA Class

Arrhythmias

Heart Failure Survival Score (HFSS)

HEART FAILURE SURVIVAL SCORE

Coronary artery disease (yes = 1, no = 0)	(..... × 0.6931) =	+
Intraventricular conduction delay (yes = 1, no = 0)	(..... × 0.6083) =	+
Left ventricular ejection fraction (%)	(..... × −0.0464) =	+
Heart rate (b.p.m.)	(..... × 0.0216) =	+
Na^+ concentration (mmol/L)	(..... × −0.0470) =	+
Mean arterial pressure (mmHg)	(..... × −0.0255) =	+
Peak VO_2 (mL/min/kg)	(..... × −0.0546) =	
	HFSS = ...	

High risk <7.19 (35%, 1-year survival), medium risk = 7.20–8.09 (60%, 1-year survival), and low risk >8.10 (88%, 1-year survival).

Is the HFSS relevant to patients with advanced heart failure in 2008?

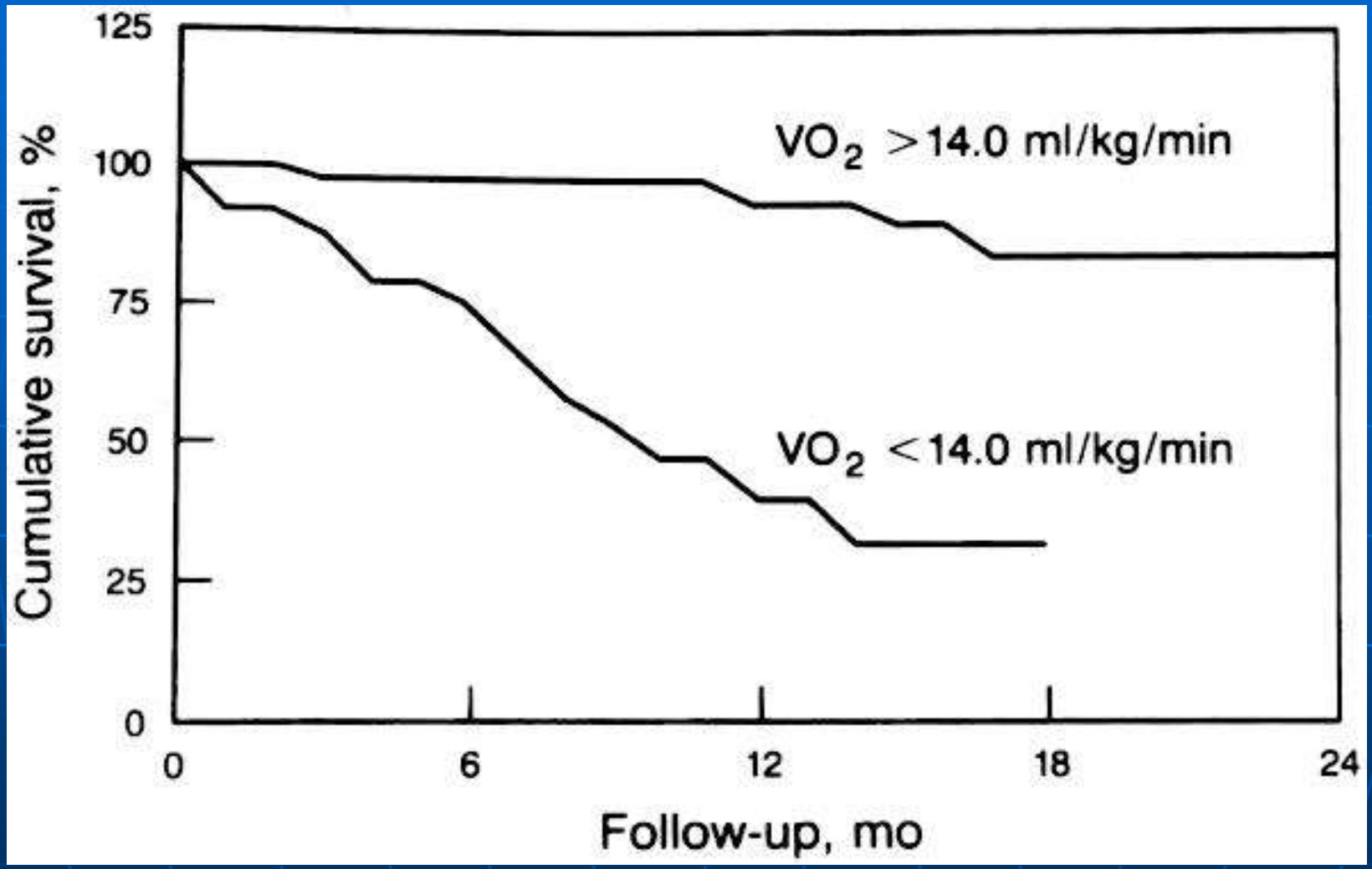
- Patients cohorts from 1986 to 1991 and 1993 to 1995
- Since the late 1990s there has been a dramatic change in the management of HF (BB,aldosterone AT receptor blockers,ICD and CRT)

Characteristics of the HFSS model derivation (n = 268) and model validation (n = 199) samples

Characteristic	Derivation sample	Validation sample
Age (years)	50+11	52+10
Sex (% male)	80	81
Race (% Caucasian)	66	78
NYHA class (mean)	2.8+0.9	2.8+0.7
LVEF (%)	20+8	22+8
Peak VO2 (mL/kg/min)	14.6+5.4 (4–40)	15.9+4.3 (7–40)
Resting heart rate (b.p.m.)	87+16 (56–140)	87+17 (43–150)
Mean blood pressure (mmHg)	86+13 (57–130)	83+12 (60–119)
Serum sodium (mmol/L)	137+4 (119–147)	138+4 (120–148)
IVCD (%)	27	53
Ischaemic aetiology (%)	45	47
Medical therapy (%)		
ACE inhibitor	88	93
Digoxin	94	92
Diuretic	93	92

Other concerns related to the HFSS in 2008

- Resting pulse rate
- Mean arterial pressure
- Interventricular conduction delay
- Left ventricular ejection fraction
- Peak VO2


125
100
75
50
25
0
Cumulative survival, %
VO2 >14.0 ml/kg/min
VO2 <14.0 ml/kg/min
0
6
12
18
24
Follow-up, mo

Ventilatory Equivalent for CO2

Reflects inefficient ventilation in HF and provides further prognostic information in addition to peak VO2.

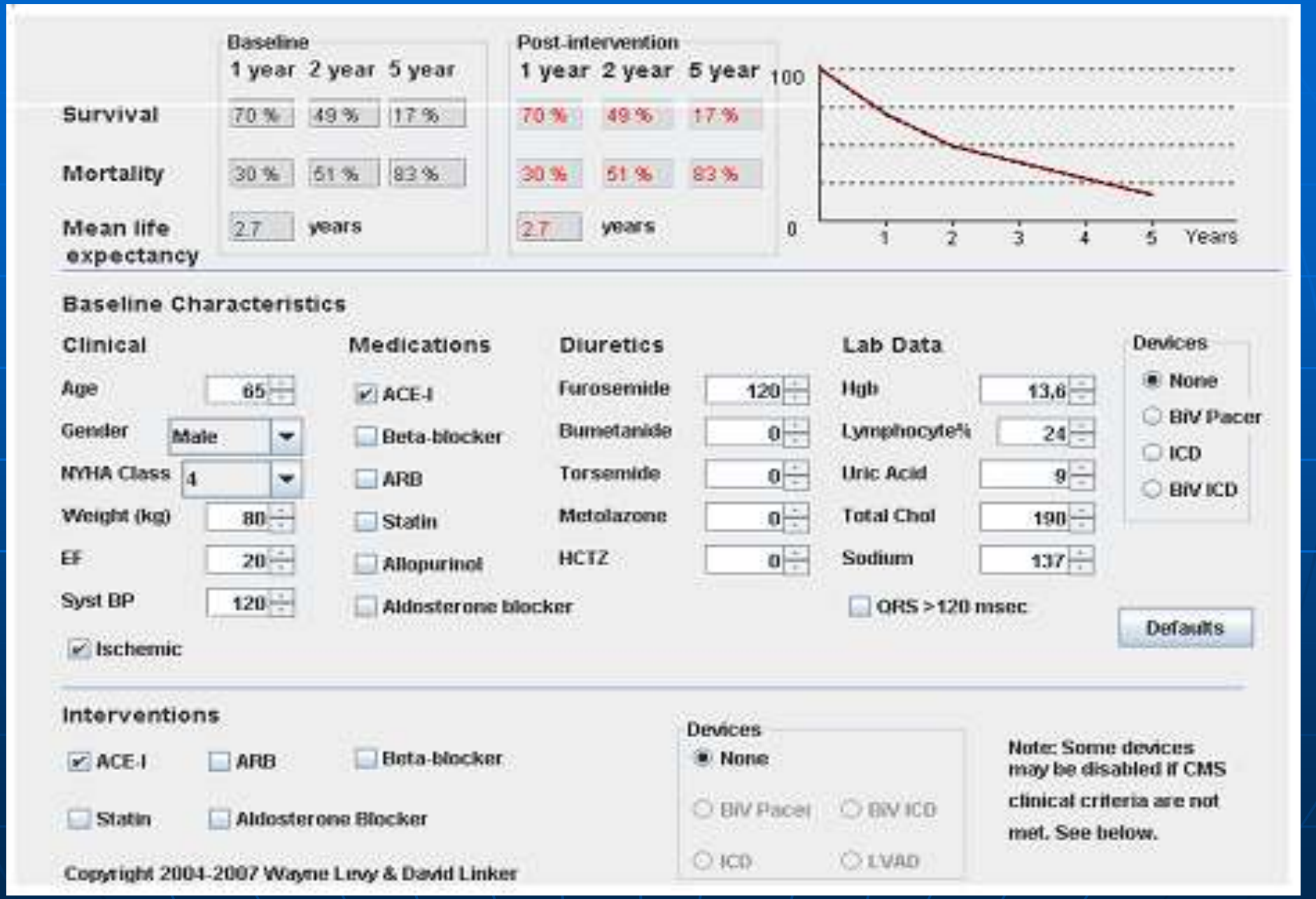
Peak VO2=15 and VE/CO2>50%

Mortality rates of 82% vs 22%.

What might predict prognosis better than the HFSS?

- BNP
- Pulse pressure
- Seattle heart failure model

SEATTLE HEART FAILURE MODEL



End stage heart failure
Steps to diagnosis I

- **High NYHA (III-IV)** → **Anamnesi e EO**
- **Low left ventricular ejection fraction** → **Ecocardio**

Heart Failure as a Symptomatic Disorder

Functional Class

- **New York Heart Association (NYHA)**
  - **Class I: normal exercise tolerance**
  - **Class II: symptoms with ordinary exertion**
  - **Class III: symptoms with only mild exertion**
  - **Class IV: symptoms at rest**

Problem: *the underlying disease progresses, even in the absence of symptoms!!*

End stage heart failure
Steps to diagnosis II

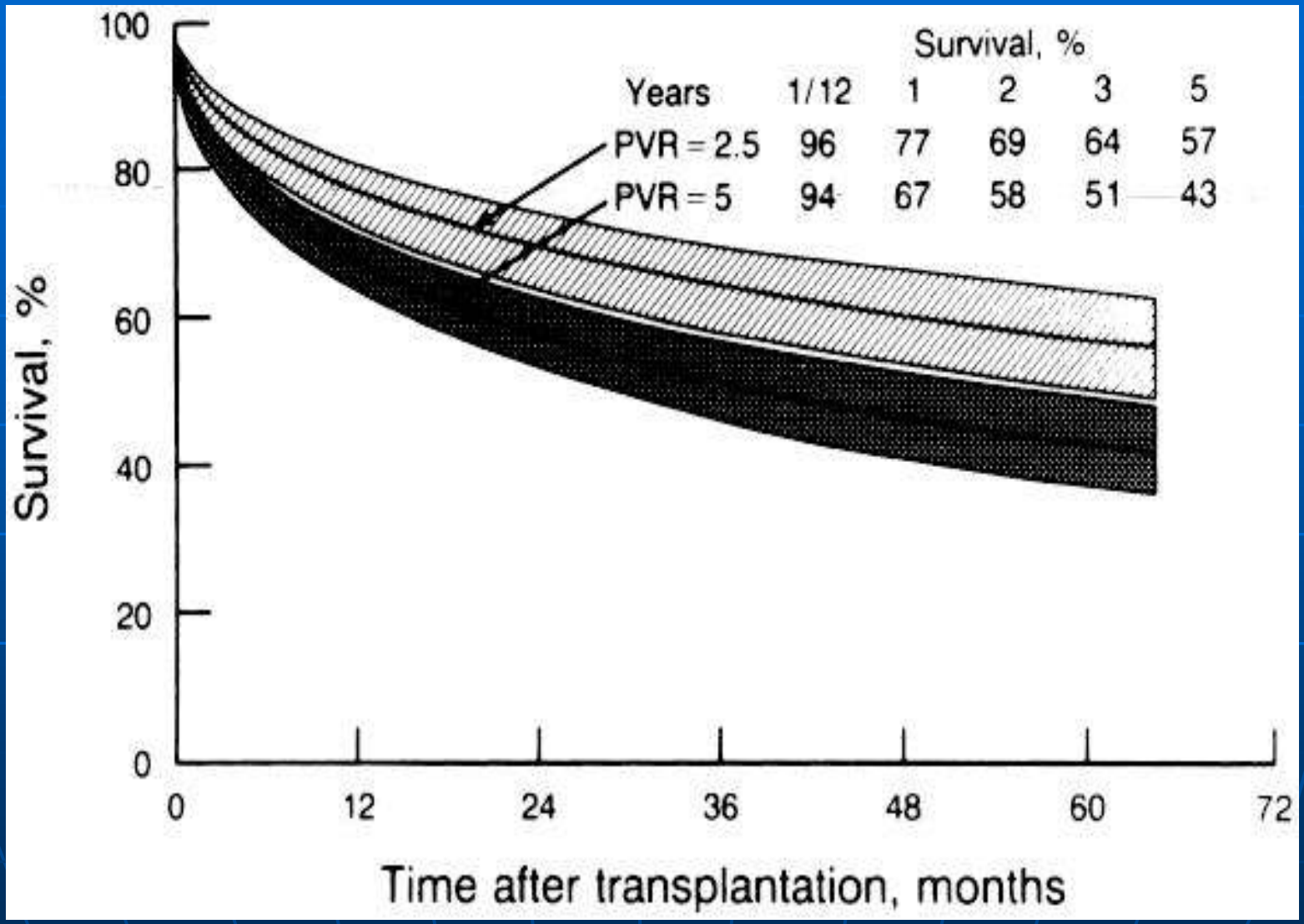
- Low Cardiac output
- High filling pressures
- Limited functional capacity

→ **Cateterismo cardiaco destro**

→ **Test Cardiopolmonare**

Cateterismo Cardiaco destro

- catetere di Swan Ganz con accesso venoso giugulare o femorale
- misurazione parametri: PAP, CO, IC (<2,5), wedge pressure, AD, RPA
- test di vasoreattività con vasodilatatori (es.NTP), per valutare la reversibilità di una eventuale ipertensione polmonare secondaria


Survival, %
Years 1/12 1 2 3 5
PVR = 2.5 96 77 69 64 57
PVR = 5 94 67 58 51 43
100
80
60
40
20
0
Survival, %
0 12 24 36 48 60 72
Time after transplantation, months

Test cardiopolmonare

Valutazione della tolleranza allo sforzo fisico in pazienti con insufficienza cardiaca congestizia in fase di valutazione per trapianto cardiaco

Test Cardiopolmonare

- Parametro oggettivo di capacità funzionale
- Con l' esercizio fisico si calcola il consumo di O2 (VO2) kg / min e il cambiamento del metabolismo muscolare (aerobio -> anaerobio) che è direttamente proporzionale alla portata sistemica e alla funzione cardiaca
- Vo2 picco< 14 ml/kg/min

Comorbid non cardiac condition

E' necessario escludere comorbidità non cardiache che potrebbero compromettere seriamente l'esito del trapianto o influire negativamente sulla sopravvivenza del paziente indipendentemente dalla malattia cardiaca

Comorbid non cardiac condition

- ✓ Età > 60-65 anni (soprattutto se comorbidità)
- ✓ Ipertensione polmonare irreversibile
- ✓ Storia recente di neoplasia
- ✓ Diabete mellito complicato
- ✓ Obesità severa
- ✓ Malattia epatica irreversibile
- ✓ Infezione sistemica attiva grave

Comorbid non cardiac condition

- ✓ Disfunzione polmonare severa
- ✓ Embolia polmonare recente
- ✓ Ulcera peptica attiva
- ✓ Abuso di sostanze stupefacenti
- ✓ Disfunzione psichiatrica severa
- ✓ Non compliance alla terapia medica e ai controlli di follow-up

Diabetes mellitus

- ***Wound healing after surgery***
- ***Hyperglycemia with steroid use***
- ***Nephropathy and neuropathy***
- ***Mancini: 5-year FU of Tx- pts with and without DM- comparable survival at 1- and 3-yrs (85%)***

Severe chronic bronchitis or COPD

- Poor candidates fot Heart Tx if:

- FEV/FVC < 40-50% of predicted
- FEV1 < 50% of predicted
- despite optimal medical therapy

Screening pre-trapianto

Livello I

Ematochimici:

- ✓Emocromo
- ✓Funzionalità epatica (AST,ALT, proteine tot,
- ✓ parametri coagulazione)
- ✓Funzionalità renale (creatininemia,urea)
- ✓Sierologia per CMV, Toxo, Varicella zoster, EBV
- ✓Sierologia per HBV,HAV,HCV
- ✓Marker tumorali ?

Screening pre-trapianto

Livello I

Esami strumentali

- ✓ Rx Torace
- ✓ Ecografia Addome
- ✓ Ecografia TSA e AA inferiori (> 50 aa o se FRC)
- ✓ Ortopantomografia +visita odontoiatrica
- ✓ Visita psicologica

Screening pre-trapianto

Livello II

Esami strumentali

- ✓ Spirometria e DLCO (BPCO, enfisema, pregresso Ca polmone)
- ✓ Sangue occulto feci (se storia di malattia ulcerosa o
- ✓ ridotta Hb)
- ✓ Colonscopia (diverticolosi/poliposi del colon)
- ✓ Tac Torace/(BPCO)e Addome (neoplasia pregressa)
- ✓ Tipizzazione (HLA)

Patient Selection in the Current Era

- To establish the patient's severity of heart disease
- To screen for comorbidities that may negatively affect survival
- To assess psychological variables necessary for successful outcome following transplantation

Open question

If the 1-year survival with medical therapy is better than transplant, can we justify transplanting a patient for the 5- and 10-year possible benefit?
If the patient dies peri-operatively, this argument is difficult to justify.

"OK, the old one's in my right hand,
the donor's in my left. Right?"

Grazie

Per la vostra attenzione